University of Piraeus

School of Information and Communication Technologies

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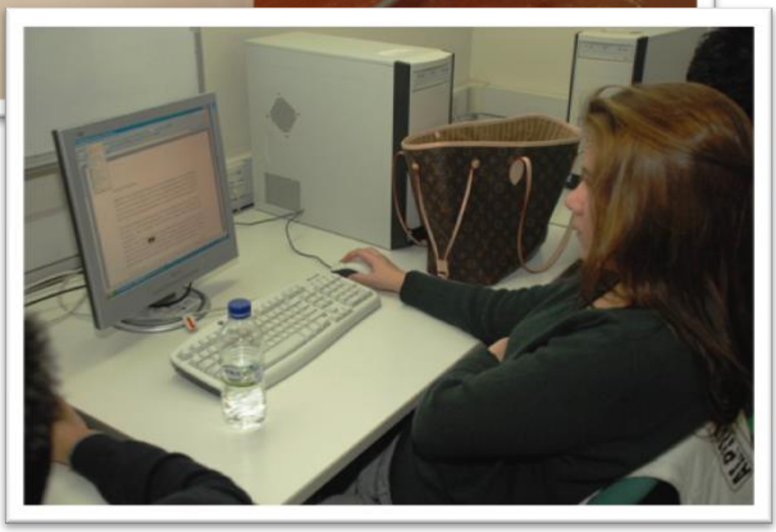
Department of Informatics

Student Handbook 2024-2025



MESSAGE FROM THE CHAIR OF THE DEPARTMENT OF INFORMATICS PROFESSOR EFTHIMIOS ALEPIS

I am pleased to welcome you to the Department of Informatics, School of Information and Communication Technologies, University of Piraeus.

The Department of Informatics of the University of Piraeus is one of the leading Departments of Informatics in our country, with international recognition and a wide range of activities. It has been operating for 32 years and is one of the first Departments of Informatics established in Greece. In the department, 21 professors at various ranks carry out teaching and research duties, a particularly high number of researchers, scientists, doctoral candidates, postdoctoral fellows, as well as a significant number of temporary and external collaborators. Our department has achieved an important position as a research participant in international scientific developments, while it is important to point out that 40% of our professors belong to the top 2% of professors worldwide, according to the list published every year by Stanford University.

Informatics as a science is perhaps going through its "golden" age. It participates in all areas of entrepreneurship, research, economy and has been integrated in various ways into human daily life. The

Contents

Covid-19 pandemic has highlighted even more the contribution and value of Information at a global level, with education at all levels, communication, transactions, online shopping, information, health and research to be based to a high degree, directly or indirectly, on it. In the post-Covid era, the needs for IT scientists and graduates have soared to unprecedented levels, inside and outside our country, with the most expanded work, living, remote or even hybrid possibilities.

Our department makes continuous efforts to enhance research and teaching and aspires to provide a high-level educational experience. Our collective effort to maintain high standards of academic excellence and support the development of global knowledge is a key part of our educational philosophy. The undergraduate study program of the department has 3 directions according to the current developments in our field. In addition, the department operates 4 postgraduate study programs, as well as 2 more, in collaboration with other departments.

The staff of the department and all the professors are at your disposal for whatever you need.

Professor Efthimios Alepis
Chair of the Department of Informatics

Administrative Bodies of the University

1. **Rector**
2. **Board of Directors**
3. **Senate**

Administrative Bodies of the School of Information and Communication Technologies

1. **Dean's Office**
2. **Dean**

Administrative Bodies & Staff of the Department of Informatics

1. **General Assembly of the Department**
2. **Department Chair**

Department Chair: Professor E. Alepis

Staff:

Professors

Alepis Efthimios
Apostolou Dimitrios
Vergados Dimitrios
Virvou Maria
Douligeris Christos
Theodorides Ioannis
Kotzanikolaou Panagiotis
Konstantopoulos Charalampos
Metaxiotis Konstantinos
Panagiotopoulos Themistoklis
Polemi Despoina
Tsihrintzis George

Associate Professors

Patsakis Constantinos
Sakkopoulos Evangelos
Psarakis Michael

Assistant Professors

Venetis Ioannis
Liagkouras Konstantinos
Pikrakis Aggelos
Sotiropoulos Dionisios
Tasoulas Ioannis
Chrysafiadi Konstantina

Administrative staff

Gotsi Vasiliki (Secretary)
Tomara Evgenia
Katsiadrami Aristea
Giannouli Maria

Laboratory Teaching Staff of the Department

Tsakonas Panagiotis

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Undergraduate Program

The Undergraduate Program has a total duration of **eight (8) semesters** and corresponds to **240 credits** of the European Credit Transfer and Accumulation System (ECTS).

The Undergraduate Program of the Department is adapted to nowadays requirements regarding the science of Informatics and competitive with corresponding programs of other Universities in Greece and abroad. It is also adapted to the Greek reality, aiming at the creation of specialized and well-trained executives in the fields of Informatics, in order to create a potential for competent executive personnel for Greek and international companies.

The Undergraduate Program of the Department of Informatics of the University of Piraeus aims to fulfill at the highest possible degree the following objectives:

- ✓ Alignment with current internationally defined guidelines in the field of Information Technology and needs in the labor market,
- ✓ Determining the unique identity of the Department by establishing directions to deal with cutting-edge areas of Informatics adequately adapted to an undergraduate level,
- ✓ Creation of a "nursery" of young scientists with the integration of modern subjects and courses in combination with the already launched Postgraduate Programs of the Department.

Three directions have been introduced in the curriculum for the last two years of studies, which provide the necessary and critical specialization for the undergraduate program that makes the graduates of the Department competitive in the IT labor market.

The first four (4) semesters (1st and 2nd academic year) are common for all students of the Department. For the four (4) last semesters (3rd and 4th academic year) three directions are established:

- Software Engineering and Intelligent Systems
- Online and Computer Systems
- Information Systems and Services

Direction: Software Engineering and Intelligent Systems (TSIS)

The rapid development of computers, marked by increased computing power, increased memory capacity and specialized peripherals, has allowed the spread of advanced and demanding programming techniques, even at the level of personal computers. These techniques are studied by the scientific fields of Software Engineering, Graphics and Virtual Reality, Artificial Intelligence and Intelligent Systems, Pattern Recognition and Machine Learning, Multimedia and Human-Computer Interaction. On one hand, this direction aspires to offer undergraduate students the necessary background, and on the other hand the special technical knowledge so that they will be able to develop and perform research in the wider area of modern and advanced software development techniques.

Direction: Online and Computer Systems (NCS)

The convergence of information and telecommunication technologies, the explosive development of the Internet and the exponential changes in the complexity and speed of the systems that support the above technologies, require the acquisition of specialized knowledge in the scientific fields of network computing or network-centric systems and computer systems that are necessary for the spread of these technologies. The curriculum in this direction provides students with the opportunity to first acquire the necessary background to understand, operate and use these technologies and then to equip themselves with the necessary skills to develop, maintain and optimize systems operating in a network environment.

Direction: Information Systems and Services (IS)

The development, implementation and management of modern information systems requires a wide range of knowledge related to Information and Communication Technologies, as well as knowledge related to Business Administration, so that information systems are innovative, secure, trusted by users and successfully integrated into business operations. The purpose of this direction is to provide the students of the Department with the necessary knowledge, both at a theoretical and applied level, on the methodologies and technologies of development of modern information systems, project management procedures related to the (secure) development of information systems, and methods for the management of installed information systems. Indicatively, special emphasis is given to methodologies of analysis and (secure) systems design, design and development of efficient databases, computer networks, development of information systems based on business processes, workflow systems and information security.

COURSES

(M: Mandatory, F.L.: Foreign Language, S: Selection, C: Core, M(D): Mandatory(Direction), W: Workshop, T: Tutorial)

1st Semester				
Course	*Type of course*	*Hours (per week)*	*Credits*	*Lecturers*
LOGIC DESIGN OF DIGITAL SYSTEMS	M	4+2W	5	Psarakis Michael
ANALYSIS I	M	4+2T	5	Tasoulas Ioannis
INTRODUCTION TO PROGRAMMING	M	4	5	Apostolou Dimitrios
INTERNET TECHNOLOGIES	M	4+2W	5	Douligeris Christos, Mavropodi Roza
INTRODUCTION TO COMPUTER SCIENCE WITH PYTHON	M	4+2W	5	Patsakis Constantinos
MATHEMATICS FOR COMPUTER SCIENCE	M	4+2T	5	Tasoulas Ioannis

2nd Semester				
Course	*Type of course*	*Hours (per week)*	*Credits*	*Lecturers*
ANALYSIS II	M	4+2T	5	Tasoulas Ioannis
DISCRETE MATHEMATICS	M	4+2T	5	Tasoulas Ioannis
DATA STRUCTURES	M	4	5	Konstantopoulos Charalampos, Venetis Ioannis
OBJECT ORIENTED PROGRAMMING	M	4+2W	5	Alepis Efthimios
COMPUTER ARCHITECTURE	M	4+2W	5	Psarakis Michael
APPLIED ALGEBRA	M	4+2T	5	Tasoulas Ioannis, Venetis Ioannis

3rd Semester				
Course	*Type of course*	*Hours (per week)*	*Credits*	*Lecturers*
MATHEMATICAL PROGRAMMING	M	4	5	Apostolou Dimitrios
OBJECT ORIENTED APPLICATION DEVELOPMENT	M	4+2W	5	Alepis Efthimios
OPERATING SYSTEMS	M	4+2W	5	Venetis Ioannis, Kotzanikolaou Panagiotis
COMPILERS	M	4+2W	5	Pikrakis Aggelos, Chrysafiadi Konstantina
PROBABILITY AND STATISTICS	M	4+2T	5	Tasoulas Ioannis, Sotiropoulos Dionisios, Liagkouras Konstantinos
APPLICATIONS OF GRAPH THEORY	S	4	5	Not offered for the academic year 2024 – 2025
MANAGEMENT	S	4	5	Ntalianis Filotheos
PEDAGOGICS	S	4	5	Tsakonas Panagiotis, Chrysafiadi Konstantina
INFORMATICS LAW	S	4	5	Sinanioti Aristea
ENGLISH III	F.L.	4	3	Mormori Pelagia
Students select one of the offered selection courses.				

4th Semester				
Course	*Type of course*	*Hours (per week)*	*Credits*	*Lecturers*
COMPUTER NETWORKS	M	4+2W	5	Douligeris Christos
ALGORITHMS	M	4	5	Konstantopoulos Charalampos
DATABASES	M	4+2W	5	Theodorides Ioannis, Mavropodi Roza
INTERNET AND WEB PROGRAMMING	M	4+2W	5	Kotzanikolaou Panagiotis
PRINCIPLES AND APPLICATIONS OF SIGNALS AND SYSTEMS	M	4+1W	5	Douligeris Christos, Tsihrintzis George
INFORMATICS IN EDUCATION	S	4	5	Chrysafiadi Konstantina
INFORMATION AND CODING THEORY	S	4	5	Patsakis Constantinos
APPLIED COMBINATORICS	S	4	5	Tasoulas Ioannis
BUSINESS STRATEGY	S	4	5	Pollalis Yannis
DYNAMICAL SYSTEMS	S	4	5	Sotiropoulos Dionisios
ENGLISH IV	F.L.	4	3	Mormori Pelagia
Students select one of the offered selection courses.				

5th Semester

Course	*Type of course*	*Hours (per week)*	*Credits*	*Lecturers*
HUMAN COMPUTER INTERACTION	M(D)	4+2W	5	Virvou Maria
INFORMATION SYSTEMS	M(D)	4	5	Metaxiotis Konstantinos, Liagkouras Konstantinos
PATTERN RECOGNITION	M(D)	4+2W	5	Tsihrintzis George, Sotiropoulos Dionisios
SCIENTIFIC WRITING IN EDUCATION	M(D)	4	5	Liagkouras Konstantinos, Venetis Ioannis
ADVANCED COMPUTER ARCHITECTURE	M(D) NCS	4	5	Psarakis Michael
ADVANCED TOPICS IN COMMUNICATIONS	M(D) NCS	4+2W	5	Vergados Dimitrios
PROGRAMMING IN LOGIC	M(D) TSIS	4+2W	5	Apostolou Dimitrios
DATABASE MANAGEMENT SYSTEMS	M(D) TSIS,IS	4+2W	5	Theodorides Ioannis
CRYPTOGRAPHY	MD(IS)	4	5	Patsakis Constantinos
THEORY OF COMPUTATION	S	4	5	Konstantopoulos Charalampos
LEARNING MANAGEMENT SOFTWARE	E	4	5	Tsakonas Panagiotis, Chrysafiadi Konstantina
QUEUING THEORY	E	4	5	Douligeris Christos
ENGLISH V	F.L.	4	3	Mormori Pelagia

The course "Scientific Writing in Education" is a prerequisite for being awarded the Bachelor's degree, however its grade is not taken into account towards calculating the Bachelor degree grade.

Students select one of the offered selection courses or one course from another direction.

6th Semester

Course	*Type of course*	*Hours (per week)*	*Credits*	*Lecturers*
SOFTWARE ENGINEERING	M(D)	4+2W	5	Virvou Maria, Alepis Efthimios, Liagkouras Konstantinos
ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	M(D)	4	5	Apostolou Dimitrios
COMPUTER SYSTEMS DESIGN	M(D) NCS	4	5	Psarakis Michael
HIGH SPEED NETWORKS	M(D) NCS	4+2W	5	Vergados Dimitrios
TELECOMMUNICATIONS, SERVICES AND SYSTEMS PROGRAMMING	M(D) NCS	4+2W	5	Vergados Dimitrios
DATA ANALYTICS	M(D) IS	3+2W	5	Theodorides Ioannis, Pikrakis Aggelos, Pelekis Nikolaos
SYSTEMIC ANALYSIS	M(D) IS	4+1W	5	Asimakopoulos Nikitas
DECISION SUPPORT SYSTEMS	M(D) IS	4	5	Apostolou Dimitrios
MULTIMEDIA SYSTEMS	M(D) TSIS	4	5	Pikrakis Aggelos
NATURAL LANGUAGE PROCESSING	M(D) TSIS	4	5	Panagiotopoulos Themistoklis
BIOINFORMATICS	M(D) TSIS	4	5	Pikrakis Aggelos
DIDACTICS OF INFORMATICS	S	4	5	Tsakonas Panagiotis

SECURITY GOVERNANCE	S	4	5	Polemi Despoina, Patsakis Constantinos
INTELLIGENT SOCIAL NETWORKS INTERACTION	S	4	5	Sotiropoulos Dionisios
SOFTWARE DESIGN PATTERNS	S	4+2W	5	Sakkopoulos Evangelos
PARALLEL COMPUTING	S	4	5	Venetis Ioannis
ENGLISH VI	F.L.	4	3	Mormori Pelagia
Students select one of the offered selection courses or one course from another direction.				

7th Semester

Course	***Type of course***	***Hours (per week)***	***Credits***	***Lecturers***
DISSERTATION A	M(D)	4	5	
DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEMS	M(D) NCS	4	5	Douligeris Christos, Psarakis Michael
MOBILE AND WIRELESS COMMUNICATIONS	M(D) NCS	4+2W	5	Vergados Dimitrios
INFORMATION SYSTEMS SECURITY	M(D) NCS, IS	4+2W	5	Kotzanikolaou Panagiotis
DATA SCIENCE TOPICS	M(D) IS	3+2W	5	Theodorides Ioannis, Pikrakis Aggelos, Pelekis Nikolaos
SYSTEMS' SIMULATION	M(D) IS	4+1W	5	Asimakopoulos Nikitas
VIRTUAL REALITY	M(D) TSIS	4+2W	5	Panagiotopoulos Themistoklis
IMAGE ANALYSIS	M(D) TSIS	4+2W	5	Tsihrintzis George
CURRENT TOPICS OF SOFTWARE ENGINEERING – SOFTWARE FOR MOBILE DEVICES	M(D) TSIS	4+2W	5	Virvou Maria, Alepis Efthimios
INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB	M(D) IS	4	5	Konstantopoulos Charalampos, Venetis Ioannis
TUTORING PROGRAMS EVALUATION	S	4	5	Tsakonas Panagiotis
PRACTICAL TRAINING	S	4	5	Panagiotopoulos Themistoklis, Tsihrintzis George
NEXT GENERATION VEHICULAR NETWORKS	S	4	5	Vergados Dimitrios
KNOWLEDGE MANAGEMENT	S	4	5	Metaxiotis Konstantinos, Liagkouras Konstantinos
SMART CITIES AND INTERNET OF THINGS	S	4	5	Dasaklis Thomas
E-LEARNING AND SOCIAL NETWORKS	S	4	5	Sotiropoulos Dionisios
MARITIME ICT SYSTEMS	S	4	5	Polemi Despoina
COMPUTER GAME DEVELOPMENT TECHNOLOGIES	S	4	5	Panagiotopoulos Themistoklis
SERVICE ORIENTED PROGRAMMING	S	4+2W	5	Sakkopoulos Evangelos
The "DISSERTATION" can be selected only once (either in the 7th or the 8th semester)				
Students select two of the offered selection courses and/or courses from other directions.				

8th Semester				
Course	***Type of course***	***Hours (per week)***	***Credits***	***Lecturers***
DISSERTATION B	M(D)	4	5	
NETWORK SECURITY	M(D) NCS	3+1W	5	Kotzanikolaou Panagiotis
E-BUSINESS AND INNOVATION	M(D) NCS, IS	2+2W	5	Polemi Despoina
INTERNET-BASED INFORMATION SYSTEMS	M(D) NCS, IS	4+2W	5	Douligeris Christos
IT PROJECT MANAGEMENT	M(D) IS	4	5	Metaxiotis Konstantinos, Liagkouras Konstantinos
EDUCATIONAL SOFTWARE	M(D) TSIS	4+2W	5	Virvou Maria, Sakkopoulos Evangelos
SPEECH AND AUDIO PROCESSING	M(D) TSIS	2+2W	5	Pikrakis Aggelos
INTELLIGENT AGENTS	M(D) TSIS	4+2W	5	Panagiotopoulos Themistoklis
PRACTICAL TRAINING	S	4	5	Tsihrintzis George
ERP/CRM	S	4	5	Metaxiotis Konstantinos, Liagkouras Konstantinos
ADVANCED TOPICS IN NETWORK AND MOBILE COMMUNICATION MANAGEMENT	S	4	5	Vergados Dimitrios
BLOCKCHAIN TECHNOLOGIES AND APPLICATIONS	S	4	5	Patsakis Konstantinos
The “DISSERTATION” can be selected only once (either in the 7th or the 8th semester)				
Students select two of the offered selection courses and/or courses from other directions.				

Detailed Course Information

Detailed information for each course of the Undergraduate Program per semester is presented in the section "**DETAILED DESCRIPTION - COURSE INFORMATION**". Specifically, for each course the following are reported:

- The hours of lectures, workshops, tutorials, etc.
- ECTS credits
- The website of the course
- The expected learning outcomes
- The content of the course
- The organization of teaching
- The teaching and delivery modes used for the course and student assessment methods
- The recommended bibliography

CONDITIONS FOR BEING AWARDED A DEGREE

Obtaining the degree requires **eight (8) semesters of study** and the accumulation of a total of **240 credits (ECTS)**. According to the current curriculum, forty-eight (48) courses are required to obtain a degree, in addition to the foreign language courses (in case of non-exemption, as defined below), as well as the course "SCIENTIFIC WRITING IN EDUCATION" which concerns all students (as defined below). A breakdown per semester follows:

1st semester: successful completion of six (6) compulsory courses.

2nd semester: successful completion of six (6) compulsory courses.

3rd semester: successful completion of five (5) compulsory courses, one (1) of the offered selection courses and one (1) foreign language course (“ENGLISH III”).
Regarding the foreign language course (“ENGLISH III”) it is noted that:

- Successful completion is a prerequisite for being awarded the degree.
- The grade of the course does not contribute to the grade of the degree.
- The credits earned (ECTS) do not contribute towards the required total of 240 credits.
- It is possible to be exempted from the examination of the course, by submitting to the secretariat of the Department a certificate proving language skills of at least level B2 according to the standards of ASEP.

4th semester: successful completion of five (5) compulsory courses, one (1) of the offered selection courses and one (1) foreign language course (“ENGLISH IV”).
Regarding the foreign language course (“ENGLISH IV”) it is noted that:

- Successful completion is a prerequisite for being awarded the degree.
- The grade of the course does not contribute to the grade of the degree.
- The credits earned (ECTS) do not contribute towards the required total of 240 credits.
- It is possible to be exempted from the examination of the course, by submitting to the secretariat of the Department a certificate proving language skills of at least level B2 according to the standards of ASEP.

5th semester: compulsory selection of one of the three directions (NCS, IS, TSIS), successful completion of the two (2) compulsory direction courses and the four (4) compulsory core courses. It is noted that one of the four compulsory core courses is "SCIENTIFIC WRITING IN EDUCATION", which is a prerequisite for being awarded the degree. However, the grade received does not contribute to the grade of the degree, neither do the credits earned (ECTS) contribute towards the required total of 240 credits. Students must also complete one (1) of the offered elective courses or one (1) course of another direction as an elective and one (1) foreign language course ("ENGLISH V") .
Regarding the foreign language course (“ENGLISH V”) it is noted that:

- Successful completion is a prerequisite for being awarded the degree.
- The grade of the course does not contribute to the grade of the degree.
- The credits earned (ECTS) do not contribute towards the required total of 240 credits.
- It is possible to be exempted from the examination of the course, by submitting to the secretariat of the Department a certificate proving language skills of at least level B2 according to the standards of ASEP.

6th semester: successful completion of the three (3) compulsory courses and of the two (2) compulsory core courses, one (1) of the offered elective courses or a course of another direction as an elective, and one (1) foreign language course ("ENGLISH VI").

Regarding the foreign language course ("ENGLISH VI") it is noted that:

- Successful completion is a prerequisite for being awarded the degree.
- The grade of the course does not contribute to the grade of the degree.
- The credits earned (ECTS) do not contribute towards the required total of 240 credits.
- It is possible to be exempted from the examination of the course, by submitting to the secretariat of the Department a certificate proving language skills of at least level B2 according to the standards of ASEP.

7th semester: commencement of thesis, successful completion of the three (3) compulsory courses, two (2) of the elective courses offered and / or courses of another direction as an elective.

8th semester: completion of thesis, successful completion of the three (3) compulsory courses, two (2) of the elective courses offered and / or courses of another direction as an elective.

(For the above, the provisions of the Undergraduate Program Regulations are taken into account.)

TRANSITIONAL RULES FOR COURSES

The course "INTRODUCTION TO COMPUTER SCIENCE WITH PYTHON" is a renaming of the course "INTRODUCTION TO COMPUTER SCIENCE". Therefore, students admitted to the program during previous years who have not yet successfully completed the course, will now be examined in the course "INTRODUCTION TO COMPUTER SCIENCE WITH PYTHON".

The elective course "SCIENTIFIC WRITING IN EDUCATION" of the 5th semester is a renaming of the course "SCIENTIFIC WRITING". Therefore, students admitted to the program during previous years who have not yet successfully completed the course, will now be examined in the course "SCIENTIFIC WRITING IN EDUCATION".

The course of the direction IS "DATA ANALYTICS" of the 6th semester replaces the course "DATA WAREHOUSES AND DATA MINING". Therefore, students admitted to the program during previous years who have not yet successfully completed the course, will now be examined in the new course.

Students admitted up to the academic year 2015-2016 who have not successfully completed the 6th semester course "GRAPHICS WITH COMPUTERS" in the TSIS direction, will be examined in the course "NATURAL LANGUAGE PROCESSING".

The 7th semester course "CURRENT TOPICS OF SOFTWARE ENGINEERING – SOFTWARE FOR MOBILE DEVICES" of the TSIS direction replaces the course "CURRENT TOPICS OF SOFTWARE ENGINEERING". Therefore, students admitted to the program during previous years who have not yet successfully completed the course, will now be examined in the new course.

A new course titled: "DATA SCIENCE TOPICS" is introduced in the IS direction, which replaces the course "INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB". The course "INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB" is offered as an elective course. Students of the IS direction with admission year 2019 and onwards, will choose the new course "DATA SCIENCE TOPICS". The students of the IS direction, with admission year up to 2018, who have not been successfully examined in the course "INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB" may choose any of the two courses above.

The 8th semester course "INTELLIGENT AGENTS" of the TSIS direction replaces the course "DISTRIBUTED ARTIFICIAL INYELLIGENCE". Therefore, students admitted to the program during previous years who have not yet successfully completed the course, will now be examined in the new course.

TRANSITIONAL RULES FOR THE COURSES "ENGLISH" AND "FRENCH"

The courses "ENGLISH I", "ENGLISH II" or "FRENCH I", "FRENCH II" that are related to the first and second semesters of studies, are still examined, without being taught, for students admitted to the program during previous years.

The courses "ENGLISH VII", "ENGLISH VIII" and "FRENCH VII", "FRENCH VIII" are not required to obtain a degree for students admitted during the academic years 2016-2017, 2017-2018 and 2018-2019.

The courses "ENGLISH VII", "ENGLISH VIII" or "FRENCH VII", "FRENCH VIII" are being examined, without being taught, during each corresponding examination period for students admitted during the academic years from 2012-2013 to 2015-2016.

FRENCH lessons are henceforth cancelled. Those students who have not been successfully examined in the courses FRENCH I or FRENCH II or FRENCH III or FRENCH IV or FRENCH V or FRENCH VI or FRENCH VII or FRENCH VIII may be examined in the corresponding courses, without being taught, in each respective examination period.

Course Grade Re-evaluations

Students of the Department are entitled to request the improvement of their grade in eight (8) courses in total, one per semester, by filing an application to the Secretariat of the Department during the course registrations at the beginning of each semester. The improvement of grades is allowed only once for each course. With the re-evaluation application, the student does not waive the existing grade unless the grade resulting from the re-evaluation is higher. Therefore, a grade obtained during the re-examination of a course is registered only if it is higher than the previous one.

The re-assessments take place during the studies and until the submission of the "DISSERTATION", which is the last course submitted to the Secretariat of the Department.

Calculation of the Grade of the Degree

The requirements for being awarded a degree are as follows:

1. successful completion of forty (40) compulsory courses, of which the 7th and 8th semester dissertation corresponds to two (2) courses.
2. successful completion of eight (8) elective courses.

Weights of course grades in the grade of the degree
Dissertation: 2 (receives a weight of 2)
Compulsory courses: 1
Elective courses: 1

The grade of the degree equals the weighted average of the student's grades in the courses, plus the dissertation and is divided by the number fifty (50), ie:

Grade of Degree = $\frac{4\times\beta_\pi+\sum_{i=1}^{46}\beta_i}{50}$ **, where β_π: grade of dissertation and β_i: grade of ith course**

Pedagogical and Teaching Competence

Starting with the academic year 2019-2020 and onwards, the Department of Informatics, according to the decision of the Assembly of the Department dated 13/06/2019 and then the decision of the Senate of the University of Piraeus from 27/06/2019, allows all the students of the Department to acquire, if they wish, Pedagogical and Teaching Competence through a Special Curriculum of the Undergraduate Curriculum of the Department of Informatics. Detailed instructions for obtaining Pedagogical and Teaching Competence are posted on the Department's website.

Useful Information

- ✓ The application to start the dissertation is filed at the beginning of the 7th semester during the months of October and November, provided that the student has successfully completed 2/3 of the courses of the program of studies. Detailed instructions for the preparation of the dissertation are found in the Thesis Regulations of the Department of Informatics of the University of Piraeus, which is posted on the website of the Department.

- ✓ The grade of the dissertation is the last grade submitted to the Secretariat. After its submission, re-evaluations of courses are not allowed, nor the participation in exams of pedagogical competence courses.

- ✓ The elective course "PRACTICAL TRAINING" can be selected once in either the 7th or the 8th semester of studies. Detailed instructions are posted on the Practical Training Regulations of the Department of Informatics of the University of Piraeus, on the website of the Department.

- ✓ Students attending the Erasmus + student mobility program are not expected to take any courses during the University's semester exam period.

Facilities and Electronic Services

INSTITUTIONAL ACCOUNT

Upon completion of your registration at the University, it is necessary to activate your account at the web site **https://uregister.unipi.gr**.

By activating your account you will have access to both your personal student account and the electronic services provided by the University and the Ministry of Education. After registering in the **uRegister** system, each user gains access to the **mypassword** service, from where she/he can a) reset her/his password, if she/he has forgotten it, or b) manage her/his password, email and mobile phone that she/he has provided.

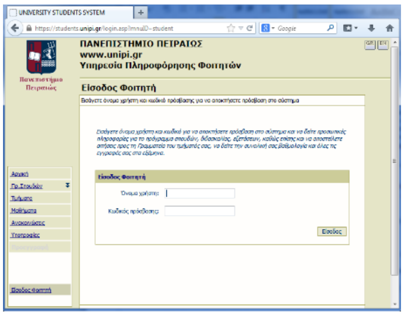
The user password management service is located at https://mypassword.unipi.gr/

ACADEMIC ID, STUDENT TICKET

The Academic ID is mandatory for all enrolled students. It issued upon request, submitted electronically to the address **academicid.minedu.gov.gr**

The academic ID also functions as a student ticket (pass) that facilitates transportation by public transport.

ELECTRONIC SECRETARIAT



The online application of the Electronic Secretariat operates at **sis-portal.unipi.gr**. From this application you have the opportunity to:

- be informed about the courses of your program of study, the lecturers, the suggested books, etc.,
- submit enrollment statements and course statements each semester,
- be informed about the grades in the courses you have taken,
- receive certificates of attendance directly and in electronic form.

This application is accessed through your personal credentials.

APPLICATION OF STUDENT CARE

The electronic application platform of the Student Care operates at **sitisi.unipi.gr**. There you can submit your application and upload the necessary documents for requesting free meals or housing. In addition, you can check the status of your application, until its final evaluation.

UNIVERSITY BOOKS

Books are distributed through the EUDOXOS service of the Ministry of Education that operates at **eudoxus.gr**. The books required each semester are registered in this service and relevant information is provided.

REMOTE ACCESS SERVICE – VPN

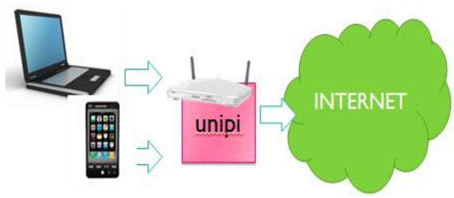
The service to access the internal network of the University (VPN service) provides the possibility of using the electronic services of the University from remote locations or networks, such as e.g. from Internet connections at home.

Through this service, it is possible to access the content of electronic scientific books, journals and databases that are made available by the library, from computers outside the University.

More information about this service is available at

www.unipi.gr/unipi/el/hu-sundesh-vpn.html

WI-FI



All areas of the University are covered by a free wireless network called **unipi**. You can connect to it either with a laptop or from your mobile phone, without using a password. In addition, all students who have received personal credentials can make use of the pan-European eduroam wireless network.

For authorized users, it is also possible to access the international academic network EDUROAM (www.eduroam.org), through which users from all over Europe have the opportunity to use remotely and securely the services provided by their academic institution. Using the eduroam network requires the issuance of personal credentials.

AVAILABILITY OF SOFTWARE FOR EDUCATIONAL PURPOSES

University students have free access to Microsoft software through the Imagine service (formerly Dreamspark). The Imagine service is accessed using their personal credentials at **dreamspark.unipi.gr**

In addition, Microsoft Office 365 Education Plus software is available to all students using their personal credentials, via **https://delos365.grnet.gr**

Detailed instructions for activating the service can be found at **http://www.unipi.gr/unipi/images/various/noc/office365instructions.pdf**

Apart from the centrally available software, some academic departments have additional subscriptions. For details regarding access to additional software contact directly your instructors and the Secretariat.

Electronic Distance Learning (e-learning)

The University operates, under the supervision of each individual Academic Department, e-learning systems that support the educational process. Notes, announcements and other educational material are posted on these systems. Information regarding their use is provided by lecturers.

The system that serves the students of the Department of Informatics is located at **http://thales.cs.unipi.gr**

LIBRARY Website: www.lib.unipi.gr

Access to the Library of the University of Piraeus is provided to professors, researchers and students, and its mission is to support education and research. It is housed in the main building of the University, in the second basement. Its entrance is in the main circular staircase in the middle of the ground floor. The elevator on the left side of the building can be used by people with mobility difficulties. The library consists of three main areas:

- The Reception Area, where the material movement area, the closed collection, rare collections and the computers for the catalog search and the sources of information are located,
- The Main Library, which houses the entire printed collection of the library, the photocopier and computers for the readers, and
- The Reading Room, where the dictionaries, the exhibitions with the latest issues of the printed magazines and other informative material are located.

Its opening hours have been extended to serve the needs of the members of the University, from 8.00 in the morning until 20.00 in the evening, every day, all working days.

Services

General information: The reception provides information about the library and its material, such as lending rules, photocopies, use of audiovisual material, location of items, etc. For the same reason, 9 brochures have been issued.

Specialized information: The library provides online thematic subscription and open access databases.

Specialized research questions are submitted and conducted by librarians of the relevant department by e-mail, phone, or in person.

Borrowing: each member of the University registers as a member in the library, in order to borrow its material. There is also a service for renewals and reservations for already borrowed material as well as keeping priority of borrowing requests upon return of the corresponding material.

Acquisition of material that does not exist in the library, either with proposals for its enrichment or by inter-lending from Greek libraries, or collaborators from abroad.

User training: the library staff offers to new students, but also to anyone interested, support and information regarding the use of the library, its catalog, services and electronic sources of information it provides.

Main Learning Outcomes

The Undergraduate Program of the Department of Informatics is designed in such a way that its graduates are able to:

- ✓ understand the basic principles of Information Science and relevant cutting-edge Technologies,
- ✓ understand the principles, methods and technologies of use and development of Software, Intelligent Systems and Artificial Intelligence Systems, Internet and Computer Systems, Information Systems and Services in electronic and mobile environments,
- ✓ analyze the needs and the main characteristics of requirements and to holistically implement the most modern methodologies of Software Engineering, and to develop solutions of Intelligent Systems and Artificial Intelligence Systems, Internet and Computing Systems, Information Systems and Services in electronic and mobile environments,
- ✓ broaden their knowledge on current issues related to the scientific interests of the Science of Informatics, but also to be guided in terms of current trends in the relevant sectors of the labor market and the required formal work qualifications,
- ✓ cooperate effectively in the management and execution of team work of high complexity and difficulty of implementation at a professional level with modern, widely accepted IT tools,
- ✓ research and develop innovative software and services in a wide range of modern IT applications with great interdisciplinarity,
- ✓ gain experience of applying the science of Informatics in a real work environment through practical training, increasing the prospects of employment,
- ✓ learn, research, deepen and cultivate their critical thinking and analytical skills through the writing (and / or presentation) of research papers, in the context of courses and the mandatory Thesis of the program, and to become familiar with research tools and methodologies,
- ✓ to pursue excellence, having been exposed to practices such as awards/praise and/or publications/announcements in important international conferences and/or by being rewarded for their participation in the operation of the Laboratories of the Department and/or by participation in international IT competitions,
- ✓ have the necessary pedagogical competence to carry out teaching.

Postgraduate Studies

The Department operates Postgraduate Programs aimed at training graduate students of Universities and TEI to provide specialized knowledge in specific subjects and applications of Informatics so that its graduates are able to cover recruiting needs of public and private institutions.

The Department proceeded during the academic year 2018-2019 to the reenactment of the following Postgraduate Programs:

- **“Master of Science (M.Sc) in Advanced Informatics and Computing Systems – Software Development and Artificial Intelligence”**

  Reenactment of Program (ΦΕΚ 2430/τ. Β’/26.06.2018) – Regulations of the Program (ΦΕΚ 3315/τ. Β΄/10.08.2018 and ΦΕΚ 2924/τ. Β’/12.07.2019).

- **“Master of Science (M.Sc) in Informatics”**

  Reenactment of Program (ΦΕΚ 3164/τ.Β/01.08.2018) – Regulations of the Program (ΦΕΚ 3861/τ.Β/06.09.2018 and ΦΕΚ 2924/τ. Β/12.07.2019).

- **“Master of Science (M.Sc) in Digital Culture, Smart Cities, IoT and Advanced Digital Technologies”**

  Establishment of Program (ΦΕΚ 2506/τ.Β/29.06.2018) – Regulations of the Program (ΦΕΚ 2621/τ. Β/05.07.2018 and ΦΕΚ 2924/τ. Β/12.07.2019).

- **“Master of Science (M.Sc) in Cybersecurity and Data Science”**

  Establishment of Program (ΦΕΚ 2099/τ. Β/21.05.2021) – Regulations of the Program (ΦΕΚ 2253/τ. Β/31.05.2021).

INTER-INSTITUTIONAL POSTGRADUATE STUDIES

- **“Master of Science (M.Sc) in Health Care Management-Health Informatics”**

  Reenactment of the inter-institutional Program of the Department of Nursing and Department of Economics of the National and Kapodistrian University of Athens and of the Department of Industrial Management and Technology, Department of Informatics and Department of Digital Systems of the University of Piraeus. (ΦΕΚ 3279/τ.Β/08.08.2018).

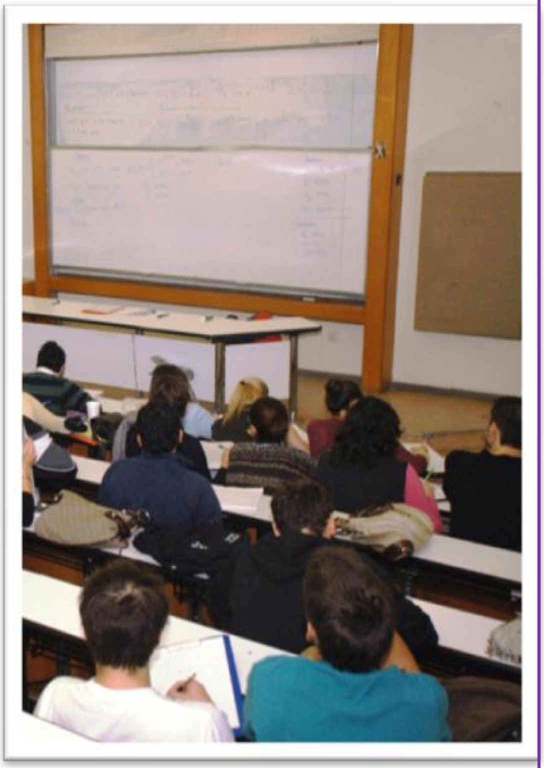
- **“Master of Science (M.Sc) in Modern Information Technologies and Services”**

  Reenactment of the inter-institutional Program of the Department of Informatics of the School of Science of the University of Western Macedonia and of the Department of Informatics of the School of Information and Communication Technology of the University of Piraeus. (ΦΕΚ 3668/τ.Β’/03.08.2019).

PhD Studies

One of the main goals of the Department is the discovery of new knowledge through research, in order to continuously modernize and enhance teaching.

In a rapidly changing world, production of new knowledge is achieved through continuous research effort and activities. For the development of these, the Department of Informatics accepts doctoral candidates in all cognitive subjects related to its purposes.



Research at the Department of Informatics and at the University of Piraeus in general is inspired by academic freedom and is conducted with respect to scientific ethics. The elaboration of a Doctoral Thesis is a test that involves the Doctoral Candidate, the Supervising Professor and the three-member Advisory Committee in continuous and multidimensional collaboration. For this reason, the assignment of a Supervising Professor and a three-member Advisory Committee is done with strict academic criteria.

Criteria for the acceptance of a Doctoral Thesis and for the award of the title of Doctor of the Department of Informatics are strong elements of originality in the achieved research results, as recognized by the international scientific community. The Doctoral Program of the Department is characterized by conducting high quality research and thorough training of young scientists, with significant prospects for academic development.

The procedures for the preparation of a doctoral dissertation are performed in accordance with the current legislation, as well as the Regulation of Doctoral Studies of the Department (ΦΕΚ 2736/τ.Β'/10.07.2018), which is posted on the website of the Department.

Postdoctoral Research

The Department of Informatics of the University of Piraeus provides the possibility of performing **postdoctoral research** by PhD holders of domestic or foreign universities, in collaboration with faculty members of the Department.

Postdoctoral research within the Department is for the Department, and the University in general, a source of collective excellence, high level scientific cooperation and international distinction. Thus, postdoctoral research contributes to the quantitative and qualitative upgrade of research in the Department and to the transfer of know-how in new and dynamic research fields for the benefit of society and the national economy.

The procedures for performing postdoctoral research are in accordance to the current legislation as well as the Regulations of Postdoctoral Research of the Department, which is posted on the website of the Department.

LIFELONG LEARNING PROGRAMS

www.cs.unipi.gr

The Department of Informatics of the University of Piraeus has included in its educational activity the program "Distance Education in Informatics", with the contribution and assistance of the new generation of educational products implemented over the Internet and utilizing its human resources, applying new platforms of high technology and distance learning, which puts it among the leading Departments of Informatics in Greece and abroad.

Objectives

The purpose of the program is to pass on knowledge of the IT industry to those who wish to immerse themselves in this diverse and highly interesting science. The Department of Informatics has created Teaching Educational Modules that cover every aspect of the field, and offers courses that interest a large percentage of employees, high school graduates and more.

Through our website, participants enter the online training platform and receive the electronic course material of their choice. The participants have the opportunity to get acquainted with the latest developments but also to receive primary knowledge, which is applied in the IT sector. The result of this educational process is for the trainees to acquire for the first time relevant knowledge that will allow them to have initial access to the labor market with more knowledge and to achieve improvement of their position through their further training in advanced IT subjects.

Applictions & Selection

The beginning of each round of courses is announced with a relevant publication in the press and on the Internet (via the website of the Department of Informatics, the Research Center of the University of Piraeus and other electronic media), while at the same time it is sent electronically or in print to all professional bodies that are directly or indirectly related to the program.

The Program accepts applications from:

- high school graduates, with or without prior knowledge in the field, whose participation in the program will help them understand specific concepts in Informatics.
- graduates of all Universities and TEI of the country that either do not work or have a job in sectors or positions related to the subject of the program and in general to those who want to be informed about developments in the field of IT.

The application form is submitted only electronically through the website of the program.

Initially, a first distribution of the applications is made and candidates, either partially or all at the same time, are requested to send the documents they recorded in their application, so that their acceptance in the program can proceed and at the same time the fee corresponding to their registration has to be deposited into the account of the program.

The acceptance or rejection of the application of the candidates is announced directly to the interested parties. Candidates must also, within 10 days of their acceptance into the program, send the required documents. The required supporting documents are announced on the website of the Program.

Curriculum – Teaching Educational Modules

The structure of the program, the duration as well as the cost of participation, are as follows:
1st Teaching Educational Module: Usage of IT packages.
2nd Teaching Educational Module: Informatics Mathematics Background Courses.
3rd Teaching Educational Module: Basic Informatics Courses.
4th Teaching Educational Module: Software – Computer Programming.
5th Teaching Educational Module: Intelligent Systems – Decision Making.
6th Teaching Educational Module: Networks and Computer Systems.
7th Teaching Educational Module: Areas of Informatics and Other Sciences.
8th Teaching Educational Module: Electronic and Mobile Software Services.
9th Teaching Educational Module: Advanced Topics in Multimedia Signals and Systems.
10th Teaching Educational Module: Measurements and Control of Applications with Computer Systems and LabVIEW.

The program is divided into cycles, which each cycle further divided into three periods of 3 months each. Each cycle lasts one year starting in October of one year and ending in September of the following year. The courses of the program have a duration of 3 months (10 teaching weeks), with the possibility of extending the completion of the courses, if there is a need, for reasons that will be deemed necessary by the Scientific Officer of the program.

The Distance Education in Informatics program, targets the social need for knowledge and improvement of ones position in the labor market.

The duration of all courses is **10 weeks**.

Teaching Method

In its typical form, teaching is performed through presentations, and is accompanied by notes posted on the distance learning platform per week. In some cases, teaching may include video or real-time interaction, or distance learning interactive software. For these cases, there will be relevant information in the general description of the course.

Certificate of Attendance

The participation in the program and the successful completion of a course, leads to the issuance of the Certificate of Attendance by the Research Center of the University of Piraeus. In case the participant fails in the final examination of the course or Teaching Educational Module, the program issues a simple Certificate of Attendance. Certificate of Attendance is provided to those who will attend an entire Teaching Educational Module that includes a cycle of courses.

LABORATORIES, INFRASTRUCTURE

The Department has the following laboratories and research teams:

Institutionalized Laboratories

- Software Egineering Lab.
  Director: Prof. Virvou Maria.
- Decision Support Systems Laboratory.
  Director: Prof. Apostolou Dimitrios.
- Information Systems Lab.
  Director: Prof. Alepis Efthimios.
- Internet and Telecommunication Services and Security Systems Laboratory.
  Director: Prof. Douligeris Christos.
- Artificial Intelligence and Virtual Reality Lab.
  Director: Prof. Panagiotopoulos Themistoklis.
- Integrated Computer Systems Laboratory.
  Director: Associate Prof. Psarakis Michael.
- Security Lab.
  Director: Prof. Kotzanikolaou Panagiotis.
- Pattern Recognition and Machine Learning – Multimedia Laboratory.
  Director: Prof. Tsihrintzis George.
- Discrete Mathematics and Theoretical Informatics Laboratory.
  Director: Prof. Konstantopoulos Charalampos.
- Digital Culture, Smart Cities, Internet of Things (IoT) and Advanced Digital Technologies and Services Laboratory.
  Director: Prof. Vergados Dimitrios.

The Department also participates in the operation of the laboratory:

- Data Science Laboratory.
  Director: Prof. Theodoridis Ioannis.

The research interests of the academic members of the Department cover the main areas of Computer Science. These areas are identified by the following areas of research activity:

- Theory of Algorithms and Computation.
- Mathematical and Combinatorial Analysis.
- Software Engineering.
- Intelligent Virtual Environments.
- Cryptography.
- Graph Theory.
- Dynamic Systems.
- Computational Geometry.
- Computational Logic.
- Programming Languages.
- Personalized Software Technology.
- Educational Software.
- Parallel and Distributed Algorithms.
- Computer Networks.
- Database Systems.
- Mobile Computer Systems.
- Security and Privacy of Information Systems.
- Artificial Intelligence.
- Computational Intelligence.
- Neural Networks.
- Genetic Algorithms.
- Fuzzy Logic Systems.
- Swarm Intelligence Algorithms.
- Development and Analysis of Social Media.
- Pattern Recognition and Machine Learning.
- Scientific Computing.
- Graphics.
- Signal Processing.
- Image Analysis.
- Optimization.
- Integrated Circuit Design and Testing.
- Computer architecture.
- Embedded Systems.
- Discrete mathematics.
- Operating Systems.

DETAILED DESCRIPTION – COURSE INFORMATION

1st SEMESTER

LOGIC DESIGN OF DIGITAL SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES			
DEPARTMENT	INFORMATICS			
LEVEL OF STUDY	UNDERGRADUATE			
COURSE UNIT CODE	PLPLH68		**SEMESTER**	1st
COURSE TITLE	LOGIC DESIGN OF DIGITAL SYSTEMS			
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**	
Lectures + Laboratory Exercises		4 + 2 = 6	5	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4				
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge			
PREREQUISITE COURSES:	NO			
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek / Greek			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA108/			

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
The main goal of the course is to introduce the students to the basic concepts of digital systems design. **Upon successful completion of the course, the students:** • Will have recognized the basic concepts of digital systems design • Will have understood the basic knowledge about digital systems: what are their main components, what functions they perform, how they are designed • Will have understood how numbers and data are represented in digital systems • Will be able to design and develop combinational and sequential digital circuits • Will be able to analyze the performance of a digital circuit and, after evaluating it, to improve it accordingly. • Will be able to utilize digital circuit design and simulation tools • Will have acquired the background knowledge to attend and understand more advanced courses in hardware and computer architecture

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Search for, analysis and synthesis of data and information by the use of appropriate technologies • Individual/Independent work • Group/Team work	

(3) COURSE CONTENT

1. Binary arithmetic systems. Conversions between numbering systems. Integer representation.
2. Boolean algebra and logic gates. Optimization of Boolean functions.
3. Combinational logic. Hierarchical design.
4. Arithmetic circuits.
5. Multiplexers. Coders/decoders.

6. Modern sequential circuits. 7. Registers. Counters. State machines. 8. Memories. 9. Digital integrated circuits. 10. Circuit simulation. 11. Introduction to hardware description languages.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	• In-class lecturing • Face-to-face in lab courses
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Support of learning process using e-learning platform (e-class) • Use of electronic material in teaching (slides, exercises, laboratory material) • Use of software tools for the design and simulation of digital circuits in laboratory exercises
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	22 x 2 = 44
Laboratory practice	8 x 2 = 16
Tutorials	4 x 2 = 8
Autonomous study	32
Student projects	25
Total (25 hours workload per credit unit)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	I. Written final exam (70%) which includes: - Multiple choice tests - Solve problems related to: (a) the binary representation of integers and (b) the design and optimization of digital circuits

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	- Questions about the performance of digital circuits II. Laboratory final examination (20%) which includes the design and simulation/verification of a digital circuit using a software program III. Weekly laboratory exercises (8) involving the design and simulation/verification of digital circuits (10%)

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

1. Digital design : with an introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th edition, Mano Morris, Ciletti Michael
2. Digital design, principles & practices. 5th edition with verilog. John F. Wakerly
3. Login and computer design fundamentals, 5th edition, Morris Mano, Charles R. Kime, Tom Martin

ANALYSIS I

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘ24**	**Semester**	**1**
COURSE TITLE	ANALYSIS I		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching + Tutorial	4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background Knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	**https://gunet2.cs.unipi.gr/courses/TMA117/**

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.
It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. know whether a sequence converges and calculate its limit.
2. investigate the existence of an infinite sum (series) and calculate the sum.
3. calculate the limit and derivative of functions of a single variable. They will be able to calculate the tangent, extremes and inflection points of the function, as well as its representation by a Taylor series.
4. find the indefinite integral of many categories of functions, with applications in solving differential equations.
5. calculate the value of many categories from definite integrals by associating definite integrals with indefinite ones. They will become familiar with many applications of a definite integral, such as calculating mean, area, arc length, and volume.
6. apply arithmetic methods to solve equations, approximate functions with polynomials and estimate the value of a definite integral.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Individual work
3. Introduction of innovative research
4. Adapting to new situations
5. Development of free, creative and inductive thinking

(3) COURSE CONTENT

Sequences. Series. Functions of a single variable. Derivative. Indefinite integral. Differential Equations. Definite integral. Numerical solution of equations. Polynomial interpolation of functions. Numerical integration.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching and laboratories • Support of the learning process and teaching through an eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	***Semester workload***
Lectures	52
Independent study	26
Team projects	47
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	Final exam: 100% Bonus from exercises throughout the semester: 15% Language of evaluation: Greek

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Assessment methods are communicated to the students through the course outline that is announced at the beginning of the semester on the e-class platform.

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
   - Book[4202]: Analysis and Applications 1, A. G. Sapounakis, E. X. Fountas
   - Calculus, Tom M. Apostol, 2017

INTRODUCTION TO PROGRAMMING WITH PYTHON

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			1st
COURSE TITLE	Introduction to Programming		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures and Practice exercises		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	General background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)		
COURSE WEBSITE (URL)	http://gunet2.cs.unipi.gr/courses/TMA105/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course, students are expected to: 1. have acquired the basic knowledge about the scientific disciplines of Algorithms and Programming, 2. have understood the basic programming principles of a PC, 3. recognize and understand the basics of the C/C++ programming languages, 4. distinguish the basic principles of functional and object-oriented programming, 5. be able to utilize the basic algorithmic structures in C/C++ languages, 6. be able to solve simple and complex computational problems using basic Data Structures, 7. be able to take advantage of basic software development and debugging tools in a programming environment, critically evaluating their suitability according to its parameters.

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Independent exercise • Information Systems Programming	

(3) COURSE CONTENT

Modern Programming Approaches and Technology IT & Software Development Computer Troubleshooting Programming in a Windows environment Evolution of programs languages Basic principles of C/C++ C/C++ commands Operators and C/C++ Preprocessor Simple input/output and program applications in C/C++

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In class
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Both Microsoft Developer Studio and GNU C++ compiler development environments are used and given to students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	50
Practice exercises that focus on program development	24
Independent Study	51
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	I. Written final examination (100%) which includes program development and problem solving related planning principles

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography: *PROGRAMMING PRINCIPLES WITH C/C++ PANAGIOTOPOULOS I-H. D. APOSTOLOU* *-Related scientific journals:* IEEE Software

INTERNET TECHNOLOGIES

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ90		1st semester
COURSE TITLE	INTERNET TECHNOLOGIES		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures		4 hours/week x 13 weeks	5
Laboratories		2 hours/week, x 6 weeks	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes it can be offered		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA110		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
With the successful completion of the course the student will be able to: • recognize the basic principles of protocols that support the Internet, with an emphasis on IP and TCP. • understand the basic features of internet applications, their structure, their objectives as well as their interconnection. • Understand and have a basic working knowledge of the basic techniques and tools, the use of which ensures the planning and proper control of such applications. • utilize programming techniques in conjunction with the theory of the course for a more efficient design, performance optimization and functional/effective creation of applications on the internet. • solve, compare, value and propose alternatives to existing web applications and their potential performance problems, and with traditional methods/tools. • collaborate with his fellow students in the creation and execution of simple and complex web applications.

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
- Search, analysis and synthesis of data and information, using the necessary technologies - Autonomous work - Teamwork - Project planning and management - Respect for diversity and multiculturalism - Promoting free, creative and inductive thinking	

(3) COURSE CONTENT

- This course describes in an introductory, but complete, way the technologies and protocols on which the Internet and the World Wide Web are based and analyses in more detail the development of applications using specific tools/languages, which are performed on the client side and/or on the server side.
- Some of the concepts that are addressed are: TCP/IP protocol stack, transport and internet level, HTML5, CSS3, Javascript, jQuery, AJAX call, PHP nodejs, XML and JSON.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Lectures in the amphitheatre as well as laboratory exercises are provided.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	The course deals with html, css, javascript, php, sql (introduction), ajax, jquery, nodejs, xml, json, as well as the TCP/IP protocol stack. These technologies are used in various laboratory exercises and tasks as part of the learning process. Students resolve any questions they may have during their laboratory training, but also asynchronously via email, discussion forums and the course's website.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	

Activity/Method	***Semester workload***
6 weekly laboratory exercises	Weekly
1 computer/programming project	One per semester
26 weekly 2-hour lectures	
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	The student is evaluated for his/her participation in the workshops, the implementation of his/her weekly work, the implementation of his/her semester project, as well as his/her performance in the written examinations of the course. The general grading formula that is applied is the following: 0.1 x (average weekly work) + 0.2 x (6-month work) + 0.7 x (grade of written examinations). The above formula is adjusted accordingto the degree of difficulty of the written exams. The students always have access to their evaluated papers and writings.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

There are the notes and slides of the course and workshop on the course website. Through the Eudoxos system, the students choose one of the following recommended books:

1. *Technologies and Programming on the Web. Authors: Christos Douligeris, Rosa Mavropodi, Evi Kopanaki, Apostolos Karalis*
2. *Programming of static and dynamic web pages, Karakos Alexandros, A. Tziolas and Sons Publications, 2016*

INTRODUCTION TO COMPUTER SCIENCE WITH PYTHON

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ01-1**	Semester	1
COURSE TITLE	Introduction to Computer Science with Python		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching + Labs	4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Background knowledge*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA111/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

<u>APPENDIX A</u>

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

<u>APPENDIX B</u>

- *Guidelines for writing Learning Outcomes*

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

- To understand the basic concepts of Computer Science through Python.
- Develop simple and complex programs
- Measure, check and evaluate the correctness and fitness of a program.
- Debug a program.
- Know, sellect, differiantiate, understand and combine the basic programming notion, structures and techniques.
- Perform simple and complex arithmetic calculations through programming.
- Use control flows, contitions, decision stuctrures and loops.
- Structure their programs using iterative and recursive functions.
- To understand, assess, and tell the complexity of an algorithm.
- To synthesise, organise, and develop basic data operations such as search and sort.
- Process text files
- Use data from the web automatically
- *Use and work with code repositories*

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Search for, analysis and synthesis of data and information by the use of appropriate technologies,

Individual/Independent work

Introduction of innovative research

Project planning and management

Critical thinking

Development of free, creative and inductive thinking

(3) COURSE CONTENT

Introduction

Data representation and encoding

Operations – Boole Algebra

Basic notions of algorithms, complexity and networks

Basics of operating systems

Introduction to programming: programming languages, compilations, assembly, programming language categories Basic data structures: Data types, numbers, strings, lists, arrays, sets, dictionaries Control flows: conditions, comparisons, comparing strings, boolean operations, loops and nested loops Functions Input and output of data with text files Errors and exceptions Collecting data from the web

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of Python • Use of presentations and interactive board during lectures • Use of computer for development • Use of computers in the lab for development of programs and debuging • Web page update, news updates and offer of additional content (presentations, notes, code snippets) • Use institutional platform to submit grades • Use email and GUNET for communicating with the students

COURSE DESIGN

Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.

Activity/Method	*Semester workload*
Lectures	13*4=52
Lab practice	11*2=22
Project	15
Study hours	36
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

- Η γλώσσα Python σε βάθος, Νίκος Χατζηγιαννάκης,Εκδόσεις Κλειδάριθμος
- Προγραμματισμός με την Python Στράτος Καλαφατούδης, Γεώργιος Σταμούλης
- Εισαγωγή στον Προγραμματισμό με την Python, Schneider David
- Το βιβλίο της Python, Σαμαράς Νικόλαος, Τσιπλίδης Κωνσταντίνος, 2019 ΕΚΔΟΣΕΙΣ ΚΡΙΤΙΚΗ

MATHEMATICS FOR COMPUTER SCIENCE

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘΥ01**	**Semester**	**1**
COURSE TITLE	MATHEMATICS FOR COMPUTER SCIENCE		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching + Tutorial	4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background Knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	**https://gunet2.cs.unipi.gr/courses/TMA123/**

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. understand the basic concepts and symbolism of sets, relations and mappings.
2. apply the principle of induction, the Pigeonhole principle and the principle of inclusion-exclusion to solve problems;
3. understand basic concepts and basic techniques of Propositional Calculus, such as truth tables, decision principle, and truth trees.
4. understand the basic enumeration techniques based on simple and repetitive permutations, simple and repetitive combinations. They will also be able to give combined proofs to enumeration problems
5. calculate simple sums using Newton's Binomial formula and factorial polynomials.
6. understand basic elements and techniques from number theory such as Euclid's algorithm, the concept and properties of modulo congruence, finding solutions of Diophantine equations, the Euler-Fermat theorem and its applications.
7. Understand the basic properties of Boolean binary algebra and will be able to simplify expressions and functions of Boolean algebra.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Individual work
3. Introduction of innovative research
4. Adapting to new situations
5. Development of free, creative and inductive thinking

(3) COURSE CONTENT

Introduction to Set Theory: Sets. Mappings. Operations. Relations. Equivalent Sets.
Basic Principles: Mathematical Induction. Principle of Inclusion - Exclusion. Pigeonhole Principle. Diagonalization Principle.
Elements of Mathematical Logic: Language of Propositional Calculus. Truth values. Valuations. Logical Consequence. Axioms and Completeness of Propositional Calculus. Truth trees. Resolution rule. Predicate calculus. Quantifiers.
Algebra Boole: Lattices. Operations. Dipoles.
Elements of Combinatorics: Ordered tuples. Permutations. Combinations.
Differences - Sums: Difference operator. Factorial polynomials. Newtons Binomial Theorem.
Elements of Number Theory: Divisibility. GCD. Euclid’s algorithm. Prime numbers. Modulo. Euler-Fermat Theorem.

(4) TEACHING METHODS--ASSESSMENT

<table>
<tr><td>MODES OF DELIVERY
Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, Communication with students</td><td>Use of ICT in teaching and laboratories
Support of the learning process and teaching through an eclass electronic platform (gunet2)</td></tr>
<tr><td>COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.</td><td><table><tr><th>Activity/Method</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52</td></tr><tr><td>Independent study</td><td>26</td></tr><tr><td>Team projects</td><td>47</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Total</td><td>125</td></tr></table></td></tr>
</table>

<table>
<tr><td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS

Detailed description of the evaluation procedures:

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</td><td>Final exam: 100%

Bonus from exercises throughout the semester: 15%

Language of evaluation: Greek</td></tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY:

2. Suggested bibliography:

- Διακριτά Μαθηματικά και θεωρία αριθμών με εφαρμογές, Μ. Ρασσιάς, Εκδόσεις Τσότρας
- Book[23085]: Discrete Mathematics, A. Panayotopoulos
- Discrete Mathematics, D. Hunter

2nd SEMESTER

ANALYSIS II

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘ25**	**Semester**	**2**
COURSE TITLE	ANALYSIS II		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching + Tutorial		4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background Knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	**https://gunet2.cs.unipi.gr/courses/TMA120/**		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.
It is necessary to consult:
APPENDIX A
- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B
- *Guidelines for writing Learning Outcomes*

Upon completion of the course, students will be able to:
1. calculate generalized integrals.
2. Understand the Gamma and Beta functions and their applications
3. calculate the Laplace and Fourier transform of functions, with applications in solving many categories of function equations.
4. study the convergence of sequences and series of functions, with applications in the representation of power series of functions.
5. understand functions of two (or more) variables. Specifically, they will know their limit, their partial derivative and their differentiation. They will be able to solve exact differential equations, to calculate simple and bounded extremes.
6. understand multiple techniques for calculating double integrals.
7. understand the representation of a function with a Fourier series or integral.

General Competences
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Individual work
3. Introduction of innovative research
4. Critical thinking
5. Adapting to new situations
6. Development of free, creative and inductive thinking

(3) COURSE CONTENT

Generalized integral.
Gamma and Beta Functions.
Laplace Transformation.
Sequences and series of functions.
Functions of two variables.
Derivatives of functions of two variables.

Double integral. Functions of many variables. Fourier series and integrals. Fourier transform.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching and laboratories • Support of the learning process and teaching through an eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	52
Independent study	26
Team projects	47
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.*	Final exam: 100% Bonus from exercises throughout the semester: 15% Language of evaluation: Greek

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

3. Suggested bibliography:
- Book[50656504]: Analysis and Applications 2, A. G. Sapounakis, E. X. Fountas
- Calculus, Tom M. Apostol

DISCRETE MATHEMATICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ71**	**Semester**	**2**
COURSE TITLE	DISCRETE MATHEMATICS		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching + Tutorial		4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background Knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	**https://gunet2.cs.unipi.gr/courses/TMA113/**		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.
It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. understand basic concepts and basic results regarding graphs. For example, they will be able to see if two graphs are isomorphic or not.
2. explain combinatorial numbers Fibonacci, Catalan, Motzkin, Stirling, Bell etc. as well as their applications,
3. understand basic concepts of automatic and standard languages.
4. solve linear recurrence equations with or without generator functions,
5. understand basic concepts of standard and exponential function generators and how to use them to solve enumeration problems.
6. understand asymptotic symbolism and will be able to apply appropriate theorems and formulas to corresponding problems.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Individual work
3. Introduction of innovative research
4. Critical thinking
5. Adapting to new situations
6. Development of free, creative and inductive thinking

(3) COURSE CONTENT

Introduction to Graph Theory: Undirected Graphs. Directed Graphs. Applications of graphs in algorithms. Trees: Binary trees. Ordered trees. Decision trees.
Combinatorial numbers: Fibonacci numbers, Catalan, Motzkin, Narayana, Stirling, Bell.
Generating functions: Normal and exponential sequence generating functions. Generating functions of sets. The problem of inversion (Lagrange theorem).
Recurrence equations: Solving linear recurrence equations using the characteristic polynomial. Solving recurrence equations using generating functions.

Asymptotic estimates: Asymptotic symbolism. The dominant term theorem. The Stirling equation. Sum approximations. Singularity analysis. Languages and Automata: Typical languages, D - automata. Recognizable languages.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching and laboratories • Support of the learning process and teaching through an eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	52
Independent study	13
Team projects	60
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.*	Final exam: 100% Bonus from exercises throughout the semester: 15% Language of evaluation: Greek

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
Book[12858904]: Concrete Mathematics, R. L. Graham, D. E. Knuth, O. Patashnik.

Book[13953]: Discrete Mathematics with Applications, Susanna S. Epp.

Book[41954922]: Discrete Mathematics and their Applications, 8th Edition, Rosen Kenneth H.

DATA STRUCTURES

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			
COURSE TITLE	Data Structures		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA114/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course, students will be able to: 1. Apply the appropriate data structures through analytical and critical approach in order to solve computational problems that arise in the different fields of application. 2. Assess the time required for the basic functions of a data structure both analytically and experimentally. 3. Determine the space complexity of a data structure both analytically and experimentally. 4. Develop and implement efficient data structures by selecting appropriate methods and tools after discovering, re-designing and evaluating the "behaviour", "usability" and general characteristics and parameters of each implementation platform. 5. Follow the methodology of discovery, examination, creation, composition, organization, revision and reconstruction of structures whenever there is a need or problem that needs to be solved.

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Critical thinking Development of free, creative and inductive thinking Search for, analysis and synthesis of data and information by the use of appropriate technologies, Decision-making Introduction of innovative research	

(3) COURSE CONTENT

The subject of the course is the study of the basic data structures used in the development of algorithms. Emphasis is placed on the execution time of the basic functions of the data structures and the detailed determination of the number of key operations required. The space of each data structure is also determined analytically. Specifically, the structures of the array, linked list, stack, queue, heap and binary search trees are presented. The technique of hashing, balanced search trees (AVL, Red-Black and B-trees) and basic sorting algorithms are studied, as well.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	52
Tutorials	30
Projects	43
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	**Problem Solving**

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Δομές δεδομένων, αλγόριθμοι και εφαρμογές C++, Sahnii Sartaj, Εκδόσεις Τζιόλα
- ΔΟΜΕΣ ΔΕΔΟΜΕΝΩΝ, ΓΕΩΡΓΑΚΟΠΟΥΛΟΣ Γ.Φ., Πανεπιστημιακές Εκδόσεις Κρήτης
- Δομές δεδομένων, Μποζάνης Παναγιώτης Δ., Πανεπιστημιακές εκδόσεις Κρήτης
- Δομές Δεδομένων και Ανάλυση Αλγορίθμων με C++, M. A. Weiss, Broken Hill Publishers Ltd. , 2023
- Ηλεκτρονικό Βιβλίο ΔΟΜΕΣ ΔΕΔΟΜΕΝΩΝ, ΛΟΥΚΑΣ ΓΕΩΡΓΙΑΔΗΣ, 2016

- Related scientific journals:
  Theoretical computer science, Elsevier
  Algorithmica, Springer

OBJECT ORIENTED PROGRAMMING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ37-2**		2
COURSE TITLE	Object Oriented Programming		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures – Laboratory Exercises		4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	SPECIALTY TRACK (EY) Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA103/		

(2) LEARNING OUTCOMES

Course Learning Outcomes
Upon successful completion of this course students will be able to: 1. To know the basic principles that govern object-oriented programming 2. Implement object-oriented programs 3. To design, develop and implement software as solutions to problems, consisting of objects and their interactions 4. Create classes, interfaces and objects

5. Use Java language modifiers correctly 6. Manage effectively and with the right tools the emerging exceptions 7. Handle files intended for reading and storing data 8. They keep pace with the changing technological requirements as they are exposed to modern programming techniques aimed at the quality of their software 9. Identify, evaluate and utilize software implemented in accordance with the basic principles of object-oriented design

(3) COURSE CONTENT

General Skills • Search, analysis and synthesis of data and information, using the necessary technologies • Autonomous work •Teamwork • Project design and management • Adaptation to new situations Basic course content includes: Main subject of the course is the introduction to object-oriented programming with a complete analysis of the JAVA programming language. Basic structures, inheritance, polymorphism, encapsulation, special classes, exceptions, special themes, libraries, interfaces, file access, access modifiers, non-access modifiers.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In Class and in Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use ICT in Teaching and in Laboratories. Support the learning process through the course's website (eclass gunet). Notes and educational material, etc.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching,*	

Activity/Method	*Semester workload*
Lectures	52
Laboratory Exercises	26
Project Case-Study	21
Independent Study	26

Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*		
	Total Course (25 hours per ECTS point)	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Individual software development tasks with a total weight of 40% on the final grade Written exams of total weight 60% on the final grade

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Alepis, E., Panagiotopoulos, I.X., “Object Oriented Programming Languages: Java”, University Book, Varvarigou Publications, Piraeus 2019

COMPUTER ARCHITECTURE

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLPLH52	**SEMESTER**	2nd
COURSE TITLE	COMPUTER ARCHITECTURE		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**	
Lectures + Laboratory Exercises	4 + 2 = 6	5	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION:	Greek / Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA106/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
The main goal of the course is to introduce students to the basic concepts of computer organization, the design and organization of the main computer components and the assembly language. **Upon successful completion of the course, the students:** • will be familiar with the basic design techniques of modern computers • will have identified and understood the interface between software and computer hardware • will have understood how the software controls the hardware • will be able to design and develop programs in computer assembly language • will know how to use processor architectural simulators tools and run assembly programs • will be able to analyze/evaluate the performance of a program and advise the developer on how to improve it • will be able to identify the parameters that affect the computer performance • will be able to evaluate the performance and compare different processors

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Search for, analysis and synthesis of data and information by the use of appropriate technologies • Individual/Independent work • Group/Team work	

(3) COURSE CONTENT

12. Design, Organization and Technology of Computers.
13. Computer Performance and Performance Evaluation Metrics.
14. Instruction Set Architecture (Registers, Instructions, Addressing Methods).
15. Machine Language, Symbolic Language (Assembly) and Assemblers.
16. Computer Arithmetic. Representation of integers and floating-point numbers.
17. Processor Design: Datapath and Control Unit.
18. Performance mechanisms (pipeline).

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	• In-class lecturing • Face-to-face in lab courses
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Support of learning process using e-learning platform (e-class) • Use of electronic material in teaching (slides, exercises, laboratory material) • Use of software tools (simulators) for the simulation of computers in laboratory exercises
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	22 x 2 = 44
Laboratory practice	8 x 2 = 16
Tutorials	4 x 2 = 8
Autonomous study	32
Student projects	25
Total (25 hours workload per credit unit)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	I. Written final exam (70%) which includes: - Multiple choice tests - Solve problems related to: (a) computer arithmetic and (b) computer organization and - Questions about the performance of computers II. Laboratory final examination (20%) which includes the development of assembly programs and their debugging in a computer architectural simulator III. Weekly laboratory exercises (8) involving the development of assembly programs and their debugging in a computer architectural simulator (10%)

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

4. Computer Organization and Architecture, 11th edition, Stallings William
5. Computer Organization and Design: the hardware/software interface, 6th edition, DAVID A. PATTERSON, JOHN L. HENNESSY

APPLIED ALGEBRA

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘ02-3**	**SEMESTER**	**2**
COURSE TITLE	APPLIED ALGEBRA		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
TEACHING + TUTORIAL	4+1	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA119/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course, students will be able to: 1. understand basic operations and properties of Matrices, 2. calculate the value of a determinant using different techniques, 3. choose the appropriate algorithm to solve and investigate Linear Equation Systems, 4. calculate the eigenvalues and eigenvectors of a Matrix as well as to perform its Diagonalization, 5. understand the meaning of Vector space, linear combination, linear independence, dimension and their applications 6. understand the meaning of the inner product, the length, the distance, the projection in a vector space. They will be able to model and solve problems of least squares and projection problems in spaces with smaller dimensions.

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
1. Search for, analysis and synthesis of data and information by the use of appropriate technologies 2. Individual work 3. Introduction of innovative research 4. Critical thinking 5. Adapting to new situations 6. Development of free, creative and inductive thinking	

(3) COURSE CONTENT

Algebraic structures: Groups. Rings. Fields. Vector spaces. Basic linear algebra: Matrices. Determinants. Linear Systems. Characteristic values: Eigenvalues. Eigenvectors. Diagonalization of matrices. Quadratic forms. Inner product: Orthonormalization. Gram-Schmidt method. Matrix Representations of Linear Transformations: Change of basis matrix. Matrix Representations of Linear Transformations.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching and laboratories • Support of the learning process and teaching through a eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	52
Independent study	13
Team projects	60
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	Final exam: 100% Bonus from exercises throughout the semester: 15% Language of evaluation: Greek

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:

Introduction to Applied Linear Algebra, Stephen Boyd, Lieven Vandenberghe

Linear Algebraand its Applications, David C. Lay

Linear Algebra – 2^{nd} Ed., M. A. Georgiakodis, P. N Georgiadis

Elementary Linear Algebra Applications, Anton Howard, Rorres Chris

3rd SEMESTER

MATHEMATICAL PROGRAMMING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΜΑΘ06-1		3ο
COURSE TITLE	Mathematical Programming		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures		4	5
Tutorials and Exercises		2	
Total		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TME132/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon successful completion of the course the students will acquire the ability to: • decide if a problem of low or medium complexity can be modeled as a linear programming problem. • understand in depth the algorithms for solving general and special linear programs. • determine the most appropriate linear programming model that is suitable for the given problem. • identify the variables and the parameters that will compose the linear model of the given problem. • use appropriate software to solve linear programs and interpret the results.

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Individual Assignment. • Group Assignment. • Search, analysis and processing of data and information using the necessary technologies. • Promoting free, creative and inductive thinking • Problem solving.	

(3) COURSE CONTENT

The course is part of the scientific field of operations research. The course is focused to linear programming, one of the main techniques for operations research, which offers the methodological approach and the framework for the solution of several problems of business administration. In particular, the following topics are covered in the course: • Introduction to operations research • The problem of linear programming

- Mathematical formulation of linear programming
- Modeling of linear programming problems
- Linear programs with two variables - Graphical solution
- The simplex algorithm
- Additional computational techniques
- Duality
- Sensitivity analysis
- Special network problems
- The transportation problem
- The problem of the supply chain
- The assignment problem
- Maximum flow problem
- Shortest Path Problem
- Minimum spanning tree
- Introduction to game theory

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of computer and video projector • Electronic e-class platform to support the learning process • Electronic communication with students
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures and Tutorials	52
Tutorials and Exercises	26
Individual Study	47
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	**Written examination (100%)**

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	The exam includes three problems of equal importance. The comprehension of the theoretical background is tested in the first one. The other two problems require solving linear programming problems by employing the appropriate algorithm.

(5) SUGGESTED BIBLIOGRAPHY:

- Δ. Δεσπότης, Γραμμικός Προγραμματισμός, Εκδόσεις Βαρβαρήγου, Πειραιάς, 2014
- Α. Παναγιωτόπουλος, Στοιχεία Μαθηματικού Προγραμματισμού, Εκδόσεις Σταμούλη, Πειραιάς, 1990

OBJECT ORIENTED APPLICATION DEVELOPMENT

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ37-3**		3
COURSE TITLE	Object Oriented Application Development		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures – Laboratory Exercises		4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	SPECIALTY TRACK (EY) Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/ TMB121/		

(2) LEARNING OUTCOMES

Course Learning Outcomes
Upon successful completion of this course students will be able to: 1. Use integrated software development environments 2. Produce applications at an efficient and fast pace 3. Know the basic principles of the C # language 4. Debug software with the most modern tools

5. Develops software for a wide range of fields, including windows applications, console applications, web applications, and mobile applications 6. Exposed to modern programming techniques aimed at the quality of the software produced, as well as the speed of development of complex and complex programs / projects 7. Learn to evaluate and locate software implemented with visual programming tools

(3) COURSE CONTENT

General Skills

- Search, analysis and synthesis of data and information, using the necessary technologies
- Autonomous work
- Teamwork
- Project design and management
- Adaptation to new situations

Basic course content includes:

The subject of the course is the development of applications based on the object-oriented software development model. The programming language used as a base is C #, which is considered one of the most modern object-oriented languages. In the course, special emphasis is given to application development tools, integrated development environments (IDEs) and specifically the tool used is the Visual Studio Enterprise Edition. Using Visual Studio and C # as a programming language, students learn to develop desktop, web, and / or mobile applications quickly, efficiently, and most importantly with as little chance of making programming and / or logic errors.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In Class and in Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use ICT in Teaching and in Laboratories. Support the learning process through the course's website (eclass gunet). Notes and educational material, etc.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.*	See table below

Activity/Method	*Semester workload*
Lectures	52
Laboratory Exercises	26
Project Case-Study	21
Independent Study	26

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.		
	Total Course (25 hours per ECTS point)	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Individual software development tasks with a total weight of 40% on the final grade Final Team Project of total weight 60% on the final grade

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Alepis, E., Panagiotopoulos, I.X., "The transition from Java to C#", University Book, Varvarigou Publications, Piraeus 2018

OPERATING SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ41-1**		3rd semerster
COURSE TITLE	Operating Systems		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	
Lab exercises	2	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		5

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Background knowledge*
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB103/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course students are expected to: 1. Know the basic concepts and principles of Operating Systems (O.S), 2. Be able to describe the architecture, the structure and to distinguish the main categories of O.S., 3. Define and understand the concepts of process and thread, 4. Will be able to utilize threats and processes to support multiprocessing, 5. Recognize computing deadlock conditions and understand ways of avoiding them during multiprocessing; 6. Be able to list CPU scheduling algorithms, 7. Describe memory managements systems and algorithms, such as memory paging and virtual memory; 8. identify the main memory management techniques, such as memory swapping and memory virtualization; 9. They will be familiar with virtual memory management and paging algorithms, 10. Distinguish and categorize file and directory management commands; 11. Will be able to determine the Input / Output system of an O.S.

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Development of free, creative and inductive thinking, Search for, analysis and synthesis of data and information by the use of appropriate technologies. Project planning and management. Individual work. Adapting to new situations.	

(3) COURSE CONTENT

The course covers the theoretical study and the practical training in the area of Operating Systems. In particular it includes the following:

- Basic concepts and principles of Operating Systems.
- Architecture, structure and categorization of Operating Systems.
- Processes, Threads.
- Inter-process communication.
- CPU scheduling.
- Memory systems.
- Virtual memory.
- Memory paging.
- Memory management algorithms.
- File and directory management.
- File Systems.
- Input/Output system.
- Deadlocks.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	*Face-to-face, in-class lecturing*
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	*Use of ICT in teaching.*
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	50
Laboratory practice	10
Lab exercises	20
Fieldwork project	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Final Exam An additional 10% bonus in the final grade is given, based on a non-obligatory programming exercise involving the development of algorithms related to OS. The evaluation criteria are available to the students through the course web page.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Operating Systems, 10th Edition, A.SILBERSCHATZ, P.B.GALVIN, G.GAGNE.
ModernOperating Systems, 4th Edition, A.S.Tanenbaum

COMPILERS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ08	Semester	3d
COURSE TITLE	Compilers		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge, Skills Development
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek/English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB100/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Understand and explain the concepts of language and grammar along with the respective symbolism.

- Understand and explain different ways of defining syntax (BNF, EBNF, syntactic diagrams).
- Understand and explain what a sentence and a derivation procedure is.
- Generate symbol strings for a grammar and create the syntactic tree of a derivation procedure.
- Understand regular expressions and the respective FLEX declarations.
- Understand stack automata, both the deterministic and non-deterministic ones.
- Use a stack automaton for pattern matching.
- Construct the minimum finite deterministic automaton given a regular expression.
- Understand, explain and apply syntactic analysis procedures.
- Understand, explain and compute the FIRST, FOLLOW, EMPTY, LOOKAHEAD sets and functions, construct predictive syntactic tables and recognize LL(1) grammars.
- Parse a symbol string given a syntactic analyzer.
- Compute priorities among symbols of a grammar.
- Construct the matrix of symbol priorities given a grammar.
- Understand, explain and compute the LEFT, RIGHT sets of a grammar.
- Understand the fundamentals of semantic analysis.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analyze and combine data and information using appropriate technologies.
- Individual work
- Teamwork
- Critical thinking, creative thinking and inference
- Collaborative spirit and communication skills
- Control skills and results evaluation skills
- Design and implementation of applications
- Decision making
- Professional integrity

(3) COURSE CONTENT

The course presents the theory of programming languages with an emphasis on automata theory, lexical analysis and syntactic analysis, i.e., the fundamental theory related to the design and development of the most important modules of a compiler. The course is split into the following sections:

Section 1: Introduction to the field of compilers **Section 2:** Fundamentals of languages (language definitions, grammars, automata). **Section 3:** Syntax definitions (sets, BNF, syntactic diagrams, EBNF). **Section 4:** Lexical analysis (lexical analyzers, pattern matching, regular grammars and expressions, recovery from lexical errors, lexical units, implementing lexical analyzers, FLEX). **Section 5:** Syntactic and Semantic analysis (strategies of syntactic analysis, top-down and bottom-up parsers, implementing syntactical analyzers, semantic analysis. **Section 6:** Code generation (intermediate representations, examples).

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT in teaching. Communication is supported by a e-class platform
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	***Semester workload***
Lectures	60
Individual study	24
Project assignment to teams of students	41
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative*	1. Written exams at the end of the semester (50% of the total grading score), including exercises that challenge the student's understanding of the theory that they have been taught, e.g., exercises related to lexical and syntactical analysis. 2. Programming assignment (50% of the total grading score) delivered at the end of the semester by teams of at most three students. The project assignment is about the development of lexical and syntactical analyzers using the FLEX, C and Python programming languages. The project's outcome is delivered via e-mail or the e-class platform and

(conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	consists of software code and respective documentation where the students explains their software design and implementation ideas.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

[1] M. Virvou, Μεταγλωττιστές, εκδόσεις Βαρβαρήγου, 2014 (in Greek)

[2] Μεταγλωττιστές, ΝΙΚΟΛΑΟΣ Σ. ΠΑΠΑΣΠΥΡΟΥ, ΕΜΜΑΝΟΥΗΛ Σ. ΣΚΟΡΔΑΛΑΚΗΣ, 2002 Εκδόσεις Σ. ΑΘΑΝΑΣΟΠΟΥΛΟΣ & ΣΙΑ Ο.Ε

PROBABILITY AND STATISTICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘ35-1**	SEMESTER	3
COURSE TITLE	PROBABILITY AND STATISTICS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
	4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	BACKGROUND KNOWLEDGE
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	GREEK
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB125/

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
After successfully completing this course, students will:

- have aquired the basic knowledge of concepts in Probability Theory and Statistics
- understand and recognize the fundamental distributions describing stochastic phenomena.
- be able to select the appropriate tools from the theory in order to study stochastic phenomena.
- have become fluent in encoding stochastic problems using random variables
- be able to apply the methodologies of Descriptive Statistics in order to process and display statistical data
- be able to correlate and transform statistical data
- be able to perform parameter estimation using various Statistical Inference methodologies
- know how to perform statistical tests and infer useful conclusions on the given data.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Search for, analysis and synthesis of data and information by the use of appropriate technologies
Adapting to new situations
Individual/Independent work
Team work
Critical thinking
Development of free, creative and inductive thinking

(3) COURSE CONTENT

1. Random experiments – sample space - events – probability axioms.

2. Conditional probability - Independence.

3. Random variables – cumulative density functions and probability density functions – multidimensional random variables.

4. Distributions – expected value, variance, standard deviation.

5. Inequalities Markov, Chernoff, Chebyshev, Jensen.

6. Moments – Probability generating functions, Moment generating functions.

7. Discrete distributions (Bernoulli, Binomial, Geometric, Hypergeometric, Negative Binomial, Poisson).

8. Continuous distributions (Uniform, Exponential, Normal, Gamma, Beta) – Poisson Process - Central Limit Theorem.

9. Descriptive Statistics –Data correlation – Data transformation. 10. Statistical inference – Point estimation – unbiased, efficient, consistent estimators. 11. Special distributions (chi square, t, F) – Confidence intervals for the mean, variance of one or two populations – Generalization to non-normal samples. 12. Hypothesis testing. 13. Analysis of variance, Linear Regression

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	distance teaching and distance learning
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Live interactive lectures via MS Teams Further communication via e-class Software development using Python
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see table below)

Activity/Method	***Semester workload***
Lectures	52
Projects	26
Study hours	47
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written*	Written exam (100%) in Greek Individual written work on solving various problems during the semester (bonus 15%) Evaluation criteria are communicated to students in the beginning of the term, via the e-class

work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- *Book [59376723]:Probability – Statistics and Applications, E. Foundas, K. Patsakis, X.Foundas*
- *Book [12561271]: Elements of Probability and Statistics in Computer Science, F. Georgiakodis, I. Triantafyllou*

APPLICATIONS OF GRAPH THEORY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘ35-1**	**Semester**	**3**
COURSE TITLE	APPLICATIONS OF GRAPH THEORY		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC114/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. understand basic definitions and basic theorems regarding directed and undirected graphs.
2. understand basic techniques for proving theorems in graph theory.
3. apply algorithms related to, for example, graph traversal, time planning, topological sorting, construction of decision trees
4. model several algorithmic problems as graph problems.

<table>
<tr><td colspan="2">General Competences
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?</td></tr>
<tr><td>Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research</td><td>Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)</td></tr>
<tr><td></td><td>…….</td></tr>
<tr><td colspan="2">1. Individual work
2. Development of free, creative and inductive thinking
3. Introduction of innovative research
4. Application of Mathematics to modern technology environments</td></tr>
</table>

(3) COURSE CONTENT

Introduction.
Undirected graphs: Basic definitions and results. Isomorphism. Operations. Connectivity. Bipartite Graphs. Planar Graphs. Matrix. Representation. Chromatic Number. Independence – Cover. Cost. Labelling. Multigraphs.

Trees: Basic definitions and results. Ordered trees. Binary trees. Traversal of ordered and binary trees.

Directed graphs: Basic definitions and results. Matrix. Representation. Operations. Kernel. Base. Applications: Decision Trees, Trees and Operations. Scheduling of production. Application in Time Scheduling.

(4) TEACHING METHODS--ASSESSMENT

<table>
<tr><td>MODES OF DELIVERY
Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, Communication with students</td><td>• Use of ICT in teaching and laboratories
• Support of the learning process and teaching through an eclass electronic platform (gunet2)</td></tr>
<tr><td>COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.</td><td><table><tr><th>Activity/Method</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>52</td></tr><tr><td>Independent study</td><td>26</td></tr><tr><td>Team projects</td><td>47</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td></tr>
</table>

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.	**Total**	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Final exam: 100% Bonus from exercises throughout the semester: 15% Language of evaluation: Greek

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:

   Book [33134148]: Graph Theory and Algorithms, I. Manolopoulos, A. Papadopoulos, K. Tsichlas

   Book [31356]: Introduction to Graphs, L. Kirousis, C. Mpouras. P. Spyrakis, G. Stamatiou.

MANAGEMENT

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΝ201**	**SEMESTER**	**3**
COURSE TITLE	MANAGEMENT		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
LECTURES, CASE STUDIES	4 hours/week	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	GENERAL KNOWLEDGE
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://sites.google.com/site/proflchytiris https://eclass.unipi.gr/

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Course objectives – Description: Modern organizations operate in a highly competitive and globalized context which is characterized by a high cost for acquiring and utilizing the necessary resources, turbulent social, economic and technological changes and an increasing demand for socially responsible management practices. It is therefore obvious that the effective management of organizations is a key element for achieving their goals and objectives.

The objectives of this course are the provision of the fundamental theoretical knowledge and the presentation of methods and techniques, so that future managers have a comprehensive view regarding the meaning and the content of Management, the actions and functions of Management, in order to run successfully a business unit.

Learning outcomes - skills acquired: At the end of this course, students will be able to

- identify the internal and external environment of organizations
- understand the role of the manager
- describe the 4 basic management functions
- identify and set organizational goals and objectives
- plan business actions and make decisions
- identify and understand the constituents of leadership so that they can portray relevant behavior at work through the processes of influence (communication, motivation, power)

Course contents

- Introduction to management
- The evolution of management
- Planning
- Organizing
- Leading
- Motivation
- Communication
- Teams and roles
- Controlling

(3) COURSE CONTENT

General Skills:

•Teamwork
• Search, analyze and synthesize data and information

• Making decisions to address internal business problems • Autonomous activity/ work • Making ideas • Promoting free and creative thinking

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	**YES,** the University's e-class platform is used for the course. Use of ICT.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	50
Study and Preparation for the Exam	75
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,*	Final Written Exam (Independent) – Compulsory: 100 points

other……etc. *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:

    1. Χυτήρης, Λ. (2013). Μάνατζμεντ, Εκδόσεις Φαίδιμος, Αθήνα.
    2. Μπουραντάς, Δ. (2015). Μάνατζμεντ, Εκδόσεις Σταμούλη, Αθήνα.
    3. Daft,R. (2015). Management, 12th edition, Cengage Learning.
    4. Drucker, P. (2008). Management Revised Edition, Harper Business.
    5. Drucker, P. (2001). Management Challenges for the 21st Century, Harper Paperbacks.
    6. Drucker, P. (2006). The Practice of Management, Harper Paperbacks.
    7. Griffin, R. (2012). Management, 11th edition, Cengage Learning
    8. Hamel, G. (2006). The Future of Management, Harvard Business School Press.
    9. Mintzberg, H. (2009). Managing, Berrett Koehler Publishers.
    10. Schermerhorn, J. & Bachrach, D.G.(2016). Management, 13th edition, Wiley.

2. Related scientific journals:

PEDAGOGICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΑΙΔ01**	**SEMESTER**	3rd
COURSE TITLE	Pedagogics		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise, Skills Development*
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	-

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course the student is expected to:

1. Know the different pedagogical approaches and teaching methods/techniques relevant to their scientific field, along with the learning in the content of didactic methodology.

2. Distinguish the basic concepts of each pedagogic approach, by comparing their main characteristics and focusing on the adoption of the most appropriate for a specific teaching / learning process.
3. Be able to utilize the main ideas of Pedagogics in order to design an efficient learning environment
4. Know the plethora of Didactics methodologies that stimulate the learning process
5. Distinguish, to critically interpret and take into consideration several factors (age, pre-existing cognitive background, special education needs, multiculturalism, etc.) in order to successfully apply the most appropriate combination of methods for an effective teaching, pedagogical and learning approach.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

(3) COURSE CONTENT

TOPICS:

1. Introduction (history, definitions)
2. Identification of pedagogical knowledge field
3. The science of Pedagogics and its epistemological directions
4. Critical pedagogy
5. Specialized fields of Applied Pedagogics
6. Educational Sciences – The identity of a hybrid cognitive domain
7. The content of socialization and education
8. Didactics methodology
9. Descriptive Research Scheme – Bipolar Research Scheme
10. The interpretive paradigm
11. The macro-sociological paradigm

12. The object of Didactics 13. The student 14. Educational technology 15. Teaching critical and creative thinking

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	*Semester workload*
Lectures	72
Self-study	53
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended*	Written examination

questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography: *- Νέα Μάθηση, Βασικές αρχές για την επιστήμη της εκπαίδευσης. Mary Kalantzis, Bill Cope, Kent Matthews, 2013*

INFORMATICS LAW

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΔΙΚ01**	**Semester**	**3**
COURSE TITLE	INFORMATICS LAW		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	General Knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

8. Understand the interaction of law with new technologies
9. Apply the protection of personal data, in particular in the light of the new General Data Protection Regulation

10. Ensure the confidentiality of communication
11. Manage applicable law in online shopping
12. Recognize the issue of mediators' liability
13. Identify and safeguard the issue of liability of internet service providers, social media page managers, etc.
14. Design and develop security mechanisms in Electronic Banking (e-Banking) and correction of failures, especially in cases of abnormal progress of procedures
15. To know in depth the provisions provided for the legal treatment of spamming.
16. Discover ways to secure the probative value of emails.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

7. Search, analysis and citation of legal data and laws.
8. Individual work
9. Group/Team work
10. Working in an international environment
11. Demonstration of social, moral and professional responsibility

(3) COURSE CONTENT

The aim of the course is to analyze and explain basic concepts and issues related to the field of Informatics Law.
The content of the course is divided into the following sections:
- Law in new technologies
- Right to participate in the right to information
- The protection of personal data
- The new General Data Protection Regulation
- The confidentiality of communication
- The framework of the EU Copyright and Information Society Guidelines
- The challenge of cross-border information flow and applicable law
- The issue of liability of intermediaries
- Legal Information Systems
- Electronic Banking (e-Banking)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of a computer and projector during lectures. All the lectures of the lecturer, as well as the assignments of the students are displayed in an interactive whiteboard in the form of Powerpoint slides. Learning process support through the e-class electronic platform.

COURSE DESIGN

Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.

Activity/Method	*Semester workload*
Lectures	30
Team project	45
Independent study	50
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students*	1. Oral final exam (50%), which includes oral questions, which relate to both the specific work topic of each student, as well as general questions from issues that have been analyzed during the lectures. 2. Written paper (50%), which is selected from the list of topics given at the beginning of the semester. In particular, 25% of the final grade comes from the text of the written work and the other 25% from the oral presentation of student work. The work is delivered electronically and in writing.

(5) SUGGESTED BIBLIOGRAPHY:

ΔΙΚΑΙΟ ΠΛΗΡΟΦΟΡΙΚΗΣ- LEGAL & DATA PROTECTION, ΕΝΩΣΗ ΕΛΛΗΝΩΝ ΝΟΜΙΚΩΝ e-ΘΕΜΙΣ, ΠΑΝΕΠΙΣΤΗΜΙΟ ΜΑΚΕΔΟΝΙΑΣ, 2013 ΝΟΜΙΚΗ ΒΙΒΛΙΟΘΗΚΗ ΑΕΒΕ

ΕΙΣΑΓΩΓΗ ΣΤΗ ΝΟΜΙΚΗ ΠΛΗΡΟΦΟΡΙΚΗ, ΓΙΩΡΓΟΣ ΓΙΑΝΝΟΠΟΥΛΟΣ, 2018 ΝΟΜΙΚΗ ΒΙΒΛΙΟΘΗΚΗ ΑΕΒΕ

Ιωάννης Ιγγλεζάκης, Δίκαιο πληροφορικής, εκδ. Σάκκουλα, Αθήνα-Θεσσαλονίκη, 3η έκδ., 2018, ISBN 978-960-568-828-8.

ENGLISH III

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			3rd semester
COURSE TITLE	English III		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Seminars + Tutorials	4	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	English
LANGUAGE OF EXAMINATION/ASSESSMENT:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon successful completion of the course students will be able to:

1. Understand and process texts and articles of interdisciplinary interest related to software design, use and optimization in companies, financial institutions, etc. Contact with different and varied uses of software makes students able to use their knowledge aiming at designing, expanding and selling software that covers a wide range of services such as productivity management, efficient personnel management, service facilitation, human resources optimization, productivity growth, decision making, time saving, investments, transactions, etc.

2. To be receptive to the promotion and implementation of innovative applications, designing or rebuilding new, more efficient applications, contributing to a more creative, internationally competitive market, along with promoting research in their scientific field.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

(3) COURSE CONTENT

Familiarization with texts for:

-Advertising (forms)

-Promotion and re-marketing of products

- Economy and market

-Human resources management

-Environment and productivity

-Inflation

-Technology

-Industry and natural environment

- Insurance against business risks

-Safety in the workplace

-Stock Exchange -Internet - Advantages of electronic media -Documentation -Bank and business terminology Teaching of syntax and grammar at an advanced level required for the initial stages of composing a scientific and academic text.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Interactive teaching in class.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Presentations with overhead projector, YouTube videos or PowerPoint. Listening Comprehension
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Teaching	3 hours a week 13 weeks=39
Tutoring	1 hour a week
Study hours	23
Total	75 hours

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	100% written final exam that includes: -Reading Comprehension -terminology-vocabulary exercises -grammar and syntax exercises

(5) SUGGESTED BIBLIOGRAPHY:

-*Suggest* Sivridou F., Mormori P., Tombrou C., *Intermediate Business English* , Faidimos, online Commercial Correspondence, Oxford Business Dictionary, Information Technology Cambridge Dictionary, Khan academy, el.glosbe.com, www.collinsdictionary.com,, BBC Economy, CNN, Deutsche Welle

4th SEMESTER

COMPUTER NETWORKS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ44		4th semester
COURSE TITLE	COMPUTER NETWORKS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4 hours/week x 13 weeks	5
Laboratories	2 hours/week x 4 weeks	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background
PREREQUISITE COURSES:	no
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes it can be offered
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/ TMB115

(2) LEARNING OUTCOMES

Learning Outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
With the successful completion of the course the student will be able to understand concepts such as: • Network architectures: Switching, Circuit switching and packet switching, Network types (local networks, metropolitan networks, wide area networks, wired and wireless networks), Network topologies (grid, artery, ring, star). • Performance measures: delay, bandwidth, bit rate, packet loss rate. • Network design : Layering, Protocols and Standards, Connection-oriented and connectionless Services, • The OSI reference model, the TCP/IP protocol stack, and the role of Standardization Organizations • Physical layer: analog and digital representation, Encoding and modulation, ,transmission media, Error Detection and Correction, Multiplexing. • Data Link Layer: framing, error checking (ARQ protocols), flow control, second layer standards and protocols (DSL, ISDN). • Multi-Access Control: addressing, multiple access with and without competition, local network technologies (Ethernet, Token Ring, Gigabit Ethernet), Repeaters, bridges, hubs and switches. • Wireless local networks (wifi) and mobile networks (3rd and 4th generation). • Switching Network applications: packet switching and virtual circuits, switches and internetworking; routing: distance vector routing and link statealgorithms, Congestion Control, IP protocol (addressing, OSPF and BGP routing protocols, fragmentation). • Transport layer: (multiplexing/demultiplexing, reliable data transfer, flow control), congestion control and UDP and TCP. • TCP congestion control • Application layer: transfer-level service models, client-server model, peer-to-peer model, popular application-level protocols: HTTP, SMTP/POP3/IMAP, DNS

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Search, analysis and synthesis of data and information, using the necessary technologies • Autonomous work • Teamwork • Project planning and management • Respect for diversity and multiculturalism • Promoting free, creative and inductive thinking	

- Working in an international environment
- Working in an interdisciplinary environment
- Adapt to unforeseen situations
- Problem solving

(3) COURSE CONTENT

This course describes in an introductory, but complete, way the basic concepts and principles of networking and of the protocols on which the different types of networks are based, with emphasis on the internet protocols.

In particular, the following are analysed:

- basic concepts and principles of networking
  - types of networks (switching networks, internet), design (OSI reference architecture and TCP/IP architecture)
- links and transmission of information
  - transmission and transmission of signal through a link, transmission speed, multiplexing
  - algorithms and technologies for access to a common medium
  - reliable transmission
- Switching Networks
  - forwarding and switching technologies
- Internetworking
  - general principles of networking, routing, types of routing algorithms
  - IP networks: addressing, ARP, forwarding, routing (OSPF,BGP), hashing, ICMP
- End-to-end communication
  - process communication (basic mechanisms)
  - UDP and TCP protocols
- Wireless Communications
  - Principles of mobile operation
  - Media access protocols on local wireless networks
- Applications Performance
  - Coding and quality of service
  - protocols for video transfer

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Lectures in the amphitheatre as well as laboratory practices are provided.

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	ICT technologies are used in various laboratory exercises and tasks as part of the learning process. Students resolve any questions they may have during the laboratory training, but also asynchronously via email, discussion forums and the course's website.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see table below)

Activity/Method	***Semester workload***
4 weekly laboratory exercises	Weekly
3 tests	Every 3 weeks
26 weekly 2-hour lectures	
Total	1258

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	*The student is evaluated for his/her participation in the laboratory exercises, the implementation of his/her bi-weekly work, his/her performance in the progress of the course, as well as his/her performance in the written examinations of the course.* *The general formula 0.3 x (average weekly work) + 0.7 x (progress grade or grade of written examinations) is applied. The above formula is adjusted according to the degree of difficulty of the written topics of each year.* *Students always have access to their evaluated papers and writings.*

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Notes and slides of the course and of the laboratories are provided on the course website. Through the Eudoxos system, the students choose one of the following recommended books:

- *Networked Life, Mung Chiang, (translated by C. Douligeris), 1st Edition, 2014*
- *Computer Networking, 6th Edition J.F. KUROSE KW. ROSS, GIURDA & Co. PUBLICATIONS, 2013*

ALGORITHMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			
COURSE TITLE	Algorithms		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB101/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course, students will be able to:
1. Calculate the number of key operations in an algorithm
2. Apply suitable algorithmic techniques for the solutions of computational problems that arise in the different application fields.

3. Understand the inherent difficulty of an algorithmic problem.
4. Decompose an algorithmic problem into its components.
5. Design and develop effective solution techniques.
6. Assess the solution quality of an algorithm, both analytically and experimentally.
7. Decide on the basis of the above and choose the optimal solution for each problem.
8. Analytically determine the time and space complexity of algorithmic techniques.
9. Implement efficient algorithms taking into consideration the specific implementation platforms.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

Critical thinking

Development of free, creative and inductive thinking

Search for, analysis and synthesis of data and information by the use of appropriate technologies,

Decision-making

Introduction of innovative research

Individual/Independent work

(3) COURSE CONTENT

The subject of the course is to study techniques for solving basic computational problems (Divide-and-Conquer, Dynamic Programming, Greediness etc.) and present them without reference to a specific programming language. The problems studied are central to the Computer Science and the design of efficient solving techniques for these specific problems contributes to the rapid resolution of a very large number of other computational problems that arise in various application areas.

In presenting the relevant algorithms, emphasis is placed on their execution time and the number of key operations in an algorithm is analytically determined. The solution quality of an algorithmic technique is also analyzed when achieving the best solution is practically impossible due to overly long execution time.

Among other things, algorithms are presented for sorting, searching, graph problems such as traversals, connected components, topological sorting, minimal spanning trees and shortest paths. Algorithms for basic numerical calculations (matrix multiplication, polynomial value calculation, Fast Fourier Transformation) are also presented.

Finally, an introduction to the basic concepts of Theory of Computation (Complexity Classes, etc.) is included.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	52
Tutorials	30
Projects	43
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	**Problem Solving**

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography: ΕΙΣΑΓΩΓΗ ΣΤΟΥΣ ΑΛΓΟΡΙΘΜΟΥΣ, CORMEN T.H., LEISERSON C.E., RIVEST R.L., STEIN C. , ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ ΑΛΓΌΡΙΘΜΟΙ, ΜΠΟΖΆΝΗΣ ΠΑΝΑΓΙΏΤΗΣ, ΕΚΔΟΣΕΙΣ ΤΖΙΟΛΑ ΣΧΕΔΙΑΣΜΟΣ ΑΛΓΟΡΙΘΜΩΝ, J. KLEINBERG, E. TARDOS, 2009 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ - Related scientific journals: Theoretical computer science, Elsevier Algorithmica, Springer

DATABASES

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ30-1**	**SEMESTER**	4
COURSE TITLE	DATABASES		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures, Laboratory hours		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Background knowledge*		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB102/		

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
upon the successful completion of the course, the students will be able to:

- ✓ Understand topics related to the theoretical background of Databases, including Relational Algebra and SQL language
- ✓ Exploit on the theoretical knowledge gained in order to be able to design an Information System
- ✓ Use the ubiquitous SQL language at an advanced level
- ✓ Embed database design techniques and methodologies
- ✓ Have a global view, both from the research and the empirical perspective, in order to specialize in Information Systems and Databases.
- ✓

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Search for, analysis and synthesis of data and information by the use of appropriate technologies
Individual/Independent work
Group/Team work
Project planning and management
Adapting to new situations
problem solving

(3) COURSE CONTENT

The course offers knowledge about Database design. In particular, it covers topics such as:

1. DB theoretical background (Relational model, Relational algebra),
2. SQL language
3. DB design techniques, including normalization theory
4. Hands-on using a popular DB system (PostgreSQL).

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in-class lecturing

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT in teaching, laboratory education, communication with students, etc. (e-class platform)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	40
Laboratory practice	20
team-work	20
independent (self) study	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	I. written assessment (open questions towards problem solving); 70% II. team project with face-to-face presentation; 30% The evaluation criteria are stated and they are accessible to the students via the e-class platform.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- A. Silberschatz, H. F. Korth, S. Sudarshan, "Συστήματα Βάσεων Δεδομένων" (7η έκδοση, κεφ. 1-8, 22, 27). Εκδόσεις Γκιούρδας, Αθήνα, 2011.
- R. Ramakrishnan, J. Gehrke, "Συστήματα Διαχείρισης Βάσεων Δεδομένων" (3η έκδοση, κεφ. 1-5, 19, 23). Εκδόσεις Τζιόλα, Θεσ/νίκη, 2016.
- Ε. Κεχρής, "Σχεδιακές Βάσεις Δεδομένων" 3η έκδοση Εκδόσεις Κριτική 2021

INTERNET AND WEB PROGRAMMING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΔΠΙ01**		4th semerster
COURSE TITLE	Internet and Web Programming		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	
Lab exercises	2	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		5

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Background knowledge*
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB117/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course students are expected to:

1. Be able to list the basic architectures for developing applications on the Internet and the World Wide Web, such as client-server and 3-tier architectures;
2. Know the basic technologies for the Internet and the World Wide Web such as IP, TCP, UDP and HTTP protocols, sockets technology, web servers and application servers;
3. Be able to develop web applications using an appropriate programming environment;
4. Be able to implement sockets programming (TCP sockets and UDP sockets);
5. Implement client-server applications;
6. Be able to integrate 3-tier architecture into their applications.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

Development of free, creative and inductive thinking,

Search for, analysis and synthesis of data and information by the use of appropriate technologies.

Project planning and management.

Group/Team work.

Working in an international environment.

Working in an interdisciplinary environment.

Adapting to new situations.

Development of free, creative and inductive thinking.

(3) COURSE CONTENT

The course covers the theoretical study and the practical training in the area of Internet and World Wide Web programming , such as sockets programming, client-server applications and 3-tier architectures. In particular it includes the following:

1. Client-Server Architecture
2. Network Programming (socket programming, tcp-udp)
3. HTTP protocol (description with respect to the client server model)
4. HTTP Programming: Web server implementation
5. Customer-Server Architecture Variations (3-trier architectures)
6. Server programming (Java servlets)
7. Permanent storage of data in web applications.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	*Face-to-face, in-class lecturing*
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	*Use of ICT in teaching.* *Laboratory Education.*
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	50
Laboratory practice	10
Lab exercises	20
Fieldwork project	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Fieldwork project: 60%, Laboratory Exercises: 40% The evaluation criteria are available to the students through the course web page.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- *Βιβλίο [13578]: SERVLETS ΚΑΙ ΣΕΛΙΔΕΣ ΔΙΑΚΟΜΙΣΤΗ JAVA: ΤΕΧΝΟΛΟΓΙΕΣ ΠΥΡΗΝΑ, MARTY HALL, LARRY BROWN, 2007 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ*
- *Βιβλίο [13547]: JAVA: ΠΡΟΧΩΡΗΜΕΝΕΣ ΤΕΧΝΙΚΕΣ, ΤΑΝΙΑ ΑΛ. ΚΕΡΚΙΡΗ, 2006 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ*

PRINCIPLES AND APPLICATIONS OF SIGNALS AND SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ10-1**		4th semester
COURSE TITLE	PRINCIPLES AND APPLICATIONS OF SIGNALS AND SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4 hours/week x 13 weeks	5
Laboratories	2 hours/week x 4 weeks	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background
PREREQUISITE COURSES:	no
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes it can be offered
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB110 https://gunet2.cs.unipi.gr/courses/TMB124

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

After the completion of this course the student will be able to:

1) Understand and define the notions of signals and systems
2) Classify signals in digital and analog and in continuous and discrete time
3) Identify and research the basic properties of systems, such as linearity, causality and time in-variance
4) Identify the concept of the discrete and of the continuous Fourier transform
5) Design and implement the (periodic) sampling procedure
6) Apply the uniform (linear and nonlinear) quantization
7) Define the concepts of convolution, impulse response and transfer function of linear, time-in-variant systems
8) Know and manage Analog and Digital Communication Systems
9) Use analog modulation: amplitude, angle (phase, frequency), pulse
10) Be aware of the concept of multiplexing
11) Analyze and evaluate the performance of systems under the presence of noise
12) Define and develop pulse code modulations systems
13) Apply the Shannon Hartley theorem
14) Detect binary signals
15) Program and implement transmissions in the basic zone
16) Use bandbass digital modulation techniques
17) Program with MATLAB (or equivalent software)

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

- Search, analysis and synthesis of data and information, using the necessary technologies
- Autonomous work
- Teamwork
- Project planning and management
- Respect for diversity and multiculturalism
- Promoting free, creative and inductive thinking
- Working in an international environment
- Working in an interdisciplinary environment
- Adapt to unforeseen situations
- Problem solving

(3) COURSE CONTENT

The topic of systems and systems has been growing with a fast and continuous rate for the last decades and is a fundamental topic in many undergraduate courses internationally, including study programs in informatics. In parallel, it lays the foundation of the teaching of more advanced and specialized technological courses, such as Pattern Recognition, Image Analysis, Computer Vision, Telecommunication Systems, Computer Networks, Multimedia Systems and Voice Recognition. This particular course is divided into 7 units: Unit 1: Introduction to the concepts of signals and systems, examples of signals and systems in Informatics, signal classifications, basic signal properties Unit 2: Signal tranforms Unit 3: Signal Sampling and quantization Unit 4: Linear, time-invariant systems Unit 5: Communication Systems and modulation Unit 6: Digital Communication Systems Unit 7: The Matlab programming environment

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Lectures in the amphitheatre as well as laboratory practices are provided.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialised software for signals and systems management is used (Matlab/Python). This software is used for the presentation of the algorithms and the comparative study of the various schemes, both in teaching and in homeworks/projects. The e-class platform is used for supporting the educational process.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures/Labs	40
Group project of development and implementation of Image Processing application	40
Individual study	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	1. *Written Final exam (60%): open-ended questions and problems related to signal classification, properties of the systems, modulation, communications* 2. *Programming Project (40%): Using Matlab/Python in groups of 2 or 3, the students implement a system to perform image processing, music processing and communication systems simulation. Open data are used in the project. The project is submitted online. The source code is properly organized and documented so that to allow for the evaluation of the assumptions made and of the performance of the algorithms used.* *The students have access to all their submitted and graded works/exams.*

(5) SUGGESTED BIBLIOGRAPHY:

The course webpages have all the transparencies and notes of the course. In addition, the following textbook is distributed:
Χ. Δουληγέρης και Γ.Α. Τσιχριντζής, Αρχές και Εφαρμογές Σημάτων και Συστημάτων, Εκδόσεις Βαρβαρήγου, 2005

(C. Douligeris and G. A. Tsichrintzis, Principles and Applications of Signals and Systems, Varvarigou Publishing, 2005)

The students are encouraged to read articles from:
IEEE Transactions on Signal Processing, Signal Processing, IEEE Transactions on Communications

INFORMATICS IN EDUCATION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗΕΚ01		4ο
COURSE TITLE	INFORMATICS IN EDUCATION		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures-laboratory exercises		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMG123/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course students will be able to:

- Describe and explain terms and concepts related to the use of ICT (Information and Communication Technologies) in education.
- Know and understand the benefits of ICT in education.
- Utilize web2.0 technologies in the educational process.
- Identify and interpret the terms CMS (Content Management System) and LMS (Learning Management System) and recognize their differences.
- Be able to identify if an application-system is a CMS or LMS.
- Operate existing educational software and platforms and be able to use them either as an adjunct to the teaching process of a knowledge domain, or to create e-courses.
- Integrate computer applications in the educational process.
- Propose solutions related to the use of ICT to improve the educational process.
- Recognize the features that an educational software should have.
- Compare educational software.
- Evaluate an educational software.
- Develop their own educational software.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Adaptation to new situations
- Autonomous work
- Teamwork
- Problem solving
- Project design and management
- Promoting creativity
- Professional perfection
- Teaching-learning innovation (Production of new teaching methods / techniques)
- Social and professional sensitivity regarding the treatment of difficult teaching-learning circumstances

(3) COURSE CONTENT

The course deals with the utilization of Information and Communication Technologies (ICT) in education. More specifically, it deals with methods, techniques, platforms, software, etc. that offer support in the processes of teaching, assessment and learning. In more detail, the contents of this course are:

- Historical background on the use of ICT in education.
- Asynchronous and modern e-learning.
- Benefits of using-integrating ICT in education.
- Familiarity with Web 2.0 technologies.

- Familiarity with educational software for creating quizzes, comics, posters, crossword puzzles, web browsing, wikis, avatars, etc.
- Introduction to the national accumulator of educational content and software "Photodentro".
- Designing educational scenarios that include the use of ICT in the process and the way of teaching a knowledge domain.
- Evaluation of educational software.
- Familiarity with CMS (Content Management Systems) and LMS (Learning Management Systems).
- Use of open source software (Moodle) to create online courses.
- Educational games.
- Adaptive Educational Software.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in-class lecturing and in laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching and laboratories. • Existing educational software. • Support of the learning process and teaching through an electronic e-class platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	Semester workload
Lectures	26
Laboratory practice	30
Study	26
Projects	43
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS Detailed description of the evaluation procedures:	Presentation of 3 group assignments (100%): • Task 1: Designing an educational scenario that describes the use of existing educational software and web2.0 technologies for teaching a specific knowledge domain. • Task 2: Use open source software to create an online course.

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc. Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	• Task 3: Development of educational software. The way of assessment is communicated to the students through the course outline that is announced at the beginning of the semester in the systems of the department (eclass-gunet2)

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- ΨΗΦΙΑΚΕΣ ΤΕΧΝΟΛΟΓΙΕΣ ΚΑΙ ΜΑΘΗΣΗ ΤΟΥ 21ου ΑΙΩΝΑ, ΤΖΙΜΟΓΙΑΝΝΗΣ ΑΘΑΝΑΣΙΟΣ, 2019 ΕΚΔΟΣΕΙΣ ΚΡΙΤΙΚΗ
- Τάσος Α. Μικρόπουλος, Ιωάννα Μπέλλου, «Σενάρια διδασκαλίας με υπολογιστή», εκδόσεις: Κλειδάριθμος ΕΠΕ, 1η έκδοση: 2010.
- Christian Depover, Thierry Karsenti, Βασίλης Κόμης, «Διδασκαλία με χρήση της τεχνολογίας: προώθηση της μάθησης, ανάπτυξη ικανοτήτων», εκδόσεις: ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 1η έκδοση: 2010.
- Christopher Holden, et al., “Mobile Media Learning: Innovation and Inspiration”, ETC Press 2015
- A.W. (Tony) Bates, “Teaching in a Digital Age”, 2015, publisher Tony Bates Associates Ltd (e-book)
- Kevin Pitts and Renu Kumar, “Issues in Digital Technology in Education, Publisher: Wikibooks 2011, 2018 (e-book)
- “The Future of Technology Education”, Editors: **Williams**, P John, **Jones**, Alister, **Buntting**, Cathy (Eds.) , 2015

-Related scientific journals:

- Computers & Education
- IEEE on education
- IEEE Transactions on Learning Technologies
- International Journal of Educational Research

INFORMATION AND CODING THEORY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ73-1**	Semester	4
COURSE TITLE	Information and Coding Theory		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Background knowledge*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB105/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course the students would be able to:
• Understand Code Theory • Classify the different methods • Delve in their theory for exploiting them in the future in the scope of designing, developing and applying the corresponding code • Explore alternative encodings • Assess the amount of information that can be transferred through a communication channel • Assess the randomness of a source • Develop compression algorithms • Detect and correct random errors in a signal during its transmission • Detect and correct random errors in a file system due to physical damages

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Search for, analysis and synthesis of data and information by the use of appropriate technologies, Individual/Independent work *Group/Team work* Introduction of innovative research Project planning and management Critical thinking *Development of free, creative and inductive thinking*	

(3) COURSE CONTENT

Introduction to Information theory Entropy, entropy as an Information measure, randomness Channel bandwidth

Trustworthy data transmission and Shannon's second theorem Channels Code theory Codes Errod detecting codes, encoding without noise, encoding with noise, codes with variable length (Fano-Shannon, Huffman), data compression algorithms(Lempel Ziv, Arithmetic codes) Algebraic codes, Linear-Cyclic codes

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of Python and Sage (https://sagemath.org/) • Use of presentations and interactive board during lectures • Use of computer for development • Use of computers in the lab for development of programs and debuging • Web page update, news updates and offer of additional content (presentations, notes, code snippets) • Use institutional platform to submit grades • Use email and GUNET for communicating with the students
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Διαλέξεις	13*4=52
Εργαστηριακή Άσκηση	11*2=22
Συγγραφή εργασίας	15
Ώρες Μελέτης	36
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Laboratory work

(5) SUGGESTED BIBLIOGRAPHY:

- Εισαγωγή στη θεωρία Πληροφοριών, Κωδίκων και Κρυπτογραφίας, Ν. Αλεξανδρής, Β. Χρυσικόπουλος, Κ. Πατσάκης
- ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΘΕΩΡΙΑΣ ΚΩΔΙΚΟΠΟΙΗΣΗΣ ΚΑΙ ΚΡΥΠΤΟΓΡΑΦΙΑΣ, D. R. HANKERSON, D. G. HOFFMAN, D. A. LEONARD, C. C. LINDNER, K. T. PHELPS, C. A. RODGER, J. R. WALL
- Gray, Robert M. Entropy and information theory. Springer Science & Business Media, 2011.
- Claude Shannon Μια Μαθηματική Θεωρία της Επικοινωνίας, Leader Books, 2006
- Stefan Host, Information and Communication Theory, Wiley, 2019

APPLIED COMBINATORICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΕΦΣ01**	SEMESTER	4
COURSE TITLE	APPLIED COMBINATORICS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	SCIENTIFIC EXPERTISE
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	GREEK
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB128/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

After successfully completing this course, students will:

- be able to use basic enumeration tools such as generating functions and Polya Theory.
- know the basic techniques for constructing combinatorial objects.
- be able to design and implement efficient algorithms for generating combinatorial objects.
- know the basic combinatorial tools used in search problems, optimization problems, in large discrete structures (internet, DNA, human brain), as well in algorithms analysis.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Search for, analysis and synthesis of data and information by the use of appropriate technologies
Adapting to new situations
Individual/Independent work
Critical thinking
Development of free, creative and inductive thinking

(3) COURSE CONTENT

Combinatorial objects and parameters,

Generating functions (ordinary, exponential, multivariate),

Combinatorial generation (backtracking, Gray codes, ranking-unranking),

Enumeration and fast generation for sets, permutations, combinations, set partitions, integer partitions, trees, lattice paths,

Young tableaux, the RSK algorithm, hook-length formulas,

Partial orders – Lattices – Mobius inversion

Paths in graphs: The transfer-matrix method, The Gessel-Viennot Lemma,

Enumeration under symmetry: Polya Theory

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	distance teaching and distance learning
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Live interactive lectures via MS Teams Further communication via e-class Software development using SageMath and Python
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	52
Projects	34
Study hours	39
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	Software development Project (100%) Evaluation criteria are communicated to students in the beginning of the term, via the e-class

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Applications of Combinatorial Analysis, E. Foundas, 2013.

-The Art of Computer Programming Vol. 4a, D. E. Knuth, Addison-Wesley Professional, 2011.

-D.L. Kreher, D.R. Stinson, Combinatorial Algorithms: Generation, Enumeration and Search, CRC press LTC, Florida

-Applied Combinatorics, F. S. Roberts and B. Tesman, Prentice Hall, 2nd Edition, 2005.

BUSINESS STRATEGY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			4th
COURSE TITLE	BUSINESS STRATEGY		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
lectures		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specific Expertise		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS			
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Understand the key concepts of strategy and the views and approaches developed in the literature and business practice.
- Learn how to use the techniques and methods of strategic analysis, to recognize their advantages and disadvantages.
- Determine how the strategy is shaped, given a number of strategic choices (which include: scope and type of activities, competitive strategy, strategy implementation through acquisitions / mergers / alliances / same development, and timing of strategy moves).
- Evaluate and select the best strategy options.
- Understand the importance of the strategy development and the role that the effective management, systems, human resources, values, and culture play in its successful implementation.
- Delve into strategic decision-making techniques and common mistakes in strategy design and implementation.
- Use the available software to set a strategic goal
- Control and supervise the achievement of targets and goals through the collection, processing and analysis of data by employing strategic ways of using ICT, databases and electronic applications both in the virtual context of a business and in real cases

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Group/ Team work
Search for, analysis and synthesis of data and information by the use of appropriate ICT
Problem-Solving
Decision-Making
Critical Thinking
Innovation
Effective adaptation in unpredictable situations
Target planning and implementation management
Developmemt pf free, creative and inductive thinking
Working in international environment
Working in an interdisciplinary environment

(3) COURSE CONTENT

A common and core feature of all long-term successful firms is the development and preservation of strategic competitive advantages. Therefore, the development of "business strategies" is applicable to any business or organization operating in competitive markets. The subject of the course is, on the one hand the introduction of students to the methods and tools that help a company to plan, evaluate, implement and control its strategy. On the other hand, it is the systematic analysis of case studies of Greek and foreign companies in order to connect the theory with practice. The course includes: creating

business plans, Game Theory applications, Business Reengineering strategies, business differentiation & cost strategies and strategic ways of using information technologies, change management strategies, etc. The course examines a set of concepts, contexts, methods and tools for shaping a company's strategy and implementing it. Specifically, the following strategic sections are analyzed: • Necessity of strategy, concept of strategic management • Strategic positioning of the company: analysis of internal and external environment, strategic mission and vision of a company • Business strategy - Strategy for developing a competitive advantage • Group level strategy - Business development strategy • Strategy Implementation Methods: organic development, acquisitions and mergers, strategic alliances • Business Internationalization Strategy • Implementation of the strategy in practice: Structures, procedures, management of strategic changes.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Lectures are conducted through the use of ICT. Communication with students is in person and via e-mail and the Learning Process Support via the e-class e-class platform
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	***Semester workload***
Lectures	48
Essay writing	45
Study	32
Total	**125**

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	The student performance evaluation for the course is conducted with written exams at the end of the course taught in the semester and with the completion of 2 written assignments

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	The language of the examination and for the writing of the assignments is Greek.

(5) SUGGESTED BIBLIOGRAPHY:

1. Business Strategy Design & Implementation: The Search for Competitive Advantage - Case Theory and Studies, by Thompson, Strickland & Gable, Edited by: Giannis A. Pollalis, UTOPIA Publications, 2nd Greek edition, Athens 2017 (ISBN-13: 978-618-898 0-1 & Code for Eudoxus: 59396604). (in Greek)

2. Article Resources: Harvard Business Review (https://hbr.org/), Strategy + Business International Journal (http://www.strategy-business.com/)

3. Pollalis, Yannis A., "Patterns of Co-Alignment in Information-Intensive Organizations: Business Performance through Integration Strategies", International Journal of Information Management, Vol.23, No.6, pp. 469-492, December 2003. (Included in ScienceDirect's TOP25 Articles in Decision Sciences Literature)

4. Itami, Hiroyuki. Mobilizing Invisible Assets, Harvard Business School, Boston, 1987.

5. Ohmae, Kenichi. The Mind of the Strategist: The Art of Japanese Business, McGrawHill, New York, 1982.

6. Porter, Michael. Competitive Advantage: Creating and Sustaining Superior Performance, Free Press, Boston, 1985.

7. Pollalis, Yannis A. (2014) "Sustainable Competitive Advantage in Turbulent Business Environments: Using Critical Organizational Capabilities & Resources to Manage Complexity", Chapter in Strategic Marketing in Fragile Economic Conditions (edited), IGI Global.

8. Niros, M. & Pollalis, Y.A. (2014) "Brand Personality & Consumer behavior: Strategies for Building Strong Service Brands", Journal of Marketing & Operations Management Research, Vol.2, No.2, pp.101-115, Nova Science (UK).

9. Pollalis, Y.A., C. Siontorou & Batzias, D.F. (2011) "Strategic networking of environmental sensors for early warning in case of extreme pollution episodes calling for emergent state intervention", 9th International Conference of Computational Methods in Sciences and Engineering, 2-7 Oct., Halkidiki, Greece.

10.Pollalis, Y. A. & Dimitriou, N.K., “Knowledge Management in Virtual Enterprises: A Systemic Multi-methodology towards the Strategic Use of Information”, International Journal of Information Management, Vol. 28, No. 4, pages 305-321, August 2008. (Sited among ScienceDirect’s TOP25 Articles in Management & Accounting Literature).

11.King, William R. and Pollalis, Yannis A., “Information Technology-based Coordination and Organizational Performance: A Gestalt Approach”, Journal of Computer Information Systems, Vol.41, No.2, pp.64-75, Winter 2001.

12.Pollalis, Yannis. A Systemic Approach for Reengineering: Integrating IS Planning, BPR and TQM , Information Systems Management, Vol.13, No.2, January 1996.

DYNAMICAL SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			4th
COURSE TITLE	Dynamical Systems		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

By completing this course, students are expected to:

1. solve algebraic and differential equations,
2. compute the eigenvalues and eigenvectors of linear mappings,
3. identify, formulate and solve dynamical systems (autonomous and non-autonomous) in terms of the underlying differential equations that govern their behavior,
4. understand the notion of stability within the context of dynamical systems,
5. discriminate discrete and non-linear dynamical systems,
6. describe the chaotic behavior of a dynamical system,
7. acquire the ability to simulate and algorithmically solve non-linear dynamical systems for which it is impossible to derive the analytical expressions describing their time evolution,
8. understand and evaluate the conditions under which a dynamical system exhibits chaotic behavior,
9. study dynamical systems in a unified framework that combines both theoretical and practical understanding focusing on applications in physics, biology and economics.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

(3) COURSE CONTENT

Indicative teaching and learning outcomes:

Familiarization with ordinary differential equations
Phase-space representation of dynamical systems
Solving linear dynamical systems
Understanding the notions of flow and stability within the context of dynamical systems
Introductory study of fractal sets
Introductory study of chaotic dynamical systems
Application of mathematical prototyping to the study of physical, meteorological, biological and economical phenomena.

An analytical description of the subjects covered throughout the course is given below:

- Elements of mathematical analysis required for solving ordinary differential equations.
- Elements of linear algebra, linear mappings, eigenvalues and eigenvectors.
- Algorithms for solving non-linear differential equations.
- Two-dimensional flows and phase-space representation.
- Ordinary differential equations and linear dynamical systems.
- Discrete dynamical systems and difference equations.
- Non-linear dynamics.
- Chaotic dynamical systems.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Lectures are supported by the use of ICT
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	52
Tutoring	10
Studying	35
Personal Exercises	26
Exams	2
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	**Students are evaluated through written test at the end of the corresponding semester.**

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- P. Tsikouras, Dynamical Systems, Department of Computer Science, Univeriity of Piraeus,2010
- A. Bountis, Dynamical Systems and Chaos, A. Papasotiriou & Co. GP. 1995
- N. Stavrakakis, Ordinary Differential Equations, A. Papasotiriou & Co. GP. 2010

-Related bibliography:

- JW. E. Boyce, R. C. Diprima, Ordinary Differential Equations and Boundary Value Problems, National Technical University, 1999.
- N. Mihelakakis, Notes on Linear Algebra, http://www.unipi.gr/faculty/njm/LinAlg/contents.html .
- http://ocw.mit.edu/courses/mathematics/18-353j-nonlinear-dynamics-i-chaos-fall-2012/index.htm
- S.H. Strogatz, Non-linear Dynamics and Chaos, Perseus Books, 1994.

ENGLISH IV

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			4th semester
COURSE TITLE	English 4		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Seminars + Tutorials	4	3
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	English
LANGUAGE OF EXAMINATION/ASSESSMENT:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course students are able to:

I. Understand authentic oral and written discourse for constructive communication and participation in international scientific and professional environments.

II. Acquire enriched knowledge of vocabulary and syntax in the context of scientific/academic writing addressed to international environments.

III. Understand and process authentic research papers and informative texts of interdisciplinary interest related to the utilization of Informatics in the fields of Product Promotion (Marketing, E-Commerce, etc.), bank operation and banking transactions through software, Operational Research, Accounting Software, Accounting , electronic Stock Market and financial monitoring applications, Pollution of the Environment etc.

IV. Evaluate the content and the degree of documentation of the findings of the English research texts/papers.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

1.Indepedent work (text study)

2. Search and synthesis of information related to the content of the texts using new technologies

3. Work in an international environment

4. Work in an interdisciplinary environment

5. Respect for diversity and multiculturalism

6. Promotion of innovative, creative and inductive thinking

7. Exercise of critical ability

8. Collection, processing and evaluation of information

9. Contact and adaptation to new situations

10. Social, professional and moral responsibility

11. Respect for the natural environment.

(3) COURSE CONTENT

Vocabulary, Syntax, Writing in English

Teaching authentic scientific texts

Interconnection of Informatics with topics of other scientific fields, through text presentation

Familiarization with scientific papers

(Structure and content of English CVs)

Translation of texts from Greek to English and vice versa

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Interactive teaching in class.

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Presentations with overhead projector, YouTube videos or PowerPoint. Listening Comprehension
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Teaching	3 hours a week 13 weeks=39
Tutoring	1 hour a week
Study hours	23
Total	75 hours

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	100% written final exam that includes: -Reading Comprehension -terminology-vocabulary exercises -translation from Greek into English and vice versa

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Skills and Functions in Business English by Iakovos A., SivridouF., TombrouC., Faidimos; Oxford Business Dictionary, Khan Academy, www.WordReference.com, el.glosbe.com, www.linguee.com, dictionary.cambridge.org, www.collinsdictionary.com, BBC Economy, CNN, Deutsche Welle.

5th SEMESTER

HUMAN COMPUTER INTERACTION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ20		5o
COURSE TITLE	Human-Computer Interaction		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures & laboratory exercises		4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	General knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC101/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course students will be able to:

- Know, understand and explain the principles of designing an interface system.
- Design user-friendly interface systems for any application.
- Implement user interface systems in a visual programming language.
- Evaluate the usability of interface systems developed by others.
- Identify the capabilities that one can expect from human users for designing improved, future interactive systems.
- Understand and classify tasks hierarchically
- Apply hierarchical task analysis.
- Understand the importance of having help in an interactive interface system.
- Recognize the forms of help that can be provided in an interactive interface system.
- Design and develop easy-to-use help in an interactive interface system.
- Recognize the various user manuals that come with an interactive software.
- Analyze and compose clear instructions for use in interactive software.
- To compile, based on the above, the necessary user manuals that accompany an interactive software.
- To know, understand and explain theoretical models of interaction.
- Understand and implement the stages of the Norman model.
- Analyze alternative ways of designing interactions of an interface system according to Norman's model.
- Suggest and evaluate alternative ways of designing interactions of an interface system.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Autonomous work
- Teamwork
- Project design and management
- Finding techniques, methods and possible solutions to potential problems
- Problem solving
- Critical, creative, productive and inductive thinking
- Production of new research ideas and applicable practices
- Innovation
- Work in an international environment
- Work in an interdisciplinary environment
- Effectiveness in different professional environments

(3) COURSE CONTENT

- User interface system design.
- The human side in interaction.
- Classic and modern means of computer communication.

• Interaction models and user models. • Objectives, methods, task analysis. • Usability, software friendliness.

(4) TEACHING METHODS--ASSESSMENT

<table>
<tr><td>MODES OF DELIVERY
Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td><td>In-class lecturing and laboratory exercises</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, Communication with students</td><td>• Use of ICT in teaching and laboratories.
• Support of the learning process and teaching through the electronic eclass platform (gunet2)</td></tr>
<tr><td>COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.</td><td>
<table>
<tr><th>Activity/Method</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>60</td></tr>
<tr><td>Laboratory practice</td><td>20</td></tr>
<tr><td>Projects</td><td>45</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total</td><td>125</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS

Detailed description of the evaluation procedures:

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,</td><td>Presentation of 3 group assignments (100%):
• 1st task (10%): Application of the hierarchical analysis of tasks for a specific interface system and writting of the necessary user manuals (Short start notes, Short reference manual, Detailed reference manual).
• 2nd task (10%): Proposing and evaluating alternative ways of designing interactions of an interface system, and analyzing them according to Norman model.
• 3rd task (80%): Development of interactive software with emphasis on human-computer interfaces (large-scale task).

The way of assessment is communicated to the students through the course outline that is announced at the beginning of the semester in the systems of the department (eclass-gunet2)</td></tr>
</table>

other……etc. *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- ΝΙΚΟΛΑΟΣ ΑΒΟΥΡΗΣ, ΧΡΗΣΤΟΣ ΚΑΤΣΑΝΟΣ, ΝΙΚΟΛΑΟΣ ΤΣΕΛΙΟΣ, ΚΩΝΣΤΑΝΤΙΝΟΣ ΜΟΥΣΤΑΚΑΣ, «Εισαγωγή στην αλληλεπίδραση ανθρώπου-υπολογιστή», Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα - Αποθετήριο "Κάλλιπος", 2016
- Lecture notes of Professor Maria Virvou

INFORMATION SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLPLH50	**Semester**	5th
COURSE TITLE	INFORMATION SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC121/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Course Learning Outcomes:

By the end of this course students will be able to:

1. Identify the role and influence of information systems in the various functions of businesses.
2. Understand the concepts of information systems, not only from the perspective of Management Information Systems, MIS, but also from the perspective of Systems Analysis & Design, SAD.
3. Identify the modules of a information systems and the most important types of information systems that are utilized by the organizations and companies today
4. Know the methodologies of analyzing user requirements and their transformation in system design.
5. We able to use UML for designing different models of IS.
6. Understand the ways that the aforementioned techniques lead to software development
7. Identify the basic principles in designing and developing an IS.
8. Clarify the basic methodologies designing and developing IS.
9. Getting familiar with different information systems that are utilized within the context of a "digital business", e.g. Enterprise resource planning (ERP), Supply chain management (SCM) systems, decision support systems (DSS).

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

- Search, analysis and composition of data and information with the use of appropiate technological tools.
- Efficiency and inventiveness in design
- Decision making
- Design and Project management
- Creative, inductive thinking
- Critical thinking and knowledge utilization
- Working in an international, cross-scientific business environment

(3) COURSE CONTENT

The course aims in understanding the Information Systems (IS). It covers the subject not only from the perspective of Management Information Systems (MIS), but also from the perspective of Systems Analysis & Design (SAD). The students will get familiar with the modules of a IS and the most important types of information systems that are being utilized by organizations and businesses today. The students will get familiar with the methodologies of analyzing requirements and their transformation into system design. Finally, they will learn to use UML for constructing various models of IS and see how this leads to software development.

Basic course content: • Basic concepts of information • Modules of an IS • Most important types of IS • Methodologies of analyzing requirements and their transformation into system design. • Development of IS and testing • Use of UML for constructing different models of IS • Analysis of case studies

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	The learning process in supported through the electronic platform e-class.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	80
fieldwork	15
Study and analysis of bibliography	10
Independent study	20
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Written assignment (100%) that includes: *- multiple choice tests* *-Comparative evaluation of theory elements*

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography: *Recommended textbooks through two evdoxos:* [41962586] MANAGEMENT INFORMATION SYSTEMS, KENNETH C. LAUDON, JANE P. LAUDON [22768983] MANAGEMENT INFORMATION SYSTEMS, R. Kelly Rainer, Hugh Watson

PATTERN RECOGNITION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ81-2	**SEMESTER**	**5**
COURSE TITLE	PATTERN RECOGNITION		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**	
Lectures	4	5	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	General knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC100/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Pattern recognition is the scientific area that aims at classifying "objects" into "categories" ("classes") and includes the scientific field of Machine Learning. The purpose of this course is to present in a unified way the most widely used techniques and methodologies for pattern recognition problems.

Upon completion of the course students will be able to:

- have advanced knowledge in algorithms, techniques and pattern recognition methodologies, such as Bayesian classification theory, linear and non-linear classifiers, Neural Networks, Hidden Markov Models, clustering algorithms and techniques for selection of characteristics and dimensionality reduction.
- understand how knowledge of probability, statistics, linear algebra and optimization are combined to create pattern recognition algorithms.
- analyze real data problems (open access), which require the design / development / implementation of classification systems.
- assess the feasibility of these problems, select the appropriate algorithms / techniques and evaluate and compare the performance of alternative solutions.
- manage the burden and complexity of such real data problems in a team work environment.
- gain advanced programming skills in a Python / MATLAB / GNU Octave software development environment to implement algorithms, techniques and classification methods.
- evaluate and reuse existing implementations of open source functions related to the field of pattern recognition, such as scikit-learn library functions.
- distinguish concepts related to pattern recognition, in the related scientific fields of Machine Learning, Data Analytics and Artificial Intelligence.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies
- Individual/Independent work
- Group/Team work
- Critical, creative, productive and inductive thinking
- Control and evaluation of practices and solutions
- Innovation and production of new ideas at scientific and / or professional level
- Perception of abstract concepts
- Enhance user effectiveness
- Problem solving
- Work in international, interdisciplinary and diverse professional environments

(3) COURSE CONTENT

Pattern recognition is the scientific area that aims at classifying "objects" into "categories" ("classes") and includes the scientific field of Machine Learning. The purpose of this course is to present in a unified way the most widely used techniques and methodologies for pattern recognition problems.

The content of the course is divided into eight sections and each unit is conducted in one or more lectures.

Section 1: Introduction to Pattern Recognition

Section 2: Classifiers based on Bayesian Decision Theory:
Bayesian Decision Theory, The Gaussian Probability Density Function, Minimum Distance Classifiers, Euclidean Distance Classifier, Mahalanobis Distance Classifier, Maximum Likelihood Estimation of Gaussian Density Function Parameters
Mixture Models, The Expectation-Maximization Algorithm, Parzen Windows
Probability Density Estimation Based on k-Nearest Neighbors, The Naive Bayes Classifier, The Nearest Neighbor Classifier

Section 3: Classifiers Based on Cost Function Optimization:
The Perceptron Algorithm, The Online Version of the Perceptron Algorithm, Minimum Square Error Classifier, Multi-Class Case, Support Vector Machines (SVM): The Linear Case, Multi-Class Case Extensions, SVM: The Nonlinear Case, The Perceptron Algorithm Using Kernels, The AdaBoost Algorithm, Multilayer Perceptron Networks

Section 4: Data Transformations: Feature Generation and Dimensionality Reduction:
Principal Component Analysis (PCA), Singular Value Decomposition (SVD), Fisher's Linear Discriminant Analysis, Principal Component Analysis Using Kernels, Laplacian Matrix Eigenvalue Mapping Method

Section 5: Feature Selection:
Outlier exclusion, Data Normalization, Hypothesis Checking: t-Test,
Receiver Operating Characteristic Curve, Fisher's Ratio, Class Separation Measures, Divergence, Bhattacharya Distance and Chernoff bound, Measures Based on Covariance Matrix, Subset Feature Selection, Sequential Feature Selection, Feature Vector Selection

Section 6: Comparison with Reference Patterns: Edit Distance, Comparison of Sequences of Real Numbers, Dynamic Time Distortion in the Context of Voice Recognition

Section 7: Hidden Markov Models: Modeling, Recognition, and Training

Section 8: Clustering: Basic Concepts and Definitions, Clustering Algorithms, Sequential Algorithms, BSAS Algorithm, Improving Clustering, Cost Function Optimization Algorithms, Hard Clustering Algorithms, Fuzzy Clustering Algorithms, Other Clustering Algorithms, Hierarchical Clustering Algorithms, General Merging Scheme, Specialized Merging Algorithms, Choosing the Best Clustering

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lectures
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized software for pattern recognition in (Python / GNU Octave / MATLAB) for the presentation of the algorithms and their comparative study during lectures and for the elaboration of assignments. Support of the learning process and teaching through the electronic e-class platform.

COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	*Activity/Method*	*Semester workload*
	Lectures	30
	Team assignment to develop a pattern recognition system	45
	Independent study	50
	Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	1. Written final exam (70%) that includes exercises to test understanding of the theory taught, such as exercises related to Bayesian classification theory, linear and non-linear classifiers, Markovian models and clustering algorithms. 2. Programming assignment (30%) to be developed in a Python / MATLAB / GNU software development environment, in groups of one / two / three students with a subject of developing and implementing a pattern recognition system (classification) and evaluation of its performance. Open access data is used for the evaluation of the system. The assignment is delivered electronically and consists of source code, properly organized in files, as well as accompanying documentation which describes the process of solving the classification problem, the design assumptions / hypotheses and the evaluation of the performance of the algorithms included in the solution.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

[1] Αναγνώριση Προτύπων, S. Theodoridis, K. Koutroumbas, 2011, Broken Hill Publishers Ltd. Greek translation of: Pattern Recognition, 4th edition, S. Theodoridis, K. Koutroumbas, Academic Press, 2009.

[2] Εισαγωγή στην Αναγνώριση Προτύπων με MATLAB, S. Theodoridis, A. Pikrakis, K. Koutroumbas, D. Cavouras, 2011, Broken Hill Publishers Ltd. Greek translation of: Introduction to Pattern Recognition: a MATLAB approach, S. Theodoridis, A. Pikrakis, K. Koutroumbas, D. Cavouras, Academic Press (imprint of Elsevier Science), 2010.

-Related scientific journals:

IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Neural Networks, Machine Learning (Springer), Pattern Recognition (Elsevier), Pattern Recognition Letters (Elsevier).

SCIENTIFIC WRITING IN EDUCATION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΕΓ01-1**	**SEMESTER**	5th
COURSE TITLE	Scientific writing		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**	
	4	5	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise, Skills Development*		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.cs.unipi.gr/avou/index.php/2011-10-30-13-54-20/1-2011-10-30-13-21-37		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course students are expected to:

1. Have familiarized themselves with methods of searching, hierarching and evaluating the validity and reliability of data sources,
2. Be able to prepare a scientific scheme, identifying ta building blocks (main problem, general interest, special purpose, research hypotheses, theoretical framework, selection of research methodology etc.)
3. Compose a scientific paper, using data from different/conflicting sources, critically evaluating their scientific validity and the subject under study.
4. Utilize several methods of quoting bibliographic references, selecting the most appropriate in each case, acknowledging the uniformity of citations as an absolute rule of scientific writing.
5. Organize their material, observing the generally acceptable structure of a scientific publication, in a homogeneous yet personal manner, to the extent that it does not lead to bias.
6. Be able to critically analyze conflicting sources of information, check their validity and distinguish those which are subjective and / or unsubstantiated from the empirically substantiated ones.
7. Understand and observe the scientific moral code in data collecting methods as well as in writing a scientific publication.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

Adapting to new situations

Working in an international environment

Individual/Independent work

Working in an interdisciplinary environment

Respect for diversity and multiculturalism

Introduction of innovative research

(3) COURSE CONTENT

1. Subject submission (search scheme, title, plan, main problem and subject interest, purpose and search hypotheses, theoretical framework. Definition and investigation of research topic, suggested research method, expected results, indicative bibliography) 2. Mandatory parts and their structure (preface, table of contents, summary, keywords. Table of abbreviations, Introduction, Main topic, topic development. Conclusion, epilogue, suggestions, bibliography, annex. 3. Text form Title page Following pages Table of contents Main theme Bibliography Annex (index) 4. Presentation and evaluation 5. Bibliography – References (magazine articles, chapters in collective work, conferences, dissertations, electronic bibliography)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing,*	<table><tr><th>*Activity/Method*</th><th>*Semester workload*</th></tr><tr><td>Lectures</td><td>72</td></tr><tr><td>Self-study</td><td>53</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>

Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*		
	Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Presentation

(5) SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:

Academic writing, Evdoridou E., Karakasidis Th., Tziolas publ., 2017

ADVANCED COMPUTER ARCHITECTURE

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLPRO01	**SEMESTER**	5th
COURSE TITLE	ADVANCED COMPUTER ARCHITECTURE		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures + Laboratory Exercises		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek / Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA103/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, the students:

- will have understood the architecture and organization of modern processors
- will know the basic performance mechanisms of modern processors
- will be able to use modern processor simulators and run/evaluate assembly programs
- will be able to analyze the performance of computer programs and provide optimization tips to the programmers.
- Will be able to estimate the parameters that affect the performance and power consumption of a modern computer
- Will have been updated about current research issues in the field of computer architecture

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Individual/Independent work
- Group/Team work
- Introduction of innovative research ideas
- Development of free, creative and inductive thinking
- Career prospects

(3) COURSE CONTENT

The course is a continuation of the background course Computer Architecture and aims to enhance the students’ knowledge in design and organization of modern high-performance processors.

It focusses on the study of the following topics:

1. Performance improvement using pipelining technique.
2. Memory hierarchy. Cache memory. Virtual memory.
3. Interfaces between processor, memory and input/output devices.
4. Dynamic scheduling. Branch prediction and speculation
5. Multithreaded and multicore processors

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	• In-class lecturing • Face-to-face in lab courses
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Support of learning process using e-learning platform (e-class) • Use of electronic material in teaching (slides, exercises, laboratory material) • Use of software tools (simulators) for the simulation of computers and memory systems in laboratory exercises
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	22 x 2 = 44
Tutorials	4 x 2 = 8
Autonomous study	20
Student projects	27
Essay writing	26
Total (25 hours workload per credit unit)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	I. Written final exam (20%) which includes: - Exercises related to the design of pipeline mechanism - Exercises related to the design of memory hierarchy - Questions about the performance of multithreaded and multicore processors II. Three (3) group projects about: a) the design of the pipeline mechanism and how it affects the system performance (30%), b) the design of the memory hierarchy and how it affects the system performance (30 %) and c) the design of processors with dynamic scheduling and speculation (20%)

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

1. Computer Architecture: A Quantitative Approach, 6th edition, Hennessy John L., Patterson David A
2. Computer Organization and Design: the hardware/software interface, 6th edition, DAVID A. PATTERSON, JOHN L. HENNESSY

ADVANCED TOPICS IN COMMUNICATIONS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**PLTHE01**		5th
COURSE TITLE	Advanced Topics in Communications		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization of general knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	GREEK (& ENGLISH)		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS			
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC118/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

With the successful completion of this module students will be able to:

1. Identify the basic concepts of wireless networks.
2. They introduce various wireless systems and standards and the basic cases of their operation.
3. It knows the principles of signal propagation and configuration and distinguishes the types of interference in the wireless environment of mobile communications.
4. Analyze traffic theories, and models of mobile radio radio-propagation, channel coding, and cellular communications issues
5. Model radio spectrum issues and analyze their impact on the performance of the communications system
6. Understand spectrum allocation techniques in multi-user systems and their impact on network capacity
7. Compare and contrast multi-access techniques in mobile communications systems, as well as wireless networks
8. Categorize network protocols, ad hoc and sensor networks, wireless MANS, local networks, and PANs.
9. Learn to simulate wireless networks and analyze simulation results
10. Analyze and propose broad solutions for a range of mobile communications scenarios

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

- Autonomous work
- Teamwork
- Promoting free, creative and inductive thinking
- Search, analysis and synthesis of data, techniques and information, using the necessary techniques
- Project planning and management
- Evaluation of different solutions and selection of the most appropriate
- Problem solving
- Critical ability

Working in interdisciplinary, international and diverse professional environments

(3) COURSE CONTENT

Contribution of the course to the coverage of professional requirements: 1. Students are exposed to basic wireless communication techniques 2. Students are introduced to various concepts of wireless networks and models. 3. Students learn to simulate wireless networks and evaluate their findings. Basic Principles of Wireless Communication, Physical Modeling of Wireless Channels, Wireless Transmission, Multiple Access and Channel Capacity. Next Generation Networks (NGN) and Applications, NGN Architectures, main features and platforms. Satellite Communications, DVB-T/T2 and DVB-S/SS2+ platforms, analysis and design of satellite links. Multi-step networks. Wireless Sensor Networks (WSNs), Power Control and Energy Saving, Resource Allocation, Routing

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Weekly lectures in the classroom and/or in the workshop
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use electronic slides in lectures. • Use of computers and software in Laboratory Exercises • Maintenance of a course website with announcements and provision of teaching material. • Posting scores through Pan's online course management platform. Piraeus. Use email to communicate with students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see workload table below

Activity/Method	*Semester workload*
Teaching - Workshops	74
Preparation of astudy (project)	51
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Laboratory Exercises - Written Examinations The final grade results 70% from the final examination, 30% from the laboratory exercises.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Principles and Modeling of Wireless Dissemination, Kotsopoulos Stavros, Publications A. Giola & Sons O.E.
- Telecommunications Systems, 4th Edition, Karagiannidis Georgios, Pappi Koralia, Publications A. Giola & Sons O.E.
- Wireless Communications, 2nd Edition Of Kanatas A., Kosdantinou F., Pantos G., Version A. Kanatas

PROGRAMMING IN LOGIC

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	TMC105		5th
COURSE TITLE	PROGRAMMING IN LOGIC		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures and Practice Exercises		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Special Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC105/		

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
Upon completion of the course students are expected to: 1. understand and apply the basic principles of logical programming,   2. be able to develop an application in a Prolog language environment,   3. be able to integrate Data Structures into a program written in Prolog,

4. know and apply search strategies in programs written in Prolog,
5. be able to apply techniques of retrospective programming, split logic programming, parallel logical programming and meta-logical programming;
6. be able to develop meta interpreters and other advanced applications using the Prolog language.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

- Independent Work
- Analysis and synthesis of data and information using the necessary technologies
- Promotion of creative and inductive thinking
- Decision making strategies
- Design and programming of Information Systems

(3) COURSE CONTENT

Propositional and categorical logic and logical programming.
Categorical logic.
Principle of inferencing and its strategies.
Non-monotonous inferencing and logical programming.
The Prolog language and its simple applications. Data structures in Prolog.
Search strategy in Prolog. Recursive programming.
Separating logical programming. Logical constraint planning.
Parallel logical programming.
Post-logical programming.
Post-interpreters and advanced Prolog applications.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In the lab
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Two Logic Programming program development environments are used and given to students: SWI and SICSTUS Prolog.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art*	see table below

Activity/Method	*Semester workload*
Lectures	50
Practice Exercises that focus on program development	25
Independent Study	35
Optional job	15

Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*		
	Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	I. Written final examination (100%) which includes program development and problem solving of relevant planning principles. II. Optional assignments (three) that count for 30% of the grade.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:
Logical Programming, teaching notes, Th. PANAGIOTOPOULOS, printed version
Logical Programming, slides, D. APOSTOLOU, online version
From logic to logical programming and Prolog, G. MITAKIDIS, KARDMITSA Publications
Programming in logic – Prolog, P. NOTOPOULOS, E. & D. ANIKOULA – I. ALEXIKOS OE.

- *Related scientific journals:*
IEEE Intelligent Systems

DATABASE MANAGEMENT SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ33-2**	**SEMESTER**	5
COURSE TITLE	DATABASE MANAGEMENT SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures, Laboratory hours	6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*scientific expertise*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC110/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- ✓ Understand topics related to the physical organization of Databases and the internals of a Database Management System (DBMS)

- ✓ Exploit on the above knowledge in order to be able to develop methods and tools over a DBMS
- ✓ Optimize queries using the theoretical background of query processing and optimization
- ✓ Get familiar with state-of-the-art DBMS architectures

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Search for, analysis and synthesis of data and information by the use of appropriate technologies Individual/Independent work Group/Team work Project planning and management Adapting to new situations problem solving	

(3) COURSE CONTENT

The course offers knowledge about DBMS internals. In particular, it covers topics such as:

5. Files organization and indexing
6. Query processing and optimization
7. Transaction management (concurrency control, recovery process)
8. Advanced DBMS architectures (distributed/parallel, NoSQL)
9. Hands-on using popular DB systems (PostgreSQL, MongoDB)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in-class lecturing

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT in teaching, laboratory education, communication with students, etc. (e-class platform)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	

Activity/Method	*Semester workload*
Lectures	40
Laboratory practice	20
team-work	20
independent (self) study	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	I. written assessment (open questions towards problem solving); 60% II. team project with face-to-face presentation; 40% The evaluation criteria are stated and they are accessible to the students via the e-class platform.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Garcia-Molina H., Ullman J.D., Widom J. “Συστήματα Βάσεων Δεδομένων” (2η έκδοση). Κεφάλαια 13-20.
- Elmasri R., Navathe S.B. “Θεμελιώδεις Αρχές Συστημάτων Βάσεων Δεδομένων” (5η έκδοση). Κεφάλαια 13-30.
- Silberschatz A., Korth H.F., Sudarshan S. “Συστήματα Βάσεων Δεδομένων – Η Πλήρης Θεωρία των Βάσεων Δεδομένων” (4η έκδοση). Κεφάλαια 8-22.
- Μανωλόπουλος Ι., Παπαδόπουλος Απ. “Συστήματα Βάσεων Δεδομένων - Θεωρία & Πρακτική Εφαρμογή”. Κεφάλαια 11-21.

CRYPTOGRAPHY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΚΡΥ01**	Semester	5th
COURSE TITLE	Cryptography		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC106/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Assess the security that is offered by an encryption algorithm
- Identify and categorise the types and used of encryption algorithms

- Select the proper algorithm and the parameters for the proper mode for its successful use
- Develop/apply an encryption algorithm
- Understand in depth the applications and the protocols of cryptography
- Know the methods and parameters for the design and development of a protocol
- Trace and assess possible protocol vulnerabilities
- Use the above for the development and testing of programs.

General Competences
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim? *Search for, analysis and synthesis of data and information by the use of appropriate technologies,* *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research* *Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Search for, analysis and synthesis of data and information by the use of appropriate technologies, Individual/Independent work Introduction of innovative research Project planning and management Critical thinking Development of free, creative and inductive thinking Problem solving

(3) COURSE CONTENT

Introduction Evolution of cryptography through the years Revision of necessary math background Basic algorithm (Monoalphabetic substitution, One-Time-Pad, Ceasar Vigenere, Hill) Symmetric algorithms (cipher modes: ECB, CBC, OFB κτλ) DES, AES Stream ciphers: PRNG vs TRNG, LFSR, RC4 Public key algorithms (RSA algorithm, elliptic curves) Homomorphic encryption Hash functions Digital signatures Cryptographic applications and protocols Cryptanalysis (Linear, differential, integer factorisation) Development problems

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Development with Python • Use of slides and smart board. • Use of computer for development. • Use of lab computers to develop and test programs • Use course webpage for disseminating course material (slides, notes, code) • Use the university's platform to publish grades • Use GUNET and emails to communicate with the students

COURSE DESIGN

Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.

Activity/Method	***Semester workload***
Lectures	13*4=52
laboratory practice	11*2=22
Essay writing	15
Study hours	36
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

- Nigel Smart, Cryptography: An Introduction, McGraw-Hill Education, November 2002.
- Douglas Stinson, Cryptography: Theory and Practice (Discrete Mathematics & Its Applications S.), CRC Press, February 27, 2002.
- Richard A. Mollin, An Introduction to Cryptography, CRC Press, August 10, 2000.
- Alfred J. Menezes, Paul C. van Oorschot, and Scott A. Vanstone, Handbook of Ap-plied Cryptography, CRC Press, October 16, 1996.
- Neal Koblitz, A Course in Number Theory and Cryptography, GTM 114, Springer-Verlag, 1987. Second edition, 1994.
- Neal Koblitz, Algebraic Aspects of Cryptography, Algorithms and Computation in Mathematics Vol. 3, Springer-Verlag, 1998.
- Joachim von zur Gathen, Jórgen Gerhard, Modern Computer Algebra, Cambridge University Press, 1999.
- Victor Shoup, A Computational Introduction to Number Theory and Algebra, Cam-bridge University Press, 2005.(Το βιβλίο είναι διαθέσιμο ελεύθερα στο http://shoup.net/ntb/)
- Oded Goldreich, Foundations of Cryptography (Volume I & II), Cambridge Univer-sity Press, 2001.
- Κρυπτογραφία και Εφαρμογές, Πατσάκης Κωνσταντίνος, Φούντας Ευάγγελος
- ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΘΕΩΡΙΑΣ ΚΩΔΙΚΟΠΟΙΗΣΗΣ ΚΑΙ ΚΡΥΠΤΟΓΡΑΦΙΑΣ, D. R. HANKERSON, D. G. HOFFMAN, D. A. LEONARD, C. C. LINDNER, K. T. PHELPS, C. A. RODGER, J. R. WALL
- Κρυπτογραφία για Ασφάλεια Δικτύων Αρχές και Εφαρμογές, Stallings

SPECIAL TOPICS ON OPERATIONAL RESEARCH

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΘΕΠ01		5o
COURSE TITLE	Special Topics in Operations Research		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures and Tutorials	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	Mathematical Analysis I, Applied Algebra, Mathematical Programming
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC124/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Formulate and solve convex optimization problems.
- Distinguish the basic principles and concepts of non-linear programming, integer

programming and dynamic programming.
- Recognize and model non-linear programming and integer programming problems.
- Distinguish the basic principles and concepts of non-linear programming, integer programming and dynamic programming.
- Identify and model non-linear programming and integer programming problems.
- Understand and use discrete optimization algorithms as well as integer programming algorithms.
- Apply the method of Lagrange multipliers.
- Recognize the relationship between the primal and dual models as well as the existence of a duality gap.
- Express the Kuhn - Tucker optimality conditions.
- Identify and implement approximation techniques for solving mathematical problems.
- Model dynamic programming problems by breaking down a multi-stage decision-making problem into sub-problems, to formulate the retrospective relation of the problem and to determine its optimal solution.
- Model dynamic programming problems by breaking down a multi-stage decision-making problem into sub-problems and determine the optimal solution.
- Utilize optimization techniques for inventory management.
- Calculate inventory costs, storage and management issues and control supply as well as to control supply and demand.
- Recognize the issues relating to the planning and operation of the supply chain.
- Model and solve supply chain management problems.
- Model and solve facility location problems.
- Analyze real decision problems and construct the mathematical models that describe them, considering all the parameters and constraints of the given problem.
- Select and apply the appropriate optimization techniques and algorithms for solving given problems.
- Completely solve a mathematical programming problem either on paper or by using the appropriate software.
- Interpret the results obtained from the solution of a mathematical programming problem.
- Use specialized optimization tools such as Matlab Optimization Toolbox.
- Use specialized software of data and results visualization (Matlab, Graph, GeoGebra).

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

- Individual Assignment.
- Search, analysis and processing of data and information using the necessary technologies.
- Production of new research ideas.
- Promoting free, creative and inductive thinking.
- Critical ability.
- Problem solving.
- Formulation of mathematical models.

- Knowledge and use of algorithms.
- Adaptation to new situations.
- Decision making.
- Working in an interdisciplinary environment.
- Working in an international environment.
- Social and professional responsibility.
- Team Spirit.
- Evaluation based on given standards.

(3) COURSE CONTENT

The course discusses Special Topics in Operations Research, i.e. nonlinear, integer and dynamic programming problems as well as the corresponding optimization techniques and algorithms for their solution. It also focuses on inventory management and supply chain management. In addition to understanding the basic concepts and theory, the aim of the course is to apply the presented methodologies to real world problems.

Topics

1. *Convex Optimization*

- Curved sets
- Convex Hull
- Convex and Concave Functions
- Local and Global Optimum

2. *Nonlinear Programming*

- Fractional programming problems
- Quadratic programming problems
- Derivatives of Vector-Valued Functions
- Lagrange multipliers
- Kuhn-Tucker conditions
- Duality – Duality Gap
- Parametric Techniques-Approximation Algorithms
- Solving problems using optimization software (Excel and Matlab)

3. *Integral Programming and Combined Optimization*

- Modeling of Integer and Mixed Integer Programming problems
- Integer Programming Algorithms
- Heuristic Algorithms
- Integer Programming Applications
- Solving problems using optimization software (Excel and Matlab)

4. *Dynamic Programming*

- Bellman's principle of optimality
- Bottom-up approach
- Top-down approach

- Production and Storage-Inventory problem
- Solving problems using optimization software (Excel and Matlab)

5. *Inventory Management*

- Inventory Management Systems
- Demand-Demand Forecast
- Cost and Storage
- Management and Inventory Control Models

6. *Supply Chain*

- Structure of Supply Chain
- Modeling and Optimization of Supply Chain
- Facility Location Problem
- Costs and Performance of Supply Chain
- Inventory Management Problems in the Supply Chain
- Just In Time (JIT) System

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Notes on board • Use of computer and video projector • Educational videos • Electronic books / articles • Use of Internet • Word processing and Presentation Software • Optimization Software (Matlab) • Spreadsheet Software (Microsoft Excel) • Electronic e-class platform to support the learning process • Electronic communication with students
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures and Tutorials	45
Assignments	40
Individual Study	40
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	**I. Written examination (60% of the grade) that includes**: • Multiple Choice Questions (10%) • Short-answer Questions (10%) • Problem Solving (80%) **II. Two individual assignments (2x20% of the grade) that include:** • Modeling and problem solving • Analysis of results The students should use the following software in the as-signments: • Word processing Software • Optimization Software (Matlab) • Spreadsheet Software (Microsoft Excel) • Visualization Software (Graph, GeoGebra)

(5) SUGGESTED BIBLIOGRAPHY:

- *Δεσπότης, Δ.Κ. (2011), Γραμμικός Προγραμματισμός, αυτοέκδοση.*
- *Μυγδαλάς, Α., Μαρινάκης, Ι. (2008), Σχεδιασμός και Βελτιστοποίηση της Εφοδιαστικής Αλυσίδας, Εκδόσεις Σοφία.*
- *Υψηλάντης, Π. (2015), Επιχειρησιακή Έρευνα - 5η εκδ. Ανανεωμένη/Εμπλουτισμένη, Προπομπός.*
- *Bellman, R.E. (2010), Dynamic Programming, Princeton University Press.*
- *Bertsekas, D.P. (1996), Constrained Optimization and Lagrange Multiplier Methods, Athena Scientific.*
- *Bertsekas, D.P. (2009), Convex Optimization Theory, Athena Scientific.*
- *Bertsekas, D.P. (2009), Convex Optimization Algorithms, Athena Scientific.*
- *Bertsekas, D.P. (2015), Nonlinear Programming 3rd Edition, Athena Scientific.*
- *Bertsekas, D.P. (2017), Dynamic Programming and Optimal Control Vol. 1, 4th Edition, Athena Scientific.*
- *Boyd, S., Vandenberghe, L. (2004), Convex Optimization, Cambridge University Press.*
- *Nemhauser, G., Wolsey, L. (1988), Integer and combinatorial optimization, John Wiley & Sons, Inc.*
- *Shapiro, J.F. (2001), Modeling the Supply Chain, Duxbury-Thomson.*

- Journals:
- *Mathematical Programming*
- *SIAM Journal on Optimization*
- *Operations Research*
- *Journal of Optimization Theory and Applications*
- *Mathematics of Operations Research*
- *European Journal of Operational Research*
- *Computers and Operations Research*
- *INFORMS Journal on Computing*
- *Omega*
- *Annals of Operations Research*
- *Journal of Combinatorial Optimization*
- *Optimization*
- *Interfaces*
- *Journal of Purchasing & Supply Management*

THEORY OF COMPUTATION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			
COURSE TITLE	Theory of Computation		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC125/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course, students will be able to:
1. Identify the capabilities and limitations of theoretical computation models.
2. Identify the inherent difficulty of a problem.
3. Formally prove that there is no fast algorithm to solve a difficult problem, in all likelihood.

4. Determine the space requirements of problem for its solution. 5. Evaluate alternatives given the aforementioned requirements. 6. Assess whether a problem is solvable by Computers or not.

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Critical thinking Development of free, creative and inductive thinking Search for, analysis and synthesis of data and information by the use of appropriate technologies, Decision-making Introduction of innovative research Individual/Independent work Assessment/Evaluation of problems and workarounds Adapting to new situations Pragmatic handling of difficult situations Ability to focus and analyse/compose data and circumstances Working in an international environment Working in an interdisciplinary environment	

(3) COURSE CONTENT

The subject of the course is the presentation of the basic concepts of the Theory of Calculation. In particular, the following topics are studied: Regular Languages, Finite Automata, Non-Deterministic Automata, Non-Regular Languages, Context-free Languages, Context-free Grammars, Pushdown Automata, Non Context-free Languages, Church-Turing Thesis, Turing machines, Turing machine variants, Definition of the algorithm, Decidability, Reductions, Time Complexity, Class P, Class NP, NP-completeness, The Cook-Levin theorem, Spatial Complexity, Savitch's theorem, class PSPACE, PSPACE-completeness.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	52
Study	43
Assignments (Exercises)	30
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	**Problem Solving**

(5) SUGGESTED BIBLIOGRAPHY:

- *Suggested bibliography:*

ΕΙΣΑΓΩΓΗ ΣΤΗ ΘΕΩΡΙΑ ΥΠΟΛΟΓΙΣΜΟΥ, SIPSER MICHAEL, ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ

Στοιχεία θεωρίας υπολογισμού, Lewis Harry R.,Παπαδημητρίου Χρίστος, Εκδόσεις Κριτική

- Related scientific journals:
  Theoretical computer science, Elsevier

  Algorithmica, Springer

LEARNING MANAGEMENT SOFTWARE

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			5th
COURSE TITLE	Learning Management Systems		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures - Laboratories		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/ TMC133/		

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
By completing this course, students are expected to: • acquire the ability to conduct a comparative evaluation of the leading learning management systems offered by the contemporary software industry.   • acquire a deeper understanding of the fundamental notions and concepts pervading

contemporary learning managements systems. • acquire experience in creating digital classes that support both synchronous and asynchronous teaching methods. • familiarize with the fundamental learning management tools offered by Moodle. • create their own teaching material. • acquire experience in course administration within the framework of a learning management system.

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Adapting to new situations • Incorporate recent advances in learning management systems in order to optimize the quality of education offered by contemporary distant learning services. • Facilitate innovation within the framework of learning management systems by reinforcing the generation and incorporation of new ideas and practices. • Individual / Independent work. • Group / Teem work. • Project planning and management. • Critical thinking • Reinforce course design skills. • Familiarize with the use of learning management systems.	

(3) COURSE CONTENT

This course focuses on the utilization of recent advances in Information and Communication Technology within the educational process. Students attending this course are expected to acquire a deep understanding of the fundamental concepts and notions that pervade contemporary learning management systems by familiarizing with a state-of-the-art learning management system, such as Moodle. **In particular, the syllabus of the course is the following:** • Introduction to contemporary open source learning management systems. • Review of the fundamental concepts underlying existing learning management systems such as Moodle and E-class. • Synchronous and Asynchronous learning models. • Moodle installation. • E-class installation. • Moodle parameterization for supporting synchronous and asynchronous learning models. • E-class parameterization for supporting synchronous and asynchronous learning models. • Create Moodle and E-class "Categories" and "Courses". • Adding static learning content in Moodle and E-class platforms. • Adding interactive learning content in Moodle and E-class platforms. • Administration and Maintenance services in Moodle and E-class platforms.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing, laboratories
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Lectures are supported by the use of ICT
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	26
Laboratory Practice	30
Studying	26
Group Exercises	44
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	**Students are evaluated through oral presentation of their final projects.** **Indicative final projects:** • **Implementation of a e-learning website concerning a university course through the utilization of the Moodle platform. The students are expected to incorporate a wide range of diverse Moodle plugins in order to facilitate the various learning and teaching aspects of the selected course.** • **Full from-scratch implementation of a custom plugin for the Moodle platform in PHP:** **o Activity Modules** **o Blocks** **o Themes** **o Course Formats** **o Enrollment Plugins** **o Authentication Plugins** **o Repository Plugins** **o Filters**

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Towards an Intelligent Learning Management System Under Blended Learning, Sofia B. Dias, José A. Diniz, Leontios J. Hadjileontiadis, 2014 Springer Nature
- Τάσος Α. Μικρόπουλος, Ιωάννα Μπέλλου, «Σενάρια διδασκαλίας με υπολογιστή», εκδόσεις: Κλειδάριθμος ΕΠΕ, 1η έκδοση: 2010.
- Christian Depover, Thierry Karsenti, Βασίλης Κόμης, «Διδασκαλία με χρήση της τεχνολογίας: προώθηση της μάθησης, ανάπτυξη ικανοτήτων», εκδόσεις: ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 1η έκδοση: 2010.
- Christopher Holden, et al., “Mobile Media Learning: Innovation and Inspiration”, ETC Press 2015
- A.W. (Tony) Bates, “Teaching in a Digital Age”, 2015, publisher Tony Bates Associates Ltd (e-book)
- Kevin Pitts and Renu Kumar, “Issues in Digital Technology in Education, Publisher: Wikibooks 2011, 2018 (e-book)
- “The Future of Technology Education”, Editors: **Williams**, P John, **Jones**, Alister, **Buntting**, Cathy (Eds.) , 2015

-Related scientific journals:

- Computers & Education
- IEEE on Education
- IEEE Transactions on Learning Technologies
- International Journal of Educational Research

QUEUING THEORY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ72-1		
COURSE TITLE	Queuing theory		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMI???????????		

(2) LEARNING OUTCOMES

Learning Outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.
It is necessary to consult:
APPENDIX A
• *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
• *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*
APPENDIX B
• *Guidelines for writing Learning Outcomes*

The course aims to develop basic skills regarding the modeling and mathematical analysis of systems, emphasizing Information and Communication Technologies (ICT) systems using Queuing theory's theoretical approaches. After the lectures, the students are expected to:

- describe the fundamental features of Queuing theory
- be able to analyze and model, with the appropriate technical tools, queuing systems,
- be able to use relevant system simulation techniques to control the performance and service rates of a system;
- be able to answer practical questions related to Queue Theory, such as 1) how long each customer waits on average in a queue system, 2) What is the average queue length formed 3) what will be the reduction, on average, in the service time of the system if an additional server is added etc.
- be exposed to the modern approaches regarding the analysis and modeling of Queuing systems, both in theory and practice.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Individual/Independent work
- Group/Team work
- Search for, analysis and synthesis of data and information by the use of appropriate technologies

(3) COURSE CONTENT

The course's subject covers the theoretical and practical underpinnings of Queueing Theory, emphasizing on ICT. Topics covered include, among others, single-queue systems, the Markov models M / M / 1, M / M / c, M / M / D, M / M / 1 / K, M / M / 1 / K / K, as well as non-Markov models, such as the M / G / 1 system, systems simulation, etc. The course also offers practical applications of queue theory in telecommunications systems, cloud computing systems, operating systems, and, finally, distributed systems. All the theoretical concepts of Queueing Theory are further supplemented by relevant case studies from the international literature and practice. In more detail, the main elements of this course are:

- Fundamental characteristics of queues, functionality measures, the queue length process, implanted queue length procedures at arrival and departure times, the PASTA property, Little's theorem. Kendall Symbolism.
- Fundamental thought processes and performance measures.

- Markov chain models M / M / 1, M / M / c, M / M / ∞, M / M / 1 / K, M / M / 1 / K / K, open and closed Jackson networks.
- Markovian service systems with special features.
- Reverse stochastic processes. Reversible Markov chains.
- Simulation methodologies (programming languages, result analysis, simulation examples)
- Relevant Systems Modeling Software (Network Simulator, Performance Evaluation and Prediction System, Java Modeling Tools)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of the ICT electronic platform e-class. Theoretical in-class lecturing and group discussions. The main subjects of each module are presented by the instructor: • in the form of lectures supported by visual material • through group discussions and analysis of case studies on real-life business cases.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	20 x 2 = 40
Group discussions	6 x 2 = 12
Self-study	38
Essay writing	35
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written*	Students will demonstrate constructive and critical responses through the final exam and writing assignment. The final exam will cover all of the chapter readings, outside readings, and discussions during the semester. The final exam consists of both multiple-choice and open questions. The final grade consists of 40% of the written assignment and 60% of the final exam grade.

work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography (both Greek and English):

- Α.-Γ. Σταφυλοπάτης και Γ. Σιόλας, "Ανάλυση Επίδοσης Υπολογιστικών Συστημάτων: Αναλυτικά Μοντέλα, Προσομοίωση, Μετρήσεις", Kallipos Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα & Βοηθήματα 2015
- Thomas G. Robertazzi, "Computer Networks and Systems: Queuing Theory and Performance Evaluation", Springer-Verlag, 2012.
- Selection of scientific articles

ENGLISH V

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			SEMESTER 5
COURSE TITLE	English 5		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION:	English
LANGUAGE OF EXAMINATION/ASSESSMENT:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course students:

1. Compose letters, CVs and / or emails for:

-reservations

-enquiries and replies to enquiries for services, prices, etc.

-orders

-credit

-payments and payment recovery

- agencies

-insurances

-banking

-Job finding

2. Understand the terminology regarding the aforementioned units

3. Translate texts from English to Greek and vice versa

4. Recognize important information contained in scientific articles related to their field of study.

5. Use the above mentioned for writing their scientific projects as part of their course requirements.

6. Attend international conferences in cutting-edge fields related to their scientific subject.

7. Process and understand authentic texts on issues related to venture capital, graphic representations, business research, commercial enterprises, small and medium enterprises, payment methods, etc.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

-Development of oral and written speech

-Search, analysis and synthesis of data of scientific content

-Development of critical thinking

-Social, professional and moral responsibility and sensitivity to gender issues.

-Working in an interdisciplinary environment. -Working in an international environment -Research - Intercultural consciousness -Creative and inductive thinking

(3) COURSE CONTENT

-layout of business letters, effective writing styles for letters, scientific papers and electronic messages - translation -terminology of scientific texts -advantages - disadvantages of letters and emails -letter writing etiquette and emails (netiquette) -Authentic interdisciplinary texts and terminology exercises at an advanced level.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face to face, in class lecturing. Under special circumstances: distance education. Interaction, conversations and dialogues. Optional work-presentation.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Presentation with power-point Listening exercises
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.*	

Activity/Method	***Semester workload***
Teaching	3 hours /week x13 weeks=39 hours
Work in groups	1 hour/week x 13 weeks=13 hours
Study	26 hours

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.		
	Total	75 hours

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Written final exams contain: -text comprehension -terminology, multiple choice exercises, matching exercises -Translation from English to Greek and vice versa -Business letter writing -20% bonus from class presentation or 10% from participation in listening exercises

(5) SUGGESTED BIBLIOGRAPHY:

-Online Business Correspondence

-Mormori P., Commercial Correspondence – A Practical Guide: Faedimos

Users.isc.tuc.gr (Lexiko/ Dictionary of IT terms)

6th SEMESTER

SOFTWARE ENGINEERING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ46**		6
COURSE TITLE	Software Engineering		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures – Laboratory Exercises		4+2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	SPECIALTY TRACK (EY) Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/ TMC111/		

(2) LEARNING OUTCOMES

Course Learning Outcomes
Upon successful completion of this course students will be able to: 1. Compiles structured software requirements analysis documents 2. Designs software architectural designs based on modeling languages and diagrams 3. Produces code based on the design stage, which will correspond to the corresponding diagrams

4. Uses the Rational Unified Process software lifecycle model

(3) COURSE CONTENT

General Skills

- Search, analysis and synthesis of data and information, using the necessary technologies
- Autonomous work
- Teamwork
- Project design and management
- Adaptation to new situations
- Promoting creative and inductive thinking
- Production of new research ideas in this field
- Work in an interdisciplinary environment

Basic course content includes:

Contribution of the course to meet the technological requirements:
Students are exposed to modern software modeling techniques, architectural design and the modern UML modeling language

1. Software lifecycle models with emphasis on Rational Unified Process,
2. Modeling languages with emphasis on UML,
3. Software cost budget,
4. Requirements analysis, design, implementation and programming languages,
5. Inspection, maintenance and CASE tools.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In Class and in Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use ICT in Teaching and in Laboratories. Support the learning process through the course's web-site (eclass gunet). Notes and educational material, etc.

COURSE DESIGN

Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the

Activity/Method	*Semester workload*
Lectures	52
Laboratory Exercises	26
Project Case-Study	21
Independent Study	26
Total Course (25 hours per ECTS point)	125

principles of the ECTS.	

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Final Project-Work (group) of total weight 50% on the final grade Written examination of a total weight of 50% on the grade

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography: Object Oriented Software Technology, Maria Virvou, Publisher: Varmar Publications, 2000

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	TMB109		6TH
COURSE TITLE	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures and Practice exercises		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	General Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (in English)		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMB109/		

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course students are expected to: 1. know the basic concepts of Artificial Intelligence (AI) and Expert Systems (ES), 2. be able to identify, describe and represent simple logical problems;

3. develop search algorithms, 4. focus, deepen, distinguish and demonstrate ways of solving problems with selected methods of artificial intelligence (e.g. genetic algorithms, fuzzy logic), 5. design and develop approaches for handling uncertainty and fuzziness in rule based systems; 6. know and identify the semantic networks, as well as apply inferences to them, 7. possess basic knowledge in Machine Learning and Artificial Neural Networks.

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Independent Work • Information Systems Programming	

(3) COURSE CONTENT

• Introductory knowledge of basic concepts in Artificial Intelligence and Expert Systems • Solve problems in selected areas, such as genetic algorithms using artificial intelligence methods • Basic knowledge in Machine Learning and Neural Networks

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In the class
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	The course has a website. Course are taught using a computer and an image projector.

COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching,

Activity/Method	***Semester workload***
Lectures	50
Practice Exercises that focus on program development	30
Independent Study	45

Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*		
	Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	I. Written final exam (100%) that includes solving artificial intelligence problems. II. Optional work to develop an artificial intelligence problem solving program (20% grade).

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Artificial Intelligence I. Vlachavas, P. Kefalas, N. Vassiliadis, F. Kokkoras, I. Sakellariou Publications V. GIOURDA

Artificial Intelligence A Modern Approach RYUSSELL, NORVIG KLIDARITHMOS Publications

Artificial Intelligence: A Textbook, CHARU C. AGGARWAL

- Related scientific journals:

COMPUTER SYSTEMS DESIGN

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLPLH63	**SEMESTER**	6th
COURSE TITLE	COMPUTER SYSTEM DESIGN		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures + Laboratory Exercises		4 + 2 = 6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION:	Greek / Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA112/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, the students:

- will have obtained an in-depth understanding of the design methodology of modern digital circuits
- will be able to design and develop digital circuits using a hardware description language (VHDL)

- will have obtained skills in using modern digital circuit design, simulation and debugging environments
- will be able to apply performance optimization techniques in digital circuits
- will become familiar with the FPGA (reconfigurable) technology
- will have learnt how to design digital circuits using FPGA
- will have been updated about current research issues in the field of digital circuit design

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Individual/Independent work
- Group/Team work
- Introduction of innovative research ideas
- Development of free, creative and inductive thinking
- Project planning and management
- Career prospects

(3) COURSE CONTENT

The course is a continuation of the background course Logig Design of Digital Systems and aims to enhance the students' knowledge in the design of computer (digital) systems.

It focusses on the study of the following topics:

6. Modeling of digital circuits.
7. Introduction to hardware description languages. Digital circuit design using VHDL language.
8. Design of combinational circuits.
9. Design of modern sequential circuits.
10. Design of finite state machines.
11. Memory design.
12. Microprocessor design.
13. Simulation of digital circuits.
14. Synthesis of digital circuits.
15. Design of digital circuits using FPGAs.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	• In-class lecturing • Face-to-face in lab courses
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Support of learning process using e-learning platform (e-class) • Use of electronic material in teaching (slides, exercises, laboratory material) • Use of integrated CAD environment (software) for the design, simulation and debugging of digital circuits in laboratory exercises • Use of educational FPGA development boards in laboratory exercises
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	20 x 2 = 40
Laboratory exercises	12 x 2 = 22
Autonomous study	18
Student projects	25
Essay writing	20
Total (25 hours workload per credit unit)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	I. Written final exam (20%) which includes: - Exercises related to the design of digital circuits using a hardware description language - Questions about the design of digital circuits suing FPGA technology - Questions about the performance of digital circuits II. Four (4) individual medium-level projects which include the design and simulation of digital circuits using CAD tools and the implementation of the circuits using FPGAs (4 x 10%) III. One (1) group high-level project which includes the design and simulation of digital circuits using CAD tools and the implementation of the circuits using FPGAs (40%)

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

1. Circuit design with VHDL, Volnei A. Pedroni
2. Digital design : an embedded systems approach using VHDL, Peter J Ashenden

HIGH SPEED NETWORKS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**PLPLE49**		6
COURSE TITLE	High Speed Networks		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization of general knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	GREEK (& ENGLISH)		
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC121/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

With the successful completion of the course, the student should:

1. Understands the basic principles and concepts of high-speed networks (wired and wireless)
2. It distinguishes high-speed networks from the rest and identifies their key features.

3. It designs a high-speed network consisting of heterogeneous/hybrid networks, crosslayer design.
4. Simulate and manage errors and failures of the high-speed network.
5. Evaluates the operating parameters and performance of a network.
6. It can set up the operation of a network to achieve the desired performance.
7. It can select and compose known networking technologies to create a network with specific operating specifications.
8. Detect new trends in the evolution of computer networks.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Autonomous work
- Teamwork
- Promoting free, creative and inductive thinking
- Search, analysis and synthesis of data, techniques andinformation, using the necessary technologies
- Project planning and management
- Adapt to new situations
- Work in an interdisciplinary and international environment
- Development of algorithmic thinking
- Removal ability in problem modeling

Assessment and realistic treatment of difficulties

(3) COURSE CONTENT

- The aim of the course is to provide students with the necessary knowledge regarding the followingtopics/content::
- Thedevelopment and development of high-speedλών ταχυτήτων όπως και παρουσίαση των πιο πρόσφατων επιστημονικών και τεχνολογικών networks and the presentation of the latest scientific and technological developmentsin the field.
- Concepts and protocols for broadband wired and wireless networks;
- Packet Switching Networks, Optical Networks, xDSL Technologies, IP Networks and Services, Wireless Local Networks, Wireless Broadband Networks, Satellite Communications, Internet of Things (IoT),
- Regulatory Telecommunications Issues.

Contribution of the course to the coverage of professional requirements:

1.Students are introduced to basic principles and architectures of High Speed Networks. 2.Students are introduced to various High Speed Network technologies. 3.Students are introduced to basic concepts of wired and wireless communications technologies and standards, Internet of Things technologies (IoT). 4.Students learn to simulate High Speed Networks and evaluate their findings.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Weekly lectures in class and in the workshop
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use electronic slides in lectures. • Use of computers and network infrastructures during laboratory exercises. • Maintenance of a course website with announcements and provision of teaching material. • Posting scores through Pan's online course management platform. Piraeus. Use email to communicate with students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Teaching - Workshops	74
Preparation of astudy (project)	51
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests,*	Laboratory Exercises - Written Examinations The final grade results 70% from the final examination, 30% from the laboratory exercises.

short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Broadband Networks, I. Venieris,Giola Publications.
- Σύγχρονα τηλεπικοινωνιακά & δικτυακά πρωτοκόλλα, Χ. Δουληγέρης 3/2021 ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΙΚΕ
- Mobile communications systems, Kanatas, Konstantinos, Pantos, PapasotiriOu Publications.
- Satellite Communications, Pratt, Bostian, Allnutt,PapasotiriOu Publications
- Networked Life, Mung Chang,H. Doulgeris, Publications of New Technologies Ltd.
- Provisioning, Recovery, and In-operation Planningin Elastic Optical Networks, Velasco, Wiley ebooks

TELECOMMUNICATIONS, SERVICES AND SYSTEMS PROGRAMMING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**PLPLE91-1**		6
COURSE TITLE	Systems, Telecommunications and Services Programming		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization of general knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	GREEK (& ENGLISH)		
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC119/		

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
With the successful completion of the course students will be able to: 1. Identify the basic concepts of the telecommunications and wireless networks sector.   2. They understand mobile platform architectures.

3. Know Internet of Things (IoT) and Smart Technologies, Game Machines, Sensor Networks, M2M
4. They understand the concepts Of File System and Process.
5. Identify issues with the security of the Operating System and the File System.
6. They perform Requirement Analysis and Software Design.
7. Handle Software Development and Debugging Tools
8. Design and develop AR/AR/VR, VR IoT,smart services
9. They develop fixed computer and mobile applications as well as network applications.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

- Autonomous work
- Teamwork
- Promoting free, creative and inductive thinking
- Search, analysis and synthesis of data, techniques and information, using the necessary techniques
- Project planning and management
- Adapt to new situations
- Working in an interdisciplinary environment
- Derivative of new research ideas
- Work in a wide range of professional organizations/ enterprises/ educational organizations/internet/telecommunications/service providers

(3) COURSE CONTENT

Mobile Communications Platforms, Internet of Things Platforms (IoT) and Smart Technologies, IoT Systems, TCP/Processes, Signals, Introduction Sockets to Sockets Security/VR TCP/IP, Sockets, Server Architectures, Message Queuing, Bark Programming, Software Requirements Analysis and Design, Software Development Tools, Platforms for AR/VR, Games, Sensor Networks, M2M,Operating System Security, File System Security, DoS Issues in Operating Systems, Sockets Security.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Weekly lectures in class and in the workshop
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use electronic slides in lectures. • Use of computers and network infrastructures during laboratory exercises. • Maintenance of a course website with announcements and provision of teaching material. • Posting scores through Pan's online course management platform. Piraeus. Use email to communicate with students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Teaching - Workshops	74
Preparation of astudy (project)	51
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	Laboratory Exercises - Final Laboratory Work.

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- LINUX, ΜΑΡΓΑΡΗΣ ΑΘΑΝΑΣΙΟΣ, 2021 ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- The programming environment, Brian W. Kernighan, Rob Pike,Publications I. Faldamis and EU Co.
- Android Programming 2nd Edition, Deitel Paul, Deitel Harvey, Deitel Abbey,X Editions. Giurda & EU Co.
- IOS for Programmables,4th Edition, Conway Conway Joe, Aaron Hillegas, Keur Christian,X Editions. Giurda & EU Co.
- Learn Unity for Android Game Development, Adam Sinicki, Springer ebooks
- Learn Kotlin for Android Development, Peter Späth, Springer ebooks
- Developing 2D Games with Unity, Jared Halpern, Springer ebooks

DATA ANALYTICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΑΝΑΔΕ01**	**SEMESTER**	6
COURSE TITLE	DATA ANALYTICS		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures, Laboratory hours		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*scientific expertise*		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD104/		

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
upon the successful completion of the course, the students will be able to:

- ✓ Understand topics related to Data Analytics (DA)
- ✓ Apply data preparation techniques for DA purposes
- ✓ Choose among various DA methods, such as clustering and classification, in order to solve DA problems
- ✓ Exploit on the above knowledge, which is required in a Data Scientist's portfolio

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

Search for, analysis and synthesis of data and information by the use of appropriate technologies
Individual/Independent work
Group/Team work
Introduction of innovative research
problem solving

(3) COURSE CONTENT

The course offers knowledge about Data Analytics (DA) methods and techniques. In particular, it covers topics such as:

1. Intro to DA - Data Preprocessing for DA purposes
2. DA algorithms and techniques (classification/prediction, clustering, frequent pattern mining, etc.)
3. Special – advanced topics (image/audio, spatial DA)
4. Hands-on using popular programming languages for DA purposes (R, Python)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in-class lecturing

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT in teaching, laboratory education, communication with students, etc. (e-class platform)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	25
Laboratory practice	15
team-work	50
independent (self) study	35
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Project assignment with face-to-face presentation; 100% The evaluation criteria are stated and they are accessible to the students via the e-class platform.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Dunham M. “Data Mining – Εισαγωγικά και Προηγμένα Θέματα Εξόρυξης Γνώσης από Δεδομένα”. Εκδόσεις Νέων Τεχνολογιών, 2004.
- Tan PM, Steinbach M, Kumar V. “Εισαγωγή στην Εξόρυξη Δεδομένων”. Εκδόσεις Τζιόλα, 2017.
- ΕΞΟΡΥΞΗ ΚΑΙ ΑΝΑΛΥΣΗ ΔΕΔΟΜΕΝΩΝ: ΒΑΣΙΚΕΣ ΕΝΝΟΙΕΣ ΚΑΙ ΑΛΓΟΡΙΘΜΟΙ, ZAKI M.J., MEIRA W.JR., 2017 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ
- Μανωλόπουλος Ι., Νανόπουλος Αλ. “Εισαγωγή στην Εξόρυξη Δεδομένων και τις Αποθήκες Δεδομένων”. Εκδόσεις Νέων Τεχνολογιών, 2009.

SYSTEMIC ANALYSIS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ69-1**	**SEMESTER**	**6**
COURSE TITLE	SYSTEMIC ANALYSIS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	13 weeks x 4 hours/week	5
Laboratories	4 weeks x 2 hours/week	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC116/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. Know and understand basic properties that characterize systems
2. Identify and understand the concepts of Systemic Analysis
3. Analyze Systems identifying ways of change and utilizing the content of Applied Systems

Theory 4. Define and recognize the Systems by type, as well as the meaning of a Metasystem 5. Understand the use of Systemic Methodologies 6. Distinguish the appropriate methodology for each type of Systems 7. Deepen in the content and applications of Systemic Methodologies and Multimethologies for the development of information systems 8. Familiarize with the creation of Systems Analysis models 9. Achieve distinction of dynamic systemic levels 10. Focus on applications within a real work environment using relevant software 11. Practice in the implementation of remote systems analysis management

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
6. Search for, analysis and synthesis of data and information by the use of appropriate technologies 7. Individual/Independent work 8. Group/Team work	

(3) COURSE CONTENT

Basic Concepts of Systemic Thinking in Systems Analysis. Systemic Approach to Systems Analysis (A. Introduction to Ways of Change, B. Applied Systems Theory). Οργανωτική Κυβερνητική Συστημάτων.??? Strategic Hypothesis, System Configuration and Testing Methodology. Interactive Systems Design Methodology. Soft Systems Methodology. Critical System Heuristics. The Metasystem Approach to Systems Analysis. The Systems and Metasystem Design and Control Methodology (DCSYM) in Systems Analysis and its applications in Strategic and Process Analysis environments. Total Systems Intervention. Introduction to Multi-Systems Approach methodologies. STIMEVIS: Structured total systems intervention systemic multi-methodology of viable systems and metasystems. Use of Systemic Methodologies and / or Multi-Methodologies in the Development of Information Systems. Software Training: DCSYM Case Tool and VSMod. The Webex platform in remote systems analysis management. Mandatory Work per student using the DCSYM Case Tool or VSMod Software in a real System Development environment. Professional real applications of systemic methodologies for the approach and operation of processes.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face / In a webex class
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized System Analysis software (DCSYM Case Tool, VSMod) Support of the learning process and teaching through a eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures/Labs	40
Team assignment in System Dynamics	40
Independent study	45
Additional activities: Presentations of relevant software regarding systemic methodologies.	
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	1. Oral final exam (60%) that includes the theory and questions regarding usage of the DCSYM Case Tool and VSMod software. The oral examination of the course is on the curriculum and on the compulsory individual assignment 2. Programming work (40%) prepared in a systemic analysis software environment Students always have access to their assessed assignments and their type of assessment.

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

There are notes and slides of the course and the laboratory on the website of the course.

DECISION SUPPORT SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			
COURSE TITLE	DECISION SUPPORT SYSTEMS		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	BACKGROUND KNOWLEDGE		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	GREEK		
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC131/index.php		

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
Upon successful completion of the course the student will be able to: • Recognize the structured aspects of semi-structured decision problems that can be partially modeled mathematically.   • Identify the basic techniques of multi-criteria decision analysis and apply them to problems

whose semi-structured nature is due to the existence of multiple and conflicting criteria for evaluating alternatives. • Identify analytical data-driven decision support models • Understand the Data Envelopment Analysis (DEA) method in the frame of measurement of the performance of decision-making units. • Use appropriate software to solve linear programs and interpret the results.

General Competences
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim? *Search for, analysis and synthesis of data and information by the use of appropriate technologies,* *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research* *Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Analysis and synthesis of concepts, data and information using ICT • Project design and management • Problem assessment and exploratory ability to search for appropriate management techniques • Ability to elaborate and draw conclusions • Production of new research ideas • Decision making and problem solving • Autonomous work • Critical, creative, inductive thinking • Possibility of scientific specialization and increase of research production • Work in international and interdisciplinary environments • Professional access to any kind of organization / business

(3) COURSE CONTENT

The course focuses on typical decision support methods and techniques that form the basis for the development of analytical models that can be integrated into decision support information systems. • Introductory concepts, decision, decision problem, criteria, consistent family of criteria, characteristics of a set of alternative decisions, problematic. • Introduction to decision support systems, architecture, development methodologies. • Analytical preference-oriented and data-oriented decision support models. • Methods and techniques of multi-criteria decision analysis. The method of analytical hierarchy. • Data envelopment analysis as a method of performance measurement.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	IN-CLASS LECTURING
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Special software for data envelopment analysis Learning process support through the platform e-class
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	30
Study	70
Essay writing	25
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Two individual essays (50%+50%)

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography: *ΣΥΣΤΗΜΑΤΑ ΥΠΟΣΤΗΡΙΞΗΣ ΟΜΑΔΩΝ, Δ. ΑΠΟΣΤΟΛΟΥ, 2018 Εκδόσεις ΜΑΡΚΕΛΛΑ Ι ΒΑΡΒΑΡΗΓΟΥ* *ΜΟΝΤΕΛΑ ΑΠΟΦΑΣΕΩΝ, ΣΙΣΚΟΣ Ι., 2008 ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΜΟΝ. ΕΠΕ* *ΣΥΣΤΗΜΑΤΑ ΥΠΟΣΤΗΡΙΞΗΣ ΑΠΟΦΑΣΕΩΝ, ΜΑΤΣΑΤΣΙΝΗΣ Ν., 2010 ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΜΟΝ. ΕΠΕΔ. Δεσπότης, Σημειώσεις*

MULTIMEDIA SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΠΛΗ-48		6th
COURSE TITLE	Multimedia Systems		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, skills development
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek/English
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC108/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

With the successful completion of the course, the student will:

- Possess advanced knowledge regarding algorithms, techniques and methods for digital content creation, compression and networking, including lossless/lossy compression of images/audio/video/graphics (JPEG, JPEG2000, MPEG-4), wireless networking (e.g., Bluetooth) and

digital rights management (e.g., DRM solutions for the music industry).
- Understand how digital signal processing theory, color theory, psychoacoustics, information theory, compression and networking are combined to create and operate multimedia systems.
- Possess the skills to analyze real world problems (involving open-source data), for which it is required to design/develop/implement systems that process/analyze multimedia content, conduct feasibility studies, select the appropriate algorithms/techniques and assess/compare the effectiveness of competing solutions.
- Deal with the computational burden and complexity imposed by data stemming from real-world problems in a team environment.
- Possess advanced Python/Matlab/GNU Octave programming skills for the implementation of algorithms, techniques and methods for the processing of multimedia content.
- Identify and re-use existing open-source implementations related to multimedia content processing, like the ffmpeg library of functions.
- Identify concepts related to multimedia content processing in the neighboring fields of Signal Processing, Information Theory, Data Compression and Data Networking.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analyze and combine data and information via using appropriate technologies.
- Individual work
- Teamwork
- Design and implement projects
- Critical thinking, creative thinking and inference
- Adapting to new situations
- Collaborative spirit and communication skills
- Stress and workload management
- Combinatorial thinking and ability to estimate risk
- Problem solving
- Decision making
- Possibility to work in an interdisciplinary professional environment (e.g., a business environment)

(3) COURSE CONTENT

The Multimedia Systems course deals with a scientific field in which several different scientific disciplines meet and interoperate, including the disciplines of signal processing, information theory and communications. Therefore, the goal is to develop solutions for the effective creation, storage/compression and distribution of multimedia content. As a consequence, this course aims at presenting in a unified way the diverse concepts of multimedia processing, the nature of problems that multimedia content

design is expected to solve and the most important multimedia content digitization, compression and networking techniques. The contents of the course are split into four parts, namely: Multimedia Content Creation, Multimedia Content Compression, Multimedia Content Networking and Contemporary Trends. Each part consists of one or more teaching sections and can taught over one or more lectures. **Part I: Multimedia content creation** Section 1: Introduction to Multimedia Systems – Past, Present and Future Section 2: Digital content creation Section 3: Media Representation and Formats Section 4: Color theory **Part II: Multimedia content compression** Section 5: Compression overview Section 6: Image compression Section 7: Video compression Section8: Audio compression Section 9: Graphics compression **Part II: Multimedia content networking** Section 10: Wired and Wireless Networking Section 11: Digital Rights Management **Part IV: Contemporary trends** Section 12: MPEG-4, Multimedia Databases, Information Retrieval and Multimedia Frameworks.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized software in Python/Matlab/GNU Octave is used by the teacher in the class to present, demonstrate and compare selected algorithms. The students use the same software to implement their project assignments. Communication is supported by a e-class platform.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	30
Project assignment to teams of students asking for the design and implementation of a multimedia system.	45
Individual study	50
Total (25 workload units per credit unit)	**125**

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	3. Written exams at the end of the semester (70% of the total grading score), including exercises that challenge the student's understanding of the theory that they have been taught, e.g., exercises

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	related to sampling theory/content creation and to compression algorithms for image, audio and video content. 4. Programming assignment delivered at the end of the semester (30% of the total grading score) by teams of at most three students. The project assignment is about the development and evaluation of a multimedia system in Python/Matlab/GNU Octave that processes open-source data. The project outcome is delivered via e-mail or the e-class platform and consists of software code and respective documentation, where all design choices and evaluation outcomes are documented.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

[1] Parag Havaldar καιGérard Medioni, 2011, Multimedia Systems: Algorithms, Standards and Industry Practices, Parag Havaldar και Gérard Medioni, Course Technology, 2009 (distributed to students).

- Related scientific journals

IEEE Transactions on Multimedia, IEEE Transactions on Circuits and Systems for Video Technology, Multimedia Tools and Applications.

NATURAL LANGUAGE PROCESSING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΡΠΛΗ24-01**	**SEMESTER**	**6**
COURSE TITLE	NATURAL LANGUAGE PROCESSING		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching and examples	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC113/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. understand the structure of a natural language processing system.
2. understand the concepts of speech production, speech analysis and automatic translation.
3. recognize and evaluate when a natural language processing system is necessary

4. develop algorithms for lexical, syntax and semantic analysis and knowledge extraction

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
1. Search for, analysis and synthesis of data and information by the use of appropriate technologies 2. Adapting to new situations 3. Decision-making 4. Group/Team work 5. Introduction of innovative research 6. Development of free, creative and inductive thinking 7. Working in national and international environments	

(3) COURSE CONTENT

The course contains the following: 1. Introduction to Natural Language Processing 2. Levels of Natural Language Analysis (Phonological, Morphological, Syntactic, Semantic, Pragmatic) 3. Grammars – Lexical and Syntactic Analysts for Natural Language 4. Semantic Analysis and Knowledge extraction from texts 5. Questions and answers in natural language 6. Application development

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory*	

Activity/Method	***Semester workload***
Lectures	26
Algorithm and system development in class	26
Independent study	30

practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	Team project for specific case study	43
	Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Presentation of Teamwork of 2-3 people Evaluation criteria: Quality of report Quality of Powerpoint presentation Application complexity Innovation in approach

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
   Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, and Edward Loper, http://www.nltk.org/book/

   Handbook of Natural Language Processing (Chapman & Hall/CRC: Machine Learning & Pattern Recog-nition) 2nd Edition by Nitin Indurkhya (Editor), Fred J. Damerau (Editor)

2. Related scientific journals:

BIOINFORMATICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΒΙΟΠ-01	Semester	6th
COURSE TITLE	Bioinformatics		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	http://gunet2.cs.unipi.gr/course/TMC126/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Understand and explain the main Bioinformatics objectives
- Understand the functionality of popular molecular databases and genome browsers an use diverse internet resources for sets of genes and proteins, with an emphasis on the NCBI portal

functionality.

- Use scoring matrices, understand dynamic programming concepts and perform sequence alignment operations on DNA and protein sequences using the Needleman-Wunsch and Smith-Waterman algorithms.
- Understand the BLAST method, interpret BLAST results and perform BLAST searches on the NCBI portal.
- Understand position scoring matrices and Hidden Markov modeling.
- Understand and explain the main stages of multiple sequence alignment and conduct comparative alignment studies.
- Understand and explain the molecular clock hypothesis, define positive and negative selection, and understand different types of phylogenetic trees.
- Understand basic type of repeating DNA elements along with the respective analysis procedures.
- Understand fundamental concepts related to next-generation sequencing technology.
- Describe the main RNA categories.
- Understand steady-state RNA measurement techniques.
- Explain rotein analysis and proteomics.
- Possess Python/Matlab/GNU Octave programming skills to implement bioinformatics algorithms.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analyze and combine data and information using appropriate technologies.
- Individual work
- Teamwork
- Design and implement projects
- Critical thinking, creative thinking and inference
- Adapting to new situations
- Collaborative spirit and communication skills
- Stress and workload management
- Combinatorial thinking and ability to estimate risk
- Problem solving
- Decision making
- Possibility to work in an interdisciplinary professional environment (e.g., a business environment)

(3) COURSE CONTENT

The field of Bioinformatics is where different scientific disciplines collaborate to develop algorithms and statistical methods for the analysis and understanding of large collection of biological data, including sequences of nucleotides, amin acids and protein structures, as well as the phylogenetics of

organisms. During the last decade, the science of Bioinformatics has designed and implemented tools that allow for the processing and analysis of diverse information sources related to the functionality of cells. Therefore, the main objective of this course is to provide fundamental knowledge in the field of Bioinformatics regarding the aforementioned problems and tasks and set the knowledge foundation for the students who wish to pursue a career in the field. In addition to taught theory, the course also evolves over an applied dimension that uses publicly available data, so that the students become familiar with concepts and algorithms from a practical perspective. The course is split over twelve sections and each section can be taught over one or more lectures: **Section 1:** Introduction to Bioinformatics **Section 2:** Access to Sequence Data and Literature Information **Section 3:** Pairwise Sequence Alignment **Section 4:** Basic Local Alignment Search Tool **Section 5:** Advance Database Searching **Section 6:** Multiple Sequence Alignment **Section 7:** Molecular Phylogeny and Evolution **Section 8:** DNA - eukaryotic chromosome **Section 9:** Analysis of next-generation sequencing data **Section 10:** Bioinformatics approaches to RNA **Section 11:** Gene Expression: Microarray Data Analysis **Section 12:** Protein Analysis and Proteomics

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized software in Python/Matlab/GNU Octave is used by the teacher in the class to present, demonstrate and compare selected algorithms. The students use the same software to implement their project assignments. Communication is supported by a e-class platform.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see table below)

Activity/Method	***Semester workload***
Lectures	30
Project assignment to teams of students asking for the study of molecular sequences	45
Individual study	50
Total (25 workload units per credit unit)	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	Programming assignment delivered at the end of the semester (1000% of the total grading score) by teams of at most three students. The project assignment is a study of DNA/RNA sequences and proteins using Python/Matlab/GNU Octave/web-based tools and open-

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	source data from the NCBI portal. The project outcome is delivered via e-mail or the e-class platform and consists of software code and respective documentation, where all design choices and evaluation outcomes are documented.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

[1] Jonathan Pevsner, Bioinformatics and Functional Genomics, 3d edition, Wiley-Blackwell, 2015.

[2] Neil C. Jones, Pavel A. Pevsner, Introduction to Bioinformatics Algorithms, 2004 MIT Press.

[3] A. Baxevanis, B.F. Ouellette, Bioinformatics, 2nd Edition, 2012.

DIDACTICS OF INFORMATICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΔΙΔΠΛ01**	**SEMESTER**	6th
COURSE TITLE	Didactics of Informatics		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD142/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course the student is expected to be able to:

- organize his/her teaching approach by detecting the students' level and presenting the unit's concepts using techniques that include models of exploratory learning and collaborative teaching,

- compose activities suitable for the students’ familiarization with basic algorithmic control structures and data structures,
- look for learning objects available online on respective digital repositories and incorporate them in the teaching process as elements of visualization, simulation, investigation, experimentation etc.,
- look for educational/learning scenarios kai teaching practices deemed as optimal as well as structure his/hers own,
- evaluate his/her students and his/her teaching approach by applying appropriate research tools and quantitative indicators.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Individual/Independent work
Group/Team work
Teaching planning
Didactic proficiency
Critical / creative thinking
Adapting to new situations
Social, professional and ethical responsibility and sensitivity to gender issues
Respect for diversity and multiculturalism

(3) COURSE CONTENT

In this course, we focus on Informatics as a teaching subject. We present examples of application of algorithmic thinking and programming to other disciplines. We discuss a chronology of the introduction of the subject to various levels of education in Greece, along with the relevant learning theories.

In the main part of the course, we address the Didactics of Informatics both on hardware and software level, stressing the importance of educational software development. We explore common students’ misconceptions, as they are presented in international research programs, ranging from computer architecture, to the concept of programming variable, to control flow statements, to data structures, to sub-routines, to typical solvable problems, etc.

We attempt a number of simulated teachings in selected topics, emphasizing on teaching organization spanning several typical time scales (45 min period, semester, school year). We develop techniques for composing activities aiming to rectify misconceptions, using alternative teaching approaches, incorporating learning objects for personalized teaching, etc.

TOPICS:

1. Historical background
2. Didactic of Informatics in Preschool Education
3. Examples of educational software
4. Didactic of Informatics in Primary Education

5. Informatics as an interdisciplinary tool: Programming in Excel for simulation – visualization of concepts in Physics, Chemistry, and Mathematics.
6. Didactic of Informatics in Secondary Education
7. Algorithmic logic in the study of physical phenomena by using and (mainly) developing simulation software
8. Introduction to didactics
9. Teaching techniques
10. Learning theories in education
11. Bloom's taxonomy
12. Design of teaching approach
13. Gagné's Theory
14. The concept of programming variables
15. Didactics of control flow statements (conditionals)
16. Didactics of control flow statements (loops)
17. Didactics of data structures
18. Didactics of sub-routines
19. Didactic approaches on programming
20. Learning object repositories
21. Educational scenario repositories
22. Educational robotics
23. Online research
24. Conceptual maps in education

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT, use of simulation and visualization software
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see table below)

Activity/Method	***Semester workload***
Lectures	28
Teaching simulations	12
Teaching demonstrations	6
Educational scenario development	3
Self-study	48
Learning object development	16
Design of teaching approach	12
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	1. Written examination consisting of: a. Multiple choice tests (5%) b. Fill-In-The-Blank questions (5%) c. Short-answer questions (5%) d. Case study (45%) 2. Presentation (40%)

(5) SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:

- *Nikolaos Alexandris, Basilios Belesiotis, Evagelos Fountas, Didactics of informatics, Barbarigou publ., 2011*
- *Maria Grigoriadou et.al, Teaching approaches and tools on the didactics of informatics, New Technologies publ., 2009*
- *Vasilis Komis, Didactics of informatics, an introduction, Klidarithmos publ., 2008*
- *Vasilios Dagdilelis, Kaliopi Pavlopoulou, Panagiota Triga, DIDACTICS – Methods and applications, Benou publ., 1998*
- *ΔΙΔΑΚΤΙΚΗ ΤΗΣ ΠΛΗΡΟΦΟΡΙΚΗΣ, Τύπος: Ηλεκτρονικό Βιβλίο, ΣΤΥΛΙΑΡΑΣ ΓΕΩΡΓΙΟΣ,ΔΗΜΟΥ ΒΙΚΤΩΡΙΑ, 2016*

SECURITY GOVERNANCE

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΔΑΣ01**	Semester	6
COURSE TITLE	Security Governance		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD116/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Know methods and tools to identify vulnerabilities
- Determine possible vulnerabilities in an information system
- Understand common vulnerabilities of information systems and applications
- Identify possible attacks through log file analysis
- Examine and assess the security issues of a process of an organisation
- Identify and classify the methodologies of risk analysis
- Design and implement a security policy in an organisation

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Search for, analysis and synthesis of data and information by the use of appropriate technologies,

Group/Team work

Introduction of innovative research

Project planning and management

Critical thinking

Development of free, creative and inductive thinking

Foresee and predict possible threats and security issues

Assess of alternative mitigation methods

Problem solving

Working in an international environment

Working in an interdisciplinary environment

Expand of work possibilities in various environments (public/private organisations, companis, software houses, financial institutions etc.)

(3) COURSE CONTENT

The main objective of this course is to enable students to assess the security that is offered by an information system as well as the quality of the security that is offered from the application of processes of an organisation. More precisely, we will analyse the following: • Common vulnerabilities of systems and applicatons. • Methods and tools to discover vulnerabilities of apps and systems • Exploitation & persistence • Digital forensics • Information risk analysis • Security plans, policies and processes. • Regulatory framework and security standards • Continuity and recovery plans

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of specialised software tools to identify vulnerabilities • Use of presentations and interactive board during lectures • Use of computer for development • Use of computers in the lab for development of programs and debuging • Web page update, news updates and offer of additional content (presentations, notes, code snippets) • Use institutional platform to submit grades • Use email and GUNET for communicating with the students
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	13*4=52
Lab practice	11*2=22
Project	15
Study hours	36
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	***laboratory work***

(5) SUGGESTED BIBLIOGRAPHY:

- Ασφάλεια Πληροφοριών & Συστημάτων στον Κυβερνοχώρο, Σωκράτης Κάτσικας, Στέφανος Γκρίτζαλης, Κωνσταντίνος Λαμπρινουδάκης, 1η 2020 ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΙΔΙΩΤΙΚΗ ΚΕΦΑΛΑΙΟΥΧΙΚΗ ΕΤΑΙΡΕΙΑ
- Port Cybersecurity Securing Critical Information Infrastructures and Supply Chains (eBook ISBN: 9780128118191 Paperback ISBN: 9780128118184), Nineta Polemi, 1η/2017 Elsevier
- TJ O'Connor, Violent Python: A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineers
-
- David Kennedy, Metasploit: The Penetration Tester's Guide
- Thomas Wilhelm, Professional Penetration Testing: Creating and Learning in a Hacking Lab
- Jon Erickson, Hacking: The Art of Exploitation
- Κρυπτογραφία για Ασφάλεια Δικτύων Αρχές και Εφαρμογές, Stallings
- ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΑΣΦΑΛΕΙΑΣ ΔΙΚΤΥΩΝ: ΕΦΑΡΜΟΓΕΣ ΚΑΙ ΠΡΟΤΥΠΑ, WILLIAM STALLINGSJon Erickson, Hacking: The Art of Exploitation
- Κρυπτογραφία για Ασφάλεια Δικτύων Αρχές και Εφαρμογές, Stallings
- ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΑΣΦΑΛΕΙΑΣ ΔΙΚΤΥΩΝ: ΕΦΑΡΜΟΓΕΣ ΚΑΙ ΠΡΟΤΥΠΑ, WILLIAM STALLINGS

INTELLIGENT SOCIAL NETWORKS INTERACTION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			6th
COURSE TITLE	Intelligent Interaction with Social Networks		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures - Laboratories		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/ TMF155/		

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
By completing this course, students are expected to: • Obtain a deep understanding of the graph-theoretical representation of social networks   • Obtain a deep understanding of the statistical properties of social networks that emerge from their graph-theoretical representation.

- Analyze and determine the structural information contained within a social network.
- Develop semi-supervised learning algorithms for node classification in social networks.
- Develop algorithms for the computation of graph-theoretic node centrality measures in digital social networks.
- Develop algorithms for community detection in social networks.
- Develop algorithms for the extraction of the connected components of a social network.
- Analyze the textual information conveyed within a digital social network through the utilization of Corpus Vectorization, Topic Modelling and Sentiment Analysis Algorithms.
- Obtain a deeper understanding of algorithmic mechanisms for the generation of artificial networks.
- Perform algorithmic analysis of co-authorship networks.
- Obtain a deeper understanding of information diffusion models in social networks.
- Understand the fundamental concepts of opinion formation models in social networks.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Adapting to new situations
- Individual/Independent work
- Group/Team work
- Project planning and management
- Problem solving
- Work in an international environment

(3) COURSE CONTENT

This course focuses on presenting a unified algorithmic framework for addressing the problems that emerge within the context social network analysis. In particular, the learning outcomes of this course concentrate on developing algorithmic mechanisms for analyzing a wide spectrum of data modalities that are interchanged within online social networks such as textual data, multimedia data or data that represent the structural organization of the digital social media.

Indicative teaching and learning outcomes:

- Graph-theoretical representation of social networks.
- Statistical properties of social networks emerging from their graph-theoretical representation.
- Community Detection & Community Evolution Tracking in social networks.
- Node Classification Algorithms in Social Networks.
- Link Prediction in Social Networks.
- Keyword filtering using the streaming API of Twitter.
- Text Mining
- Topic Modelling
- Sentiment Analysis

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing, laboratories
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Lectures are supported by the use of ICT
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	***Semester workload***
Lectures	26
Laboratory Practice	30
Studying	26
Group Exercises	43
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	**Students are evaluated through oral presentation of their final projects. The final project for this course concerns the development of link prediction algorithms in social networks.**

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- ΕΠΙΣΤΗΜΗ ΔΙΚΤΥΩΝ, ALBERT LASZLO BARABASI, 2022
- Newman, Mark. Networks. Oxford university press, 2018.

SOFTWARE DESIGN PATTERNS

COURSE OUTLINE

(1) GENERAL

SCHOOL	INFORMATION TECHNOLOGIES AND COMMUNICATIONS		
DEPARTMENT	INFORMATICS		
COURSE LEVEL	UNDERGRADUATE		
COURSE CODE	**ΠΛΠΡΑΝΑΛ01**	**COURSE SEMESTER**	**6**
COURSE TITLE	**SOFTWARE DESIGN PATTERNS**		

TEACHING ACTIVITIES	**TEACHING HOURS PER WEEK**	**ECTS**
INSTRUCTION – LAB EXERCISES	4+2	5

COURSE TYPE	SPECIALTY TRACK (EY), Developing Skills (ΑΔ) SOFTWARE ENGINEERING AND INTELLIGENT SYSTEMS TRACK
EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:	
TEACHING AND EXAMINATIONSLANGUAGE::	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEB PAGE (URL)	http://gunet2.cs.unipi.gr/courses/TMC135/

(2) COURSE LEARNING OBJECTIVES

COURSE LEARNING OBJECTIVES

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

Guidelines for writing Learning Outcomes
Upon successful completion of this course students will be able to: 1. Explain and apply advanced object-oriented software design principles (π. χ. single responsibility, open-closed κλπ) 2. Create source code following a software design pattern 3. Critically analyze source code and refactor it based on software design patterns 4. Distinguish and develop solutions to recurring software development problems using software patterns and principles. Contribution of the course to the coverage of technological requirements: 1. Students are exposed to modern efficient source code design techniques for effective software 2. Students learn effective development and reorganization techniques for increased efficiency 3. Students learn to evaluate and identify software cases where a software development template is required

(3) COURSE CONTENT

General Skills
1. Standalone-Autonomoys work 2. Teamwork 3. Project planning and management 4. Adapt to new situations
The course is about the theoretical study and practical development training in the design of efficient software, manageable source code and the use of software design standards that facilitate the evolution, reuse and efficiency of software applications. It is based on the concept of software design patterns that are the "example" of best practice in the implementation approach to a recurring system and logic programming problem. The course includes the presentation of software patterns with the aim of laying the foundations for higher level programming performance and skills. The most popular software design patterns of Singleton, Builder, Visitor, Prototype, Factory, and AbstractFactory, which are also known as the gang of four, are presented and practiced in the popular, efficient and effective programming in both object-oriented and other programming languages requires the knowledge and application of standards in software development. In addition, the practical improvement of existing code is being practiced by applying advanced software design principles. 1. Necessity of Classes 2. Associations between classes and UML 3. Polymorphism & Principle of Integration 4. Principle of Low Coupling & Advanced Software Design Principles 5. Principle of Unique Competence & Open-Closed Design Principle 6. Liskov Substitution Principle & Principle of Inversion of Dependencies 7. Principle of Separation of Interconnections 8. Apply principles to Software Design Standards 9. Adapter & Composite & Bridge 10. Unit & Visitor & Observer

11.	Factory
12.	Redesign, Rebuild, Reproduce
13.	Applications for software version control systems
14.	Methodological analysis of software case study
15.	Introduction to flexible software development methodologies and standards

(4) TEACHING AND LEARNING METHODS - ASSESSMENT

MODES OF DELIVERY Face-to-face, in-class lecturing, distance teaching and distance learning etc.	In Class and in Laboratory (Face to Face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, Laboratory* *Education, Communication with students*	**Use ICT in Teaching.** **Support the learning process through the course's website (eclass gunet). Notes and educational material, etc.**
COURSE DESIGN Description of teaching techniques, practices, and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.	see table below
STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS Detailed description of the evaluation procedures: Language of evaluation, assessment methods, formative or	Presentation of Software Implementation Work in a Laboratory Environment with Computer & Oral Examination (100%) Bonus Extra individual exercises during the semester: 10% Presentation language: Greek

Δραστηριότητα	*Φόρτος Εργασίας Εξαμήνου*
Lectures	52
Laboratory Exercises	26
Project-Case Study	21
Independent Study	26
Total Course (25 hours per ECTS point)	125

summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc. Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	The assessment method is communicated to the students at the beginning of the semester through the systems of the department (eclass)

(5) SUGGESTED BIBLIOGRAPHY

Chadjigeorgiou Object-oriented design with UML, principles, standards and heuristic rules, Kleidarithmos Publications

- Electronic bibliography available to users connected through the Academic network:

Beginning SOLID Principles and Design Patterns for ASP.NET Developers, Eudoxus No: 75482278, https://link.springer.com/book/10.1007%2F978-1-4842-1848-8

Practical Python Design Patterns, Eudoxus No

: 75490854, https://link.springer.com/book/10.1007%2F978-1-4842-2680-3

PARALLEL COMPUTING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΡΑΝ01**		
COURSE TITLE	Parallel Computing		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development		
PREREQUISITE COURSES:	The course requires knowledge from the following courses: “Introduction to Programming”, “Data Structures”, “Algo-rithms”, “Computer Architecture”, “Operating Systems”		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/......		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. Distinguish among the different categories of Parallel Systems and evaluate their advantages and disadvantages
2. Evaluate the performance of a parallel application using appropriate tools and appropriate

performance metrics
3. Create new algorithms for the parallel computer systems being studied
4. Describe what a critical section, mutual exclusion, a semaphore and atomic instructions are
5. Distinguish when mutual exclusion is required in parts of a parallel application
6. Describe mutual exclusion implementation algorithms
7. Distinguish in what kind of parallel architecture a specific programming model can be used
8. Develop a parallel application using any of the programming models POSIX Threads, OpenMP, MPI and a programming model for graphics cards (GPU)
9. Distinguish between different types of data dependencies and the effect they have on parallelization
10. Explain what vectorization is and what benefits it offers
11. Explain parallel algorithms for implementing basic data structures
12. Distinguish which data structures should be used on a case-by-case basis to achieve high performance in a parallel program
13. Describe the architecture of GPUs
14. Describe programming models for GPU programming
15. Describe performance optimization techniques for parallel applications

Upon completion of the course, students will have developed the following skills:

1. They will be able to identify the parts of a serial application that have increased chances of achieving better performance when parallelized
2. They will be able to develop a parallel application using the appropriate algorithms, tools and programming models for the computer system in use
3. They will be able to evaluate the performance of the parallel application they use or have created
4. They will be able to identify parts of parallel application that can be optimized
5. They will be able to apply techniques to optimize performance at these parts
6. They will be able to design new parallel algorithms for the computer system in use

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Adapting to new situations
3. Decision-making
4. Group/Team work
5. Development of free, creative and inductive thinking

(3) COURSE CONTENT

1. Introduction to the concepts of Parallel Computing
2. Classification of Parallel Computing Systems
    a. Flynn's taxonomy
    b. Classification based on memory
3. Performance metrics

4. Mutual exclusion – Semaphores – Atomic instructions
    a. Implementation algorithms
5. Programming models for parallel architectures
    a. Threads - The POSIX Threads programming model
    b. The OpenMP programming model
    c. The MPI programming model
    d. Mapping of parallel algorithms to programming models
6. Data dependencies – Vectorization
7. Data structures for Parallel Computing
8. Co-processors
    a. GPU architecture
    b. Programming models for GPU programming
    c. Mapping of parallel algorithms on GPUs

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching and laboratories • Support of the learning process and teaching through a eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	52
Independent study	26
Team projects	47
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative*	1. Language of evaluation: Greek 2. Laboratory exercises: The work requires the application of parallel programming techniques, optimization, performance analysis and application of performance metrics

(conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

3. Suggested bibliography:
   - Slides for the course (available on gunet2).
   - An Introduction to Parallel Programming. Peter S. Pacheco, Morgan Kaufmann, 2011.
   - Προγραμματισμός και Αρχιτεκτονική Συστημάτων Παράλληλης Επεξεργασίας. Στυλιανός Παπαδάκης, Κωνσταντίνος Διαμαντάρας, Εκδόσεις Κλειδάριθμος, 2012.
   - Παράλληλα συστήματα και προγραμματισμός, Βασίλειος Δημακόπουλος, 2017.
   - Programming Massively Parallel Processors, 3rd Edition. David B. Kirk, Wen-mei W. Hu, Morgan Kaufmann, 2016.

4. Related scientific journals:
   - IEEE Transactions on Parallel and Distributed Systems
   - ACM Transactions on Parallel Computing
   - International Journal of Parallel Programming
   - Journal of Parallel and Distributed Computing
   - Parallel Computing

ENGLISH VI

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			6th
COURSE TITLE	ENGLISH 6		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	3
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*			
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	English		
LANGUAGE OF EXAMINATION/ASSESSMENT:	English		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

After the successful completion of the course the students:

- understand and process texts and terminology of academic and professional context

- Write summaries of extended texts

- Manage oral discourse, deliver public speeches, or lectures and present oral texts of interdisciplinary content (including Informatics)

- translate to and from English specific terminology through scientific articles and texts

- identify and utilize fundamental theories and empirical data through a variety of bibliographic databases

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

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

-Ease of attending and participating in seminars, lectures, workshops

-Participation in workshops and collaborative spirit

Autonomous work

-Teamwork

-Social, professional and moral responsibility

-Critical, creative and inductive thinking

-Working in an international environment

-Communication flexibility

(3) COURSE CONTENT

-Presentation and elaboration of advanced level texts with topics of various scientific areas that are combined and supported by the applications of Informatics Science (eg Statistics, Games and Internet, Financial issues of Financial Institutions and International Organizations).

-Translation of original texts of scientific interest

- Watching TED talks on Hackers, Electronic Games, Mathematics, IT, and similar topics

-Translation

-Scientific terminology

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Teaching in class Practice focusing on the analysis and terminology to groups of students
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Teaching support by: Presentation with power-point Listening exercises
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see workload table below)

Activity/Method	***Semester workload***
Teaching	3hours per week x 13=39
Work in groups	1 hour/week x13 weeks=13 hours
Study	26 hours
Total	75 hours

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	Written final exams containing: -text comprehension -terminology, multiple choice exercises -translation from English to Greek and vice versa

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	--20% bonus from class presentation or 10% from participation in listening exercises

(5) SUGGESTED BIBLIOGRAPHY:

_Reading and Writing English for Advanced Students of Economics and Business Management by Sivridou F., Ananiadou E., εκδόσεις Φαίδιμος - *Oxford Business Dictionary, www.WordReference.com* - *el.glosbe.com, www.linguee.com, dictionary.cambridge.org, www.collinsdictionary.com, BBC Economy, CNN, Deutsche Welle* Online lectures: Yale University, Khan academy

7th SEMESTER

DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLPSYS01-1	**SEMESTER**	7th
COURSE TITLE	DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEM		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures + Laboratory Exercises	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek / Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA103/

(2) LEARNING OUTCOMES

Learning Outcomes   *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.*   *It is necessary to consult:*   ***APPENDIX A***   • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*   • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*   ***APPENDIX B***   • *Guidelines for writing Learning Outcomes*
Upon successful completion of the course, the students: • will have understood the basic principles of distributed systems   • will have understood the basic principles of multicore processors

- will be able to achieve high performance using distributed and multiprocessing systems
- will gain technical skills in developing distributed applications using modern programming models, Java RMI and Java Threads
- will gain skill in developing applications on massively parallel computing machines (e.g. GPUs) using programming models such as CUDA
- will be updated regarding the latest technological advances in the area of distributed systems and multicore processors

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Individual/Independent work
- Group/Team work
- Introduction of innovative research ideas
- Development of free, creative and inductive thinking
- Project planning and management
- Career prospects

(3) COURSE CONTENT

The course deals with advanced issues from the area of Distributed Systems and Multiprocessing Computer. Systems and specifically with:

1. Introduction, Objectives and Features of Distributed Systems, Client-Server Model
2. Distributed Systems Communication, Networking, Remote Call of Process and Objects, Message and Current Oriented Communication.
3. Server Organization, Processes, Control Threads, Thread Programming, Code Migration Systems
4. Entity Name, Directory Services, Entity Locating
5. Distributed File Systems: examples NFS, AFS, others.
6. Synchronization: Real and Logical Time, Universal Situations and Universal Conditions, Deadlock Detection, Leader Election, Mutual Exclusion, Distributed Transactions
7. Error Tolerance: Process Durability, Reliable Communication, Distributed Agreement, Remedy
8. Consistency and Reproduction: Consistency Models and Protocols, Distribution Protocols
9. Internet Applications of Things and Cloud Computing
10. Distributed Object Systems: examples RMI, CORBA, DCOM
11. Distributed Systems Security
12. Distributed Transactions
13. Instruction Level Parallelism (ILP): Dynamic scheduling, Dynamic branch prediction, Multiple issue, Speculation mechanism
14. Multithreading: Thread level parallelism (TLP), Simultaneous multithreading (SMT)
15. Multiprocessors: Introduction and programming difficulties, Shared-memory multiprocessors (SMPs), Messaging passing processors, Coherence protocols

16. Graphics processing units (GPUs), GPU Architectures 17. Programming with CUDA

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	• In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Support of learning process using e-learning platform (e-class) • Use of electronic material in teaching (slides, exercises, laboratory material) • Use of development environment (software) for distributed systems • Use of cloud computing environment • Use of development environment for multiprocessing computer systems
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	26 x 2 = 52
Autonomous study	23
Student projects	35
Essay writing	15
Total (25 hours workload per credit unit)	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written*	I. An individual project (15%) that includes problems for understanding the architecture of multicore processors (dynamic scheduling, speculation, coherence protocols). II. A team project (35%) regarding the development of an application in a massively parallel processor architecture (GPU) using the CUDA programming model and the comparison with a conventional computer system in terms of performance. III. A team project (50%) regarding the development of a distributed application using modern programming models

work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

1. Distributed systems: Principles and Paradigms, Andrew Tanenbaum and Maarten van Steen, Prentice Hall
2. Programming massively parallel processors hands-on with CUDA, Kirk, David, Hwu, Wen-mei, Morgan Kaufmann Publishers.
3. ΚΑΤΑΝΕΜΗΜΕΝΑ ΣΥΣΤΗΜΑΤΑ ΜΕ JAVA, Ι. Κ. ΚΑΒΟΥΡΑΣ, Ι. Ζ. ΜΗΛΗΣ, Α. Α. ΡΟΥΚΟΥΝΑΚΗ, Γ. Β. ΞΥΛΩΜΕΝΟΣ, 2011 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

MOBILE AND WIRELESS COMMUNICATIONS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**PLKAE01**		**7th**
COURSE TITLE	Mobile and Wireless Communications		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization of general knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	GREEK (& ENGLISH)		
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC114/		

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
1. With the successful completion of the course, the student should: 2. It understands the basic principles and architecture of wireless and mobile communications systems.

3. It recognises various types of technologies and standards of mobile and wireless communications systems.
4.
5. He is familiar with wireless multi-access and resource allocation techniques, as well as radio transmission and management techniques..
6. Itdiscusses mobility management issues and
7. Ifitchanges the impact ofthe above on the performance of thecommunications system, the
8. Understandsεί resource allocation techniques in multi-user systems and their impact on network capacity and network performance
9. He is familiar with signalling, mobility management and Mobile IP protocol.
10. It recognisesthe basic principles ofAd-hocBluetooth). networks and Bluetooth.
11. Understands the basic principles of Wireless Local Networks (WLAN) – 802.11.
12. Configures and operates wireless local networks
13. Ittreats errors and failures of wireless local networks.
14. ιIt simulatesων wirelessnetworksand mobile and wireless communications networks
15. Aanalyzes the results of the simulation
16. It evaluates its findingsandprovides broad solutions for a range of mobile communications scenarios

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Autonomous work
- Teamwork
- Promoting free, creative and inductive thinking
- Search, analysis and synthesis of data, techniques and information, using the necessary techniques
- Project planning and management
- Evaluation of different solutions and selection of the most appropriate

(3) COURSE CONTENT

- Principles of design of mobile and wireless communications systems with extensive analysis of the latest developments in the field.

- Introduction and Overview of Mobile Communications Systems, Cellular Systems Architecture - Basic Principles ofCellularSystems,
- Resource Allocation – Multiple Access, Transmission and Management of Radio Channels , Signaling and ΡαδιοδιαύλωνArchitectures 2G, 3G, 4GG, 5G.
- Mobility Management, LTE and5G Network Basics,
- Wireless Local Networks (WLAN) – 802.11, Mobile IP,

Ad hoc networks - Wireless Personal Networks, Small-scale Wireless Networks.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Weekly lectures in class and in the workshop
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use electronic slides in lectures. • Use of computers and network infrastructures during laboratory exercises. • Maintenance of a course website with announcements and provision of teaching material. • Posting scores through Pan's online course management platform. Piraeus. Use email to communicate with students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Teaching - Workshops	74
Preparation of astudy (project)	51
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	Laboratory Exercises - Written Examinations

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	The final grade results 70% from the final examination, 30% from the laboratory exercises.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Technology of Terrestrial Cellular Mobile Communications Systems, Kotsopoulos Stavros, Publications A. Giola & Sons O.E.
- Mobile and Personal Communications Networks, Theologou M., Publications A. Giola & Sons O.E.
- Microwaves Yultsis Traianos - Kriezis Emmanouil, Publications A. Giola & Sons O.E.

INFORMATION SYSTEMS SECURITY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΠΛΗ47**		7th semerster
COURSE TITLE	Information System Security		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	4	
Lab exercises	2	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		5

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise*
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD108/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course students will be able to:
1. Recognize and understand the content of information systems security requirements throughout their life cycle.
2. Understand and identify the theoretical and practical issues of information systems security.
3. Understand the structural and functional characteristics of cryptographic systems
4. Deepen their understanding in key areas of this field and implement (through simulation) techniques or applications for various threat or risk situations
5. Practically apply information systems security technologies in real conditions
6. Design new applications and extend existing ones
7. Manage threats and risks in information systems with a critical, creative and research disposition to find solutions

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

Search for, analysis and synthesis of data and information by the use of appropriate technologies.
Adapting to new situations.
Problem solving,
Development of free, creative and inductive thinking,
Decision-making.
Individual work.
Group/Team work.
Project planning and management.

(3) COURSE CONTENT

The security of information, systems and applications is a basic requirement in the development and operation of information systems. The course covers basic issues of information systems security and includes the following sections:
1. Introduction to information system security concepts
2. Security Management Systems
3. Cryptographic systems
4. Public Key Infrastructure
5. Access control and Privacy
6. Security in Technologies
7. Secure electronic and mobile services
8. Introduction to network security

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	*Face-to-face, in-class lecturing*
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	*Due to the nature of the course, it is required to use a laboratory environment with more than one computer and networks per workgroup. Due to lack of resources and in order to prevent possible security problems due to lab equipment misuse, each working group uses its own laptop, which uses "virtual machines" with which the necessary systems for the course are simulated.* *In this way an attempt is made to cover the objective difficulty and the laboratory lessons are done with the use of laptops.*
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	50
Laboratory practice	30
Fieldwork project	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Fieldwork project: 50%, Laboratory Exercises: 30% Multiple choice test: 20% The evaluation criteria are available to the students through the course web page.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Course notes are provided to students. In addition, the students may choose one book in the field of Information System Security from the Eydoxos platform.

Βιβλίο [3466]: Πρακτικά Θέματα Ασφάλειας Πληροφοριακών Συστημάτων & Εφαρμογών, Νινέτα Πολέμη, Αλέξανδρος Καλιοντζόγλου
ΑΣΦΑΛΕΙΑ ΠΛΗΡΟΦΟΡΙΩΝ ΣΥΣΤΗΜΑΤΩΝ & ΣΥΣΤΗΜΑΤΩΝ ΣΤΟΝ ΚΥΒΕΡΝΟΧΩΡΟ, ΚΑΤΣΙΚΑΣ Σ., ΓΚΡΙΤΖΑΛΗΣ ΣΤ., ΛΑΜΠΡΙΝΟΥΔΑΚΗΣ Κ., 1η 2020 ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΙΚΕ
ΑΣΦΑΛΕΙΑ ΥΠΟΛΟΓΙΣΤΩΝ: ΑΡΧΕΣ ΚΑΙ ΠΡΑΚΤΙΚΕΣ, WILLIAM STALLINGS, LAWRIE BROWN, 3η Α-μερ/κη 2016 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ
Port Cybersecurity Securing Critical Information Infrastructures and Supply Chains
(eBook ISBN: 9780128118191 Paperback ISBN: 9780128118184), Nineta Polemi, 1η/2017 Elsevier
Βιβλίο [2165]: Ασφάλεια Πληροφοριακών Συστημάτων , Σωκτ. Κάτσικας - Δ. Γκρίτζαλης - Στεφ. Γκρίτζαλης

Relevant scientific journals:
Computers and Security, Elsevier
International Journal of Information Security, Springer

DATA SCIENCE TOPICS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΗΘΕΔ01	**SEMESTER**	7
COURSE TITLE	DATA SCIENCE TOPICS		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures, Laboratory hours		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*scientific expertise*		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD146/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon the successful completion of the course, the students will be able to: ✓ Understand topics and methodologies related to Data Science; ✓ Apply data preparation techniques for Data Science purposes; ✓ Choose among various data analytics and machine learning methods, such as clustering and classification, in order to solve Data Science tasks ✓ Exploit on the above knowledge, which is required in a Data Scientist's portfolio

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Search for, analysis and synthesis of data and information by the use of appropriate technologies Individual/Independent work Group/Team work Introduction of innovative research problem solving	

(3) COURSE CONTENT

The course offers knowledge about Data Science topics. In particular, it covers topics such as: 1. Intro to Data Science - Data preprocessing & visualization 2. Data Scioence- related algorithms and techniques (Big data processing, NN-based machine learning, etc.) 3. Special – advanced topics (time series data, geo-spatial data, etc.) 4. Hands-on using popular programming languages and tools (Python, Scikit-learn, Tensorflow, Keras, GeoPandas, etc.)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT in teaching, laboratory education, communication with students, etc. (e-class platform)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	25
Laboratory practice	15
team-work	50
independent (self) study	35
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Project assignment with face-to-face presentation; 100% The evaluation criteria are stated and they are accessible to the students via the e-class platform.

(5) SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:

- Grus J. (2019) Data Science from Scratch, 2/e. O'Reilly.
- Provost F, Fawcett T. (2013) Data Science for Business. O'Reilly.

- Related scientific journals:

ACM Transactions on Knowledge Discovery in Data

Data Mining and Knowledge Discovery (Springer)

Int. Journal of Data Science and Analytics (Springer)

SYSTEMS' SIMULATION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΜΑΘ34-4**	**SEMESTER**	**7**
COURSE TITLE	SYSTEMS' SIMULATION		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	13 weeks x 4 hours/week	5
Laboratories	4 weeks x 2 hours/week	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Background knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC104/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. Recognize key properties of systems
2. Understand the concepts of system simulation
3. Identify the structural and functional components of the construction of simulation models
4. Distinguish the levels of dynamic simulation
5. Discover the applications of simulation in Information Systems and Networks
6. Categorize the Simulation models
7. Clarify the characteristics of Hybrid Simulation
8. Implement the programming, where required, of simulation models using the appropriate software
9. Apply Hybrid Simulation models

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Individual/Independent work
3. Group/Team work

(3) COURSE CONTENT

01: Basic Concepts:
Introduction
The philosophy, development and application of a simulation model
Simulation model design elements
02: Application Examples and Structure of System Simulation Models
03: Generation of Random Numbers & Random Variables
Generation of Random Numbers
Examples of Random Numbers applications
Generation of Discrete and Continuous Random Variables
Methods for Generating Continuous Random Variables: Inversion, Rejection, Synthesis, Approximation
04: Stochastic Models of interactive simulation-based optical system
05: Construction of Simulation Models and Hybrid Simulation of Systems
06: Object Oriented System Simulation
07: Introduction to the VENSIM, AnyLogic and Forio software
08: The Hybrid Model via AnyLogic
09: Function of AnyLogic
10: Simulation Applications in Information Systems and Computer Networks
11: Hybrid System Simulation Applications with AnyLogic

12: Assignment per individual student regarding the application of VENSIM or AnyLog or Forio in a real environment The field of Systems Simulation has been developing rapidly and continuously for a number of decades and is now the basis of science in undergraduate programs internationally, including curricula in modern Informatics. At the same time, it lays the foundations for the teaching of specialized technological courses, such as Telecommunication Systems, Computer Networks, Business Dynamics, etc.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face / In a webex class
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized dynamic systems simulation software (Vensim, Anylogic, Forio) Support of the learning process and teaching through a eclass electronic platform (gunet2)
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures/Labs	40
Team assignment in System Dynamics	40
Independent study	45
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests,*	1. Oral final exam (60%) that includes the theory and questions regarding usage of the Vensim, Anylogic and Forio software. 2. Programming work (40%) prepared in a systems simulation software environment Students always have access to their assessed assignments and their type of assessment.

short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

There are notes and slides of the course and the laboratory on the website of the course.

Προσομοίωση και Εφαρμογές (αναθεωρημένη έκδοση), Σφακιανάκης Μιχαήλ, 2020 Broken Hill Publishers

VIRTUAL REALITY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΕΙΚ03**	**SEMESTER**	**7**
COURSE TITLE	VIRTUAL REALITY		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching and examples	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD117/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. know the components of a Virtual Reality system.
2. understand the development parameters of Virtual Reality systems in the Unity3D environment.
3. develop and implement virtual reality applications in the Unity3D environment
4. understand the management of 3D models of objects, camera, sound, various textures, animations, etc.
5. discover various virtual reality models on the Internet,
6. combine and integrate the above, in a complete operating system of Virtual Reality.
7. detect and evaluate data regarding problems at the operational level
8. invent ways to solve problems and optimize operations in virtual environments

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Adapting to new situations
3. Decision-making
4. Group/Team work
5. Introduction of innovative research
6. Development of free, creative and inductive thinking

(3) COURSE CONTENT

1. Structure and operation of a virtual reality system. Hardware, Software.
2. Categories of Virtual Reality systems.
3. Worlds of 3D graphics. 3D object models.
4. Object surface texture. Management of light sources, sounds, cameras. Animations.
5. The Unity3D environment.
6. Development of virtual reality applications on the Unity3D platform.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching

COURSE DESIGN

Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.

Activity/Method	***Semester workload***
Lectures	26
Algorithm and system development in class	26
Independent study	30
Team project for specific case study	43
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Presentation of Teamwork of 2-3 people Evaluation criteria: Quality of report Quality of Powerpoint presentation Quality of short video produced Application complexity How real and believable the application is Innovation in approach

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
   Εικονικοί κόσμοι, Βοσινάκης, Σπυρίδων, 2015
   URI: http://hdl.handle.net/11419/3187
   ISBN: 978-960-603-226-4
   ID Ευδόξου: 320158

   https://unity.com/

2. Related scientific journals:

IMAGE ANALYSIS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΗΕΙΚ01	**SEMESTER**	7
COURSE TITLE	IMAGE ANALYSIS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD102

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course students will be able to:

- categorize the types of operators on images
- develop two-dimensional image processing algorithms
- segment images into areas
- detect and connect edges in images
- perform measurements for objects on images, such as area, perimeter, length, width, etc., and calculate object shape descriptors
- analyze color and multispectral images
- understand and use the model of central and parallel projections
- develop and apply static and dynamic stereoscopic analysis algorithms
- develop and use sensor fusion algorithms
- utilize content-based retrieval algorithms from image databases

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies
- Individual/Independent work
- Group/Team work
- Problem solving
- Decision making
- Project planning and management

(3) COURSE CONTENT

The course deals with the development of algorithms that allow machines to understand the visual world. It is part of the wider scientific field of Artificial Intelligence. The purpose of this course is to present in a unified way the most widely used techniques and methodologies for Image Analysis problems.

The content of the course is divided into the following 10 sections:

SECTION 1: Introduction to Image Analysis

SECTION 2: Point, Algebraic and Geometric Operators

SECTION 3: Image Segmentation and Analysis in Areas

SECTION 4: Image Object Measurements

SECTION 5: Color and Multispectral Image Analysis SECTION 6: Model of Geometric Projections SECTION 7: Introduction to 3D Vision SECTION 8: Static Stereoscopic Analysis SECTION 9: Dynamic Stereoscopic Analysis SECTION 10: Special Topics in Image Analysis (Sensor Fusion - Image Databases)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lectures
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized Image Analysis software in (Python / MATLAB) for presentation of algorithms and their comparative study during lectures and for the elaboration of assignments. Support of the learning process and teaching through the electronic e-class platform.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	***Semester workload***
Lectures	30
Team assignment to develop an image analysis project	45
Independent study	50
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	3. Written final exam (60%) that includes exercises to test understanding of the theory taught, such as exercises related to edge detection, model of geometric projections, etc. 4. Programming assignment (40%) to be developed in a Python / MATLAB software development environment, in groups of one / two / three students with a subject of developing and implementing an Image Analysis project. Open access data is used for the evaluation of the

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	system. The assignment is delivered electronically and consists of source code, properly organized in files, as well as accompanying documentation which describes the process of solving the problem, the design assumptions / hypotheses and the evaluation of the performance of the algorithms included in the solution.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

[1] Γ.Α. Τσιχριντζής, Ανάλυση Εικόνας, Εκδόσεις Βαρβαρήγου, 2003

[2] Χρ.-Ν. Ε. Αναγνωστόπουλος, ΕΠΕΞΕΡΓΑΣΙΑ ΨΗΦΙΑΚΩΝ ΕΙΚΟΝΩΝ - ΑΡΧΕΣ ΚΑΙ ΕΦΑΡΜΟΓΕΣ ΣΤΟ ΠΕΔΙΟ ΤΟΥ ΧΩΡΟΥ, Εκδόσεις Τζιόλα, 2017

-Related scientific journals:

IEEE Transactions on Image Processing

CURRENT TOPICS OF SOFTWARE ENGINEERING – SOFTWARE FOR MOBILE DEVICES

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΘΕΤΚΑΕ01**		7
COURSE TITLE	Current Topics in Software Engineering – Software for Mobile Devices		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**	
Lectures – Laboratory Exercises	4+2	5	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	SPECIALTY TRACK (EY) Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/ TMD100/		

(2) LEARNING OUTCOMES

Course Learning Outcomes
Upon successful completion of this course students will be able to: 1. Analyze and compare software development models 2. To select software development models according to the needs and to use them 3. Utilize the Android Studio tool for mobile application development

4. To develop native mobile apps using the Android SDK 5. Utilize local (SQLite) databases 6. To know the most modern Cloud and Mobile backend services as a service provided by Firebase 7. To use them practically 8. To design and develop applications for mobile and mobile devices implementing the most modern programming techniques 9. To ensure the effectiveness of the software through the aforementioned applications

(3) COURSE CONTENT

General Skills

• Search, analysis and synthesis of data and information, using the necessary technologies
• Autonomous work
• Teamwork
• Project design and management
• Adaptation to new situations
• Innovation
• Ability to continuously monitor current scientific trends and developments for professional and / or academic development

Basic course content includes:

- Software development models,
- Structured Analysis and Object Oriented Analysis,
- Architectural design, detailed design, Structured and Object Oriented design.
- Development of applications that can be run from modern mobile devices (smartphones) with integrated operating system. These applications can work on modern "smart" phones, as well as on other "mobile" devices, which have appeared in recent years and use an operating system (Tablets, Wearables).

The course summarizes the most popular mobile operating systems, as well as the tools for developing applications on them, however the material mainly includes the use of object-oriented Java programming language for developing applications on mobile devices under the Android operating system. Indicatively, the development of mobile apps is implemented using the Android Studio software development environment.
In addition, the course covers the material related to the sensors of mobile devices, geolocation services and a number of other advanced programming techniques (asynchronous programming, android services, broadcast receivers, android intents).

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In Class and in Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use ICT in Teaching and in Laboratories. Support the learning process through the course's website (eclass gunet). Notes and educational material, etc.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	See table below

Activity/Method	*Semester workload*
Lectures	52
Laboratory Exercises	26
Project Case-Study	21
Independent Study	26
Total Course (25 hours per ECTS point)	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	Individual software development tasks of a total weight of 50% on the final grade Final Project-Work (group) of total weight 50% on the final grade

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

ΑΝΤΙΚΕΙΜΕΝΟΣΤΡΕΦΗΣ ΑΝΑΠΤΥΞΗ ΛΟΓΙΣΜΙΚΟΥ ΜΕ ΤΗ UML, ΓΕΡΟΓΙΑΝΝΗ Β.,ΚΑΚΑΡΟΝΤΖΑ Γ.,ΣΤΑΜΕΛΟΣ Γ.,ΦΙΤΣΙΛΗΣ Π.,ΚΑΜΕΑΣ Α., 2006 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

Software Engineering, M. Giakoumakis, N. Diamantidis, Stamouli Publications, 2009.

INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			
COURSE TITLE	Information retrieval and Search in Word Wide Web		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD105/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion of the course, students will be able to: 1. Understand the basic steps executed by a search engine to answer user queries. 2. Determine the preprocessing required in order that user queries will be processed fast in a search engine. 3. Assess the performance of search engines according to predefined criteria. 4. Investigate the reasons in case of non-satisfactory answers to user queries. 5. Handle the problems above by examining all possible solutions in accordance with the basic principles of web search. 6. Expand the range of solutions through research in relevant situations and contexts. 7. Design data structures that support fast searching of files with natural language content. 8. Understand and apply techniques for extracting information from the World Wide Web graph. 9. Discover methods of enriching existing indexes.

General Competences
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim? *Search for, analysis and synthesis of data and information by the use of appropriate technologies,* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research* *Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Critical thinking Development of free, creative and inductive thinking Search for, analysis and synthesis of data and information by the use of appropriate technologies Decision-making Introduction of innovative research Individual/Independent work Group/Team work Assessment and solution of problems Social, professional and ethical responsibility

(3) COURSE CONTENT

The subject of the course is the presentation of the basic concepts of Information Retrieval, Modeling issues as well as Indexing techniques. In particular, the following topics are presented: 1) Information retrieval based on the Boolean model, term vocabulary and posting lists, Dictionaries

and Error-Tolerant Retrieval 2) Index Construction, index compression, document ranking, term weighting and vector space model 3) Evaluation of information retrieval systems 4) Relevance feedback and query expansion 5) Basic principles of web search 6) Web crawling and indexing 7) Link analysis

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	52
Projects	30
Study	43
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended*	**Problem Solving**

questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

ΑΝΑΚΤΗΣΗ ΠΛΗΡΟΦΟΡΙΑΣ, BAEZA-YATES RICARDO,RIBEIRO-NETO BERTHIER, 2η 2014 ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΑΝΑΚΤΗΣΗ ΠΛΗΡΟΦΟΡΙΩΝ, MANNING D. CHRISTOPHER, RAGHAVAN PRABHAKAR, SCHUTZE HINRICH, 2012 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

ΑΝΑΚΤΗΣΗ ΠΛΗΡΟΦΟΡΙΑΣ, Τύπος: Ηλεκτρονικό Βιβλίο, ΑΠΟΣΤΟΛΟΣ ΠΑΠΑΔΟΠΟΥΛΟΣ, ΙΩΑΝΝΗΣ ΜΑΝΟΛΟΠΟΥΛΟΣ, ΚΩΝΣΤΑΝΤΙΝΟΣ ΤΣΙΧΛΑΣ, 2016

Η ΜΕΘΟΔΟΣ PAGERANK ΤΗΣ GOOGLE ΚΑΙ ΑΛΛΑ ΣΥΣΤΗΜΑΤΑ ΚΑΤΑΤΑΞΗΣ ΙΣΤΟΣΕΛΙΔΩΝ, LANGVILLE AMY, MEYER CARL, ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ

- Related scientific journals:
  Information Retrieval Journal, Springer

TUTORING PROGRAMS EVALUATION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΑΠΡΟΔΙΔ01**	**SEMESTER**	7th
COURSE TITLE	Tutoring Programs Evaluation		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC134/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course the student is expected to know: • the basic guidelines for designing curricula • searching methods for the curriculum of a specific teaching subject and comprehend its targeting, its structure, its contents and its building blocks, • how to look up all the relevant material of a specific subject and compare it against the corresponding curriculum, • how to apply evaluation methods (factual, progressive, final), • how to sort and rate teaching objectives, • methods of composing evaluation questions suitable for a teaching target and the corresponding teaching purposes, • evaluation indicators in use and how to modify them as necessary, • ways of obtaining information on matters of evaluation from national authorities, • how to organize systems of self-assessment and external assessment, • in depth the contents of official school text-books related to a specific subject, • how to combine all of the aforementioned methods and tools, in order to evaluate their degree of convergence to the official curriculum, the learning objectives, the expected outcomes and the variations needed in relation to special learning needs.

General Competences *Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?*	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
Search for, analysis and synthesis of data and information by the use of appropriate technologies, Individual/Independent work Group/Team work Critical thinking Development of free, creative and inductive thinking Demonstration of social, professional and moral responsibility	

(3) COURSE CONTENT

TOPICS: 1. Introduction 2. Concept, definition, methodology and methods of evaluation 3. Types of evaluation 4. Curricula

   a. Sociology curriculum
   b. Curricula building blocks
   c. Types of curricula
5. Curriculum design
   a. Design guidelines
   b. Design models
   c. Teaching movements that affected curricula
   d. Modern curricula attributes
   e. Modern curricula teaching strategies
   f. Curricula categories
   g. Method of composing curricula
   h. Basic characteristics of curricula
   i. Review of curricula
6. Curricula and school textbooks
7. Teaching scenarios repository
8. Students' evaluation
   a. Evaluation model
   b. Taxonomy of teaching objectives
   c. Attributes of questions
   d. Categories and types of questions
9. Evaluation authorities
   a. Quality Assurance Unit (QAU)
   b. Hellenic Authority for Higher Education (HAHE)
   c. Academic certification
   d. Institutional evaluation
   e. Internal evaluation
   f. External evaluation
   g. Code of contact
10. Attending a typical period in a school of Piraeus and evaluating the teaching process
11. Simulating teaching evaluated by fellow-students

The course focuses on the process of curricula composing both horizontally (in an interdisciplinary manner) and vertically by education level (primary, secondary and higher education) and by authority (Ministry of Education, IEP, Teachers).

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of ICT, teaching simulations, demonstration of simulation and visualization software
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of*	

Activity/Method	*Semester workload*
Lectures	30
Teaching simulations	15
Teaching demonstrations	6
Visiting a school of Piraeus in order to attend a real life teaching	6

bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	Self-study	48
	Teaching preparation	10
	Preparing evaluation reports	10
	Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	3. Evaluation reports on teaching simulations conducted by fellow students (50%) 4. Evaluation report on real life teachings conducted in schools of Piraeus (50%)

(5) SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:

- *Giannis Salvaras, Evaluation of programs, Grigori publ., 2013*
- *https://www.adip.gr/*
- *Georgios Gianikopoulos et.al, Program "Self-assessment of teaching", (Greek) Institute of Educational Policy, 2007-2013*
- *Teacher's guides for Informatics in Primary, Lower Secondary and Upper Secondary education, Greek Mnistry of Education, 2011*
- *A. Ornstein, F. Hunkins, Curriculum: Foundations Principles and Issues, Pearson Education Ltd, 2018*
- *Barry Fraser, Learning environment in curriculum evaluation: a review, Evaluation in Education, vol.5, p.p. 1-93, Pergamon Press, 1981*
- *R. Skager, R.H. Dave (editors), Curriculum Evaluation for Lifelong Education, UNESCO, 1977*

NEXT GENERATION VEHICULAR NETWORKS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**PLODEDE01**		**7th**
COURSE TITLE	Next Generation Vehicular Networks		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization of general knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	GREEK (& ENGLISH)		
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC114/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

With the successful completion of the course, the student should:
1. Understands the basic principles and architecture of V2X systems.. 2. Itdevelopsand develops V2 X2systems and applications 3. Aevaluatesthe performance oftheseapplications 4. Clarifies key VANET technologies 5. He knows modern techniques/methodologies in 5G οχηματικές vehicle communications and net-working (VCN).. 6. Itdiscusses vehicle channel issues, 7. It recognises communication techniques between vehicles in the next generation of intelligent transport systems. 8. Understands multi-level interconnection on V2V communication networks 9. It understands issues related to the implementation of ad hoc vehicle networks for smart cities. 10. Analyzes and proposes broad solutions for a range of operating andproviding VCN service scenarios.

General Competences	
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?	
Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*
• Autonomous work • Teamwork • Promoting free, creative and inductive thinking • Search, analysis and synthesis of data, techniques and information, using the necessary techniques • Project planning and management • Evaluation of different solutions and selection of the most appropriate	

(3) COURSE CONTENT

The vehicular aim of the course is to provide students with the necessary knowledge regarding the introduction vehicular into ad-hoc (VANET), V2X technologies, 5G vehicle communications and net-working (VCN).

Students learn to design and develop V2X systems and applications and evaluate their performance..

Concepts relatedto:

- the characteristics of the vehicle channels and the modelling,,
- applications in VANET,

- combination of wireless and vehicle technologies: PHY-level techniques in VCN, efficient mac design in VCN,
- Wireless-vehicle development: VCN-based applications.
- system model, network topology and communication between nodes, channel access, time synchronization between vehicles, cooperation in vehicular relay ADHOCMAC, collaborative networks, enhanced node collaboration, collaborative relay broadcasting, communication issues between vehicles in the next generation of intelligent transportsystems, congestion control for ad hoc vehicle networks forsafety.

Complementarity between οχηματικών vehicle and LTE networks, traffic signal control systems and car-to-car communications, multi-level interconnection in V2Vcommunication networks, transmission of security messages onV2I οχηματικά communication networks, ad hoc vehicle networks for smart cities.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Weekly lectures in class and in the workshop
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use electronic slides in lectures. • Use of computers and network infrastructures during laboratory exercises. • Maintenance of a course website with announcements and provision of teaching material. • Posting scores through Pan's online course management platform. Piraeus. Use email to communicate with students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see table below)

Activity/Method	***Semester workload***
Teaching - Workshops	74
Preparation of astudy (project)	51
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Laboratory Exercises - Written Examinations The final grade results 70% from the final examination, 30% from the laboratory exercises.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- 5G-Enabled Vehicular Communications and Networking, Xiang Cheng, Rongqing Zhang, Liuqing Yang, Springer ebooks
- Link-Layer Cooperative Communication in Vehicular Networks, Sailesh Bharati, Weihua Zhuang, Springer ebooks
- Vehicular Ad-Hoc Networks for Smart Cities, Anis Laouiti, Amir Qayyum, Mohamad Naufal Mohamad Saad, Springer ebooks
- Principles and Modeling of Wireless Dissemination, Kotsopoulos Stavros, Publications A. Giola & Sons O.E.
- Telecommunications Systems, 4th Edition, Karagiannidis Georgios, Pappi Koralia, Publications A. Giola & Sons O.E.

KNOWLEDGE MANAGEMENT

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLDIG01	**Semester**	7th
COURSE TITLE	KNOWLEDGE MANAGEMENT		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**	
Lectures	4	5	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Major concentration		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD124/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

By the end of this course students will be able to:

1. Understand the role of knowledge within an organization
2. Identify the learning processes within the organizational and the working environment of an organization.
3. Understand the influence of the prerequisite knowledge (e.g. drive for innovation, intra- organizational cooperation, organizational climate, better efficiency)
4. Identify the classification of knowledge, the basic principles as well as the models and tools of knowledge management.
5. Identify the methods of knowledge creation and the techniques of captivating – extracting knowledge.
6. Know the ways of knowledge representation and reasoning, the channels of knowledge propagation, the modern trends with regard to a knowledge-based development.
7. Identify the challenges, but also the value of learning capability of an organization.
8. Develop and diffuse innovative plans for the optimum use of materials and human resources.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and composition of data and information with the use of appropiate technological tools.
- Independent work
- Team work
- Adapting to new situations
- Development of free, creative and inductive thinking
- Leadership qualities
- Problem solving
- Efficient and effective project management
- Decision making

(3) COURSE CONTENT

The subject of the module is the Knowledge Management, which is the process of collecting accumulated expertise of a business or an organization, either this is stored in databases, or in documents or even within the mind of the managers of the business or the organization and then its diffusion and its utilization at these functional areas of the business or the organization that will offers the maximum benefit.

Basic course content:

- Basic concepts of the theory of knowledge
- The role of knowledge within an organization
- Disciplines of knowledge
- Fundamental principles of knowledge management
- Models and tools of knowledge management
- Knowledge representation and reasoning
- Diffusion of knowledge
- Modern trends related to knowledge-based development.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	The learning process in supported through the electronic platform e-class.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	40
Group assignment in case study	40
Study and analysis of bibliography	15
Independent study	30
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Written assignment (100%) that includes essay / report.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Recommended textbooks through two evdoxos:

[[16924] The knowledge creating company, Nonaka Ikujiro,Takeuchi Hirotaka

[12308986] Knowledge management in a modern technological environment, I.I. Kekes

International Journal of Knowledge Based Development https://www.inderscience.com/jhome.php?jcode=ijkbd

Journal of Knowledge Management

https://www.emeraldinsight.com/journal/jkm

SMART CITIES AND INTERNET OF THINGS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΕΠΔΙΠΡ01		
COURSE TITLE	Smart Cities and Internet of Things		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD139/		

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*

Upon completion, the students are expected to:

- have familiarized themselves with the concepts of Smart Cities and Internet of Things applications
- define and analyze Smart Cities individual characteristics, both in theoretical and practical applications in light of the Internet of Things technology
- describe and articulate Smart Cities design technologies, the key areas of activity of a Smart City as well as relevant applications (Smart Economy, Smart People, Smart Living, Smart Environment, Smart Mobility, Smart Governance, etc.)
- will be informed about the European Union's development policy in the field of Smart Cities
- will explore specific case studies of Smart Cities both in Greece and abroad
- will understand the underlying concept of the modern city as an environment of creativity and innovation through cutting-edge technologies, digital networking and the Internet of Things applications.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Individual/Independent work
- Group/Team work
- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Development of free, creative and inductive thinking
- Working in an interdisciplinary environment
- Environmental awareness

(3) COURSE CONTENT

The course's subject concerns aspects of Smart Cities management in light of the Internet of Things Applications. It includes the analysis and understanding of Smart Cities' characteristics, both in theoretical and practical applications. In particular, the basic characteristics of Smart Cities, their design technologies, the main areas of activity of a Smart City as well as context-specific applications, such as Smart Economy, Smart People, Smart Living, Smart, Smart Environment, Smart Mobility and, finally, Smart Governance are described and analyzed. Also, the European Union's development policy in the field of Smart Cities is presented, as well as specific case studies of Smart Cities both in Greece and abroad. In more detail, the main elements of this course are:

- Introduction to the concepts of Smart Cities and the Internet of Things.
- Smart City design technologies.
- Smart Economy Applications
- Smart People
- Smart Living
- Smart Environment
- Smart Mobility Applications
- Smart Governance
- European Union policies in the field of Smart Cities.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of the ICT electronic platform e-class. Theoretical in-class lecturing and group discussions. The main subjects of each module are presented by the instructor: • in the form of lectures supported by visual material • through group discussions and analysis of case studies on real-life business cases.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	(see table below)

Activity/Method	*Semester workload*
Lectures	20 x 2 = 40
Group discussions	6 x 2 = 12
Self-study	38
Essay writing	35
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written*	Students will demonstrate constructive and critical responses through the final exam and writing assignment. The final exam will cover all of the chapter readings, outside readings, and discussions during the semester. The final exam consists of both multiple-choice and open questions. The final grade consists of 40% of the written assignment and 60% of the final exam grade.

work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Anthopoulos, L. G. (2017). Understanding Smart Cities: A Tool for Smart Government Or an Industrial Trick?, Springer.
- Bisello, A., D. Vettorato, R. Stephens and P. Elisei (2016). Smart and Sustainable Planning for Cities and Regions, Springer.
- Dustdar, S., S. Nastić and O. Šćekić (2017). Smart Cities: The Internet of Things, People and Systems, Springer.
- Helfert, M., K.-H. Krempels, C. Klein, B. Donellan and O. Guiskhin (2016). Smart Cities, Green Technologies, and Intelligent Transport Systems., Springer.
- Kumar, T. V. (2017). E-Democracy for Smart Cities, Springer.
- Kumar, T. V. and B. Dahiya (2017). Smart economy in smart cities. Smart Economy in Smart Cities, Springer: 3-76.
- Peris-Ortiz, M., D. R. Bennett and D. P.-B. Yábar (2017). "Sustainable Smart Cities." Innovation, Technology, and Knowledge Management. Cham: Springer International Publishing Switzerland.
- Selection of scientific articles

E-LEARNING AND SOCIAL NETWORKS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE			7th
COURSE TITLE	E-Learning and Social Networks.		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures - Laboratories		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD138/		

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
By completing this course, students are expected to: • Incorporate recent advances in Information and Communication Technology within the distant learning process. • Acquire a deeper understanding of the fundamental notions and concepts that pervade an

interactive learning environment which strengthens the interaction between students and tutors in order to jointly form the learning experience.

- Acquire experience in designing a digital class that supports the state-of-the-art practices related to synchronous and asynchronous teaching modalities.
- Familiarize with the fundamental social networking plugins that are offered by Moodle in order to:
  - create interactive learning content
  - reinforce collaboration between students and teachers.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Adapting to new situations
- Individual/Independent work
- Group/Team work
- Project planning and management
- Innovation
- Critical thinking

(3) COURSE CONTENT

The course focuses on the utilization of Information and Communication Technologies (ICT) in education. Students attending this course are expected to familiarize with a wide spectrum of teaching techniques and learning tools that combine traditional e-learning resources with digital social networks. In particular, this course emphasizes on establishing digital social networks as an indispensable learning tool that promotes a deeper bidirectional collaboration pattern between students and teachers.

In particular, the syllabus of the course is the following:

- Digital Social Networking as a Learning Mechanism.
- Designing Distributed Learning Environments.
- Incorporating Interactive Learning content (audio, images and video) within Open Source Learning Management Systems such as Moodle and E-class.
- Implement Social Networking plugins in Moodle such as:
  - Chat
  - Forums
  - Wikis
  - Workshops
  - Webinars
  - Video Blogs
  - Podcasts
  - Webcasts
- Evaluation of Distributed Learning Enviroments.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face, in-class lecturing, laboratories
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Lectures are supported by the use of ICT
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	26
Laboratory Practice	30
Studying	26
Group Exercises	44
Lectures	26
Laboratory Practice	30
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.*	**Students are evaluated through oral presentation of their final projects.** **Indicative final project:** • **Implementation of a e-learning website concerning a university course through the utilization of the Moodle platform. The students are expected to incorporate a wide range of diverse Moodle social plugins in order to facilitate the various learning and teaching aspects of the selected course.**

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.		

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- ΕΚΠΑΙΔΕΥΤΙΚΑ ΠΕΡΙΒΑΛΛΟΝΤΑ ΔΙΑΔΙΚΤΥΟΥ, ΘΡΑΣΥΒΟΥΛΟΣ-ΚΩΝΣΤΑΝΤΙΝΟΣ ΤΣΙΑΤΣΟΣ. Κωδικός Βιβλίου στον Εύδοξο: 320160
- Christopher Holden, et al., “Mobile Media Learning: Innovation and Inspiration”, ETC Press 2015
- A.W. (Tony) Bates, “Teaching in a Digital Age”, 2015, publisher Tony Bates Associates Ltd (e-book)
- Kevin Pitts and Renu Kumar, “Issues in Digital Technology in Education, Publisher: Wikibooks 2011, 2018 (e-book)
- “The Future of Technology Education”, Editors: **Williams**, P John, **Jones**, Alister, **Buntting**, Cathy (Eds.) , 2015

-Related scientific journals:

- Computers & Education
- IEEE on Education
- IEEE Transactions on Learning Technologies
- International Journal of Educational Research

MARITIME ICS SYSTEMS

COMPUTER GAME DEVELOPMENT TECHNOLOGIES

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΤΑΗΠ01**	**SEMESTER**	**7**
COURSE TITLE	COMPUTER GAME DEVELOPMENT TECHNOLOGIES		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching and examples	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD133/

(2) LEARNING OUTCOMES

Learning Outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.* *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course, students will be able to: 1. recognize the components of a computer game. 2. understand the components of serious and educational games 3. summarize the required knowledge about the development of video games in the Unity3D

environment.
4. develop video game applications in the Unity3D environment
5. discover ways to manage the various components of an electronic game, etc.
6. learn to discover various components of electronic games on the Internet (eg 3D models, sprites, animations, etc.)
7. combine all of the above in the design and development of an integrated electronic game

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Adapting to new situations
3. Decision-making
4. Project planning and management
5. Group/Team work
6. Introduction of innovative research
7. Development of free, creative and inductive thinking

(3) COURSE CONTENT

History of game development. Types and categories of electronic games. Shoot-them-up, Role-playing, Adventure, First Person, Third Person, Multiplayer Online Games. MMORPGs, Serious Games, Educational Games. Structure and function of an electronic game. Hardware, Software, Worlds in 2D and 3D games. The Unity3D environment. Development of video games on the Unity3D platform.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of*	

Activity/Method	*Semester workload*
Lectures	26
Algorithm and system development in class	26
Independent study	20
Team project for specific case	53

bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	study	
	Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Presentation of Teamwork of 2-3 people Evaluation criteria: Quality of report Quality of Powerpoint presentation Quality of short video produced Application complexity How real and believable the application is Innovation in approach

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:

Βιντεοπαιχνιδια: βιομηχανια και αναπτυξη, Κ. Αναγνωστου, 2009 εκδοσεις ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

Αναπτυξη συστηματων εικονικης πραγματικοτητας, Τύπος: Ηλεκτρονικό Βιβλίο, Γεώργιος Λε-πουρας, Αγγελικη Αντωνιου, Νικος Πλατης, Δημητρης Χαριτος, 2016

Computer Games for Learning, An Evidence-Based Approach, Richard E. Mayer, MIT Press, 2015

https://unity.com/

2. Related scientific journals:

SERVICE ORIENTED PROGRAMMING

COURSE OUTLINE

(1) GENERAL

SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
COURSE LEVEL	UNDERGRADUATE		
COURSE CODE	**ΠΛΥΠΛ001**	**COURSE SEMESTER**	**7**
COURSE TITLE	**SERVICE ORIENTED SOFTWARE**		

INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits	**TEACHING HOURS PER WEEK**	**ECTS**
INSTRUCTION – LAB EXERCISES	4+2	5

COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	SPECIALTY TRACK (ΕΥ), Developing Skills (ΑΔ) SOFTWARE ENGINEERING AND INTELLIGENT SYSTEMS TRACK
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEB PAGE (URL)	https://gunet2.cs.unipi.gr/courses/TMD137/

(2) LEARNING OUTCOMES

Learning Outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) *level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*

• *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Life-long Learning and* ***APPENDIX B*** *Guidelines for writing Learning Outcomes*
Upon successful completion of this course students will be able to: 1. Describe a service-oriented approach to build a modern software solution 2. To explain ws-*-based services to international standards 3. To apply REST (JSON) Architecture 4. To recognize software design principles with REST Contribution of the course to the coverage of technological requirements: 4. Students are exposed to modern techniques for designing integrated software applications with services 5. Students are introduced to various concepts of efficient software integration using services 6. Students learn to plan in environments and architectures as used in modern environments of businesses and organizations

(3) COURSE CONTENT

General Skills
1. Standalone-Autonomoys work 2. Teamwork 3. Adapt to new situations
The course is about the theoretical study and practical training in advanced software programming, the design and programming of advanced modern software based on service orientation, with rest software design principles for the efficient access to information sources and services. The aim is to understand how to design, develop, operate and maintain software with efficiency through practical training in a laboratory environment (alternative in the laboratory implementation are given in Ruby/Rails, Java, .NET C#, Python, etc.), to organize software development using agile computing approach 1. Introduction to software as a service 2. Introduction to pre-structured service-oriented software 3. Advanced features in pre-structured service-oriented software 4. Installation procedures with pre-structured service-oriented software 5. Advanced features with script language technologies 6. Legacy code management techniques 7. Security in pre-structured software as a service 8. Behavioral software design 9. Development and software version management 10. Service management of software 11. Development in groups (e.g. scrum) 12. From deployment to installation processes 13. Presentation of use case with service-oriented software 14. Deployment in third-party service-oriented software infrastructure 15. Operation in third-party service-oriented software infrastructure

(4) TEACHING AND LEARNING METHODS - ASSESSMENT

MODES OF DELIVERY Face-to-face, in-class lecturing, distance teaching and distance learning etc.	In Class and in Laboratory (Face to Face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, Laboratory* *Education, Communication with students*	**Use ICT in Teaching.** **Support the learning process through the course's website (eClass Gunet). Notes and educational material, etc.**
COURSE DESIGN Description of teaching techniques, practices, and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.	see table below

Δραστηριότητα	***Φόρτος Εργασίας Εξαμήνου***
Lectures	52
Laboratory Exercises	26
Project-Case Study	21
Independent Study	26
Total Course (25 hours per ECTS point)	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS Detailed description of the evaluation procedures: Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.	Presentation of Software Implementation Work in a Laboratory Environment with Computer & Oral Examinations (100%) Presentation language: Greek The assessment method is communicated to the students at the beginning of the semester through the systems of the department (eclass)

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.	

(5) SUGGESTED BIBLIOGRAPHY

Engineering Software as a Service, ARMANDO FOX, DAVID PATTERSON KLEIDARITHMOS PUBLICATIONS LTD 2017 ATHENS (in Greek)

- Electronic bibliography available to users connected through the Academic network:

- Deploying Rails with Docker, Kubernetes and ECS Pablo Acuña https://link.springer.com/book/10.1007%2F978-1-4842-2415-1
- JRuby Rails Web Application Development Deepak Vohra https://link.springer.com/book/10.1007%2F978-3-319-03934-3

8th SEMESTER

NETWORK SECURITY

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΑΣΦΔ01**		8th semester
COURSE TITLE	Network Security		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures		3	
Lab exercises		2	
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			5
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	*Scientific expertise*		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION:	Greek	Greek	
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA102/		

(2) LEARNING OUTCOMES

Learning Outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. *It is necessary to consult:* ***APPENDIX A*** • *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.* • *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and* ***APPENDIX B*** • *Guidelines for writing Learning Outcomes*
Upon completion of the course students will be able to: • Understand basic security concepts at all levels of computer networks with an emphasis on TCP/IP networks. • Identify vulnerabilities in these systems. • Assess any weaknesses and failures • Explore ways to manage the reduction of network vulnerabilities • To design methodologies and techniques for network security, taking into account the analysis of the data • To set up and implement network security systems, with an emphasis on the use of free software / open source software.

<table>
<tr><td colspan="2">General Competences
Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?</td></tr>
<tr><td>Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research</td><td>Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….</td></tr>
<tr><td colspan="2">Search for, analysis and synthesis of data and information by the use of appropriate technologies.

Decision-making.

Group/Team work.

Assessment and evaluation of effective problem management.</td></tr>
</table>

(3) COURSE CONTENT

The aim of the course is the theoretical and practical study of security issues at all levels of networks. The following sections will be analyzed in the course: 1. Introduction to network security 2. Routing Security 3. Design of Firewall systems 4. Virtual Private Networks (VPNs) 5. Network layer security (IPSec) 6. Session Layer Security (SSL / TLS)

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	*Face-to-face, in-class lecturing*
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	*Due to the nature of the course, it is required to use a laboratory environment with more than one computer and networks per workgroup. Due to lack of resources and in order to prevent possible security problems due to lab equipment misuse, each working group uses its own laptop, which uses "virtual machines" with which the necessary systems for the course are simulated.* *In this way an attempt is made to cover the objective difficulty and the laboratory lessons are done with the use of laptops.*
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	50
Laboratory practice	30
Fieldwork project	45
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	Fieldwork project: 50%, Laboratory Exercises: 50% The evaluation criteria are available to the students through the course web page.

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Course notes are provided to students. In addition, the students may choose one book in the field of Network security from the Eydoxos platform.

- Βιβλίο [9675]: Ασφάλεια Δικτύων Υπολογιστών, Γκρίτζαλης Στέφανος,Γκρίτζαλης Δημή-τρης Α.,Κάτσι-κας Σωκράτης, 2003 ΕΚΔΟΣΕΙΣ Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ ΟΕ
- Βιβλίο [13618]: ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΑΣΦΑΛΕΙΑΣ ΔΙΚΤΥΩΝ: ΕΦΑΡΜΟΓΕΣ ΚΑΙ ΠΡΟΤΥΠΑ, WILLIAM STALLIN, 2008 Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ
- ΑΣΦΑΛΕΙΑ ΥΠΟΛΟΓΙΣΤΩΝ ΑΡΧΕΣ ΚΑΙ ΠΡΑΚΤΙΚΕΣ, WILLIAM STALLINGS LAWRIE BROWN, 2016 ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

Relevant scientific journals:
Computers and Security, Elsevier
IEEE Transactions on Dependable and Secure Computing
Computer Networks, Elesvier
IEEE Transactions on Information Forensics and Security

E-BUSINESS AND INNOVATION

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΗΕΠΚ01		
COURSE TITLE	E-BUSINESS AND INNOVATION		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, General knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD128/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion, the students are expected to:

- Understand the theoretical foundations and practical framework of e-business and e-commerce
- Describe the fundamental elements of e-Commerce and e-Business
- Understand the main elements of the e-Environment
- Have a better understanding of the e-Business strategy, Supply Chain Management, e-Marketing and Customer Relationships Management
- Design new and apply existing methods to optimize e-Business services
- Be aware of modern e-Business approaches adopted by leading companies at the national and international level.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

- Individual/Independent work
- Group/Team work
- Project planning and management
- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Adapting to new situations
- Development of free, creative and inductive thinking
- Decision-making

(3) COURSE CONTENT

The course's subject covers the theoretical and practical underpinnings of e-Business and e-Commerce management. In particular, students are introduced to the concepts of e-Business innovation and entrepreneurship. Topics covered include, among others, e-Business and e-Commerce, e-Environment, e-Business strategies, Logistics and Supply Chain Management, Customer Relationship Management and, finally, the implementation and optimization of e-Business services. To better consolidate the above concepts, relevant case studies and real-life e-Business approaches (from companies like Amazon, eBay, Dell, etc.) are presented. In more detail, the main elements of this course are:

- Introduction to e-Business and e-Commerce.
- e-Commerce fundamentals.
- e-Business Infrastructure.
- Analysis and understanding of the e-Environment.
- e-Business Strategy.
- Supply Chain Management.
- Digital Marketing.
- Customer Relationship Management.
- Change Management.
- Analysis and Design.
- Implementation and optimization of e-Business services.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of the ICT electronic platform e-class. Theoretical in-class lecturing and group discussions. The main subjects of each module are presented by the instructor: • in the form of lectures supported by visual material • through group discussions and analysis of case studies on real-life business cases.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	20 x 2 = 40
Group discussions	6 x 2 = 12
Self-study	38
Essay writing	35
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:*	Students will demonstrate constructive and critical responses through the final exam and writing assignment. The final exam will cover all of the chapter readings, outside readings, and discussions during the semester. The final exam consists of both multiple-choice and open questions. The final grade consists of 40% of the written assignment and 60% of the final exam grade.

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- E-Business and E-Commerce Management: Strategy, Implementation and Practice (5th Edition), by Dave Chaffey, 2016. Kleidarithmos Publications, ISBN: 978-960-461-671-8
- Ηλεκτρονικο εμποριο, Laudon Kenneth, Traver Carol Guercio, 16η/2021 Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.
- Selection of scientific articles

INTERNET-BASED INFORMATION SYSTEMS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΣΥΔ01		8th semester
COURSE TITLE	Internet Based Information Systems		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Laboratories		4 +2	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Compulsory		
PREREQUISITE COURSES:	Object- oriented programming, Internet Technologies		
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes it can be offered		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD111/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

With the successful completion of the course the student will be able to:

- Be aware of the new technological trends related to internet-based information systems
- Describe the role of net-centric information systems in the current business environment kai in the networked economy
- Have a knowledge of the applications of net-centric information systems in the e-business kai e-commerce
- Know and use the technologies used in network computing
- Identify the changes, perspectives and risks brought up by the recent developments in mobile computing, cloud computing and ubiquitous computing in the net-centric information systems in particular and in the business processes in general.
- Have a working knowledge of the required infrastructure for the functioning and further enhancement of net-centric information systems
- Use the Javascript libraries (e.g. jQuery, Underscore.js)
- Develop micro-applications (Java applets/servlets) using the Java programming language
- Develop webpages with dynamic content using Java Server Pages (JSP)
- Utilize modern web programming techniques, such as the frameworks Struts and Spring
- Know the usefulness of web services, and of the SOAP protocol, the descriptive language WDSL and of the service-oriented architecture (SOA)
- Elaborate the functional requirements required for the development of a net-centric information system and suggest the development methodology to be adopted
- Utilize the tools and the techniques covered in the course to develop integrated web based applications understand the basic features of internet applications, their structure, their objectives as well as their interconnection.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies
- Autonomous work
- Teamwork
- Project planning and management
- Respect for diversity and multiculturalism
- Promoting free, creative and inductive thinking

(3) COURSE CONTENT

Course Units

1. Network Computing
   - Interent and Web Technologies
   - Browsing and information discovery), browser and server softwareλογισμικό
   - Communicatrion media
   - Electronic Collaborartion, tele-collaboration tools
   - ICT infrastructure

2. Electronic commerce and businessΗλεκτρονικό Εμπόριο και Ηλεκτρονικό Επιχειρείν
   - Business models in e-business
   - E-business and e-commerce components
   - Consumer service
   - Consumer behaviour and market research
   - E-commerce in businesses and organizations
   - E-commerce supporting
   - Implementation issues in e-business

3. New Technologies and Applications
   - New technologies' penetration in net-centric information systems
   - Mobile Computing, Wireless Computing
     - Technologies
     - Infrastructures
     - Customer support applications
   - Cloud Computing (CC)
     - CC models
     - CC types
     - Resource sharing
     - Scaling - expansion
     - Advantages and disadvantages of CC
   - Applications of Mobile Computing and Cloud Computing
   - Pervasive-Ubiquitous Computing)
     - Taking advantage of heterogeneous appliacnces
     - Location – based commerce
     - Mobile Commerce
     - Smart homes and smart schools

4. Text based distributed systems
   - Definition and examples of distributed systems
   - The World Wide Web (WWW)
     - Organization
     - Domain names (URI, URN και URL)
   - Document types in the Web
   - Web architecture and infrastructure
   - The HTTP protocol
     - Links
     - Messages
   - Web servers
     - The Apache web server
     - Web server clustering
   - The client-server model
   - Security in the client-server model

- Web application servers

5. **Basic and Advanced Web Programming Techniques**
- New technologies on the client side
    - The markup languages HTML and HTML5
    - Cascading style sheets (CSS)
    - JavaScript and the JQuery and JQuery Mobile libraries
- eXtensible Markup Language (XML)
    - Document Type Definition (DTD)
    - XML Schema
    - Extensible Stylesheet Language (XSL)
- JSON
- Asynchronous communication (AJAX)
- Other technologies
    - Python
    - Underscore.js, MooTools and Node.js
    - Java Applets

6. **Web programming with Java: Servlets and JSP**
- The programming language Java
- Java Servlets
    - Examples
    - Disadvantages
- Session management
- Authentication via data base linking
- Java Server Pages (JSP) and structured web application development libraries
    - Web programming frameworks
    - The Struts framework

(3) ΠΕΡΙΕΧΟΜΕΝΟ ΜΑΘΗΜΑΤΟΣ
Θεματικές Ενότητες

1. Δικτυοκεντρικός Υπολογισμός (Network Computing)
- Τεχνολογίες διαδικτύου και παγκόσμιου ιστού
- Περιήγηση και ανάκτηση πληροφοριών (Discovery), λογισμικό φυλλομετρητών (Browsers) και διακομιστών (Servers)
- Μέσα επικοινωνίας (Communicatrion)
- Ηλεκτρονική συνεργασία (Collaborartion), εργαλεία τηλεσυνεργασίας
- Υποδομές Πληροφορικής

2. Ηλεκτρονικό Εμπόριο και Ηλεκτρονικό Επιχειρείν
- Επιχειρηματικά μοντέλα στο ηλεκτρονικό επιχειρείν
- Συστατικά του ηλεκτρονικού εμπορίου και του ηλεκτρονικού επιχειρείν
- Υπηρεσίες προς τον καταναλωτή
- Συμπεριφορά Καταναλωτών και έρευνα αγοράς
- Ηλεκτρονικό εμπόριο σε επιχειρήσεις και οργανισμούς
- Υποστηρικτικές υπηρεσίες στο ηλεκτρονικό εμπόριο
- Θέματα υλοποίησης του ηλεκτρονικού επιχειρείν

3. Νέες Τεχνολογίες και Εφαρμογές
- Διείσδυση των νέων τεχνολογιών στα δικτυοκεντρικά πληροφοριακά συστήματα
- Κινητή υπολογιστική (Mobile Computing, Wireless Computing)
    - Τεχνολογίες
    - Υποδομές
    - Εφαρμογές για την υποστήριξη των πελατών
- Υπολογιστική νέφους (Cloud Computing)
    - Χαρακτηριστικά και μοντέλα της υπολογιστικής νέφους
    - Τύποι υπολογιστικού νέφους

o Διαμοιρασμός πόρων
o Κλιμάκωση-Επέκταση
o Πλεονεκτήματα και μειονεκτήματα του υπολογισμού στο νέφος
• Εφαρμογή της κινητής υπολογιστικής και της υπολογιστικής νέφους
• Η πανταχού παρούσα υπολογιστική - Διάχυτος υπολογισμός (Pervasive-Ubiquitous Computing)
o Αξιοποίηση ετερογενών συσκευών
o Εμπόριο βασισμένο στην τοποθεσία
o Κινητό εμπόριο
o Έξυπνα σπίτια και έξυπνα σχολεία

4. Κατανεμημένα Συστήματα Βασισμένα σε Κείμενο
• Τι είναι τα κατανεμημένα συστήματα
• Ο παγκόσμιος ιστός
o Οργάνωση
o Χώροι ονομάτων (URI, URN και URL)
• Τύποι εγγράφων στον παγκόσμιο ιστό
• Αρχιτεκτονική και υποδομή του παγκόσμιου ιστού
• Πρωτόκολλο HTTP
o Συνδέσεις
o Μηνύματα
• Εξυπηρετητές ιστού
o Εξυπηρετητής Apache
o Αναπαραγωγή και Συσταδοποίηση των εξυπηρετητών ιστού
• Το μοντέλο πελάτη-εξυπηρετητή
• Ασφάλεια επικοινωνίας πελάτη-εξυπηρετητή
• Εξυπηρετητές εφαρμογών ιστού
5. Βασικές και Προηγμένες Τεχνικές Προγραμματισμού και Λειτουργίας στον Παγκόσμιο Ιστό
• Νέες τεχνολογίες στην πλευρά του πελάτη
o Γλώσσες σήμανσης HTML και HTML5
o Κανόνες μορφοποίησης (CSS)
o JavaScript και βιβλιοθήκες JQuery και jQuery Mobile
• Η γλώσσα eXtensible Markup Language (XML)
o Document Type Definition (DTD)
o Σχήμα XML (XML Schema)
o Extensible Stylesheet Language (XSL)
• Το πρότυπο ανταλλαγής δεδομένων JSON
• Ασύγχρονη επικοινωνία (AJAX)
• Άλλες τεχνολογίες
o Python
o JavaScript βιβλιοθήκες Underscore.js, MooTools και Node.js
o Java Applets

6. Διαδικτυακός Προγραμματισμός με Java: Servlets και JSP
• Η γλώσσα προγραμματισμού Java
• Java Servlets
o Παραδείγματα
o Μειονεκτήματα
• Διαχείριση συνεδριών
• Αυθεντικοποίηση μέσω σύνδεσης σε βάση δεδομένων
• Java Server Pages (JSP) και βιβλιοθήκες δομημένης ανάπτυξης εφαρμογών ιστού
• Αρχιτεκτονική Model-View-Controller (MVC)

• Πλαίσια Εφαρμογών Ιστού
o Το πλαίσιο Struts
o Το πλαίσιο Spring

7. Web Services
- Definitions and Properties
- Simple Object Access Protocol (SOAP)
- Web Services Description Language (WSDL)
- Universal Discovery Description and Integration (UDDI)
- Web Services development
- Comparison between web services with RMI, CORBA και EJB
- Representational State Transfer (REST) architecture in Web Services

7. Service Oriented Architecture-SOA
- Practical examples
- Development of SOA in a business environment
- SOA vs Web Services
- Enterprise Service Bus/ESB

9. Development of Web based information systems
- ICT project development
- Software development methodologies
- Requirement analysis
- Design Tools
- Data base design
- Development techniques and software coding checks
- Security of Web applications

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Lectures in the amphitheatre
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of video project and laptops • Electronic books/articles • Web searching • Java NetBeans • Apache web server • Application server Glassfish • MySQL • Use of the eclass
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching,*	see table below

Activity/Method	***Semester workload***
Lectures	45 hours
Lab exercises	20
Project report	35
Independent study	25

Educational visits, projects, Essay writing, Artistic creativity, etc. *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*		
	Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Final exam (50% of the final grade): open ended questions, problem solving, multiple choice questions Group project (50% of the final grade): Development of a web application with Java and JSP/Servlets or other technologies. Report writing. Presentation.

(5) SUGGESTED BIBLIOGRAPHY:

- -Μητρόπουλος, Σ., Δουληγέρης, Χ. (2015), Πληροφοριακά Συστήματα στο Διαδίκτυο: Εφαρμογές, Ανάπτυξη, Υποδομές, Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
- Δουληγέρης, Χ., Κοπανάκη, Ε., Μαυροπόδη, Ρ. (2013), Τεχνολογίες Διαδικτύου – Αρχές Λειτουργίας και Προγραμματισμός Εφαρμογών στο Διαδίκτυο, Εκδόσεις Νέων Τεχνολογιών.
- Hall, M., Brown, L. (2003), Core Servlets and JavaServer Pages, Prentice Hall.
- Tanenbaum, A.S., Van Steen, M. (2002), “Distributed Systems: Principles and Paradigms”, 1st Edition, Prentice Hall.
- Turban, E., Leidner, D., McLean, E., Wetherbe, J. (2008), “Information Technology for Management - Transforming Organizations in the Digital Economy”, John Wiley & Sons, 6th Edition.
- Weerawarana, S., Curbara, F., Leymann, F., Storey, T., Ferguson, D. (2008), Αρχιτεκτονική Πλατφόρμας Υπηρεσιών Ιστού, Κλειδάριθμος.

Scientific Journals

- Ad Hoc Networks
- Computers & Security
- Information Systems
- Information Sciences
- European Journal of Information Systems
- Journal of Web Semantics
- World Wide Web
- IEEE Software
- Journal of Network and Computer Applications
- Electronic Commerce Research and Applications

IT PROJECT MANAGEMENT

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLDIP01	**Semester**	8th
COURSE TITLE	IT PROJECT MANAGEMENT		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization course
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION: **LANGUAGE OF EXAMINATION/ASSESSMENT:**	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD129/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

By the end of this course students will be able to:

1. Understand the basic concepts and distinguish the characteristics of projects and functions.
2. Understand the structure and the framework of IT project.
3. Classify the stages that will describe the basic features of an IT project management.
4. Define the subject and analyze the features of a project.
5. Identify the techniques and methods of IT project management.
6. Focus on the ways of applying the strategic principles that are provided by project management.
7. Evaluate and select the most suitable of the available ways for making possible the application of the strategic principles.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and composition of data and information with the use of appropiate technological tools.
- Problem solving
- Decision making
- Planning and management of projects
- Work in a international environment
- Job prospect in a wide spectrum of professions
- Development of critical thinking
- Analytical, structured, creative and inductive thinking

(3) COURSE CONTENT

Basic course content:

- Basic concepts with distinction between projects and functions
- Structure and framework of an IT project
- The phases and the basic elements in the management of an IT project.
- The topic and the environment of the project
- Techniques and methods of IT project management
- Approaches of applying the strategic principles in projects
- Analyzing case studies

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	The learning process in supported through the electronic platform e-class.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	*Semester workload*
Lectures	80
Field exercise	30
Study and analysis of bibliography	5
Independent study	10
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS	Written assignment (100%) that includes: Problem solving and project management.

Detailed description of the evaluation procedures: *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Two recommended textbooks through evdoxos:

[13644] Project Management, HARVEY MAYLOR

[6362] Management - Managing IT projects, Antonis Dimitriadis

EDUCATIONAL SOFTWARE

COURSE OUTLINE

(1) GENERAL

SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES			
DEPARTMENT	INFORMATICS			
COURSE LEVEL	UNDERGRADUATE			
COURSE CODE	**ΠΛΕΚΛ01**	**COURSE SEMESTER**	**8**	
COURSE TITLE	**EDUCATIONAL SOFTWARE**			
TEACHING ACTIVITIES			**TEACHING HOURS PER WEEK**	**ECTS**
	INSTRUCTION – LAB EXERCISES		4+2	5
COURSE TYPE	SPECIALTY TRACK (EY) SOFTWARE ENGINEERING AND INTELLIGENT SYSTEMS TRACK			
EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:				
TEACHING AND EXAMINATIONSLANGUAGE::	Greek			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEB PAGE (URL)	https://gunet2.cs.unipi.gr/courses/TMD101/			

(2) COURSE LEARNING OBJECTIVES

COURSE LEARNING OBJECTIVES
In this course the student will briefly review the learning theories and their connection to ICT teaching. The main objective is to present the techniques and methods that allow their use in the design and development of Educational Software. Functional specifications and tools are presented and analyzed through which the Educational Software is organized. Models of smart teaching systems based on educational software are presented and studied.

Upon successful completion of this course students will be able to: 1. Describe the functional parts of an educational software 2. Design and implement an educational software 3. Apply standard smart teaching approaches with software 4. Evaluate an educational software in terms of its completeness

(3) COURSE CONTENT

General Skills
1. Standalone-Autonomous work 2. Teamwork 3. Adapt to new situations 4. Search, analysis and composition of data and information using technologies
Basic course content includes: • Introduction to computer-assisted instruction • Introduction to smart assistive systems. • Models for the user, with emphasis on diagnosing errors. • Representation of the field of knowledge of teaching applications. • Counselling generator and interface system with the student. • Presentation of smart teaching systems standards in various fields and multimedia.

(4) TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD	In Class and in Laboratory
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	**Use ICT in Teaching and in Laboratories.** **Support the learning process through the course's website (eclass gunet). Notes and educational material, etc.**
TEACHING ORGANIZATION Describe in detail the way and methods of teaching: Enhanced Lectures, Online Lectures, Seminars, Tutorial, Laboratory, Laboratory Exercise, Study & analysis of literature, Practice (Positioning), Interactive teaching, Developing a project, Individual / group work Telework (reference to tools)etc. Details of the student's study hours for each learning activity and hours of non-guided study are shown to ensure that the total workload at the semester corresponds to the ECTS	(see table below)

Δραστηριότητα	***Φόρτος Εργασίας Εξαμήνου***
Lectures	60
Laboratory Exercises	24
Project-Case Study	41

	Total Course (25 hours per ECTS point)	125
ASSESSMENT OF STUDENTS *Description of the assessment process* *Assessment Methods, Formative or Concluding, Multiple Choice Test, Quick Response Questions, Test Development Questions, Problem Solving, Written Work, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Other Fully defined evaluation criteria are*	Presentation of Software Implementation Work in a Laboratory Environment with Computer & Oral Examinations (100%) Presentation language: Greek The assessment method is communicated to the students at the beginning of the semester through the systems of the department (eclass)	

(5) LITERATURE AND STUDY MATERIALS / READING LIST

Suggested Literature:

1 TEACHING INFORMATION TECHNOLOGY AND APPLICATIONS, Nikolaos Νικόλαος A. Alexandris, Vassilios S. Belesiotis, Evangelos X. Fountas, Varvarigou publishing, 2015, Athens

2 THE EDUCATIONAL SOFTWARE AND ITS EVALUATION, Ch. Panagiotakopoulos, Ch. Pierrakeas, P. Pintelas, Metechmio Publishing, 2003, Athens

SPEECH AND AUDIO PROCESSING

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΠΛΕΠΣΦΗ01	**Semester**	8th
COURSE TITLE	Speech and Audio Processing		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures	2	
Laboratory exercises	2	
Total	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, Skills development
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION:	Greek/English
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD103/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

- Possess specialized knowledge of: sampling/recording methods for speech and audio signals, sound perception theory and psychoacoustics, spectral analysis, coding/compression, recognition and synthesis techniques for speech and audio signals.
- Understand how signal processing theory, psychoacoustics and machine learning are combined and interoperated to design and implement various speech and audio processing and analysis systems, like speech/audio enhancement, compression and recognition/synthesis systems.
- Possess the skills to solve problems involving real-world data (of open-source nature), for which it is requested to design and develop speech and audio processing/analysis systems, perform feasibility studies, select the most appropriate algorithms each time and assess the comparative performance of systems under study.
- Deal with the computational burden and complexity imposed by data stemming from real-world problems in a team environment.
- Possess advanced Python/Matlab/GNU Octave programming skills for the implementation of algorithms, techniques and methods for the processing of speech and audio content.
- Identify and re-use existing open-source implementations related to multimedia content processing, like the librosa library of functions.
- Understand how the field of speech and audio processing is related to other neighboring disciplines, like the fields of image and video processing.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,	*Project planning and management*
Adapting to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Environmental awareness*
Individual/Independent work	*Social, professional and ethical responsibility and sensitivity to gender issues*
Group/Team work	*Critical thinking*
Working in an international environment	*Development of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Introduction of innovative research	*(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)*
	…….

- Search, analyze and combine data and information using appropriate technologies.
- Individual work
- Teamwork
- Adapting to new situations
- Demonstrate critical thinking
- Evaluation skills
- Problem solving
- Design and implement projects
- Collaborative spirit and communication skills
- Stress and workload management
- Promote creative thinking and inference

(3) COURSE CONTENT

This course, although part of the broader scientific discipline of Signal Processing, specializes on combining knowledge from the fields of machine learning, coding, psychoacoustics and physical modelling, so as to cover the requirements of compression and recognition/synthesis systems. The course is split into ten sections and each section is taught over one or more lectures:

Section 1: Introduction to Speech and Audio processing.
Section 2: Overview of necessary Signal Processing concepts.
Section 3: Fundamentals of sound production, hearing, sound perception and sound propagation inside the vocal tract.
Section 4: Time-domain methods.
Section 5: Spectral representations.
Section 6: Linear Prediction methods.
Section 7: Speech and audio Parameter Estimation.
Section 8: Speech and Audio Coding.
Section 9: Text-to-speech synthesis
Section 10: Speech and audio recognition, Natural Language Understanding and Audio Event Detection.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing, laboratory training
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Specialized software in Python/Matlab/GNU Octave is used by the teacher in the class to present, demonstrate and compare selected algorithms. The students use the same software to implement their project assignments. Communication is supported by a e-class platform.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	15
Laboratory exercises	15
Project assignment to teams of students asking for the design and implementation of a speech/audio processing system.	45
Individual study	50
Total (25 workload units per credit unit)	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	5. Written exams at the end of the semester (60% of the total grading score), including exercises that challenge the student's understanding of the theory that they have been taught, e.g., exercises related to sampling, spectral representations, psychoacoustics, coding and linear systems processing of speech and audio signals. 6. Programming assignment delivered at the end of the semester (40% of the total grading score) by teams of at most three students. The project assignment is about the development and evaluation of a multimedia system in Python/Matlab/GNU Octave that processes open-source data. The project outcome is delivered via e-mail or the e-class platform and consists of software code and respective documentation, where all design choices and evaluation outcomes are documented.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

[1] L.R. Rabiner, R.W. Schafer, "Theory and Applications of Digital Speech Processing", L.R. Rabiner, R.W. Schafer, 2011, Pearson Higher Education.

[2] «Ψηφιακή Επεξεργασία Σήματος: Σήματα, Συστήματα και Φίλτρα», Andreas Antoniou, Εκδόσεις Τζιόλα, 2009.

[3] John R. Deller, John H. L. Hansen, John G. Proakis, Discrete-Time Processing of Speech Signals, Wiley-IEEE Press; Reprint edition, September 1999.

INTELLIGENT AGENTS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**ΠΛΕΥΦΠΡ01**	**SEMESTER**	**8**
COURSE TITLE	INTELLIGENT AGENTS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHNG HOURS**	**CREDITS**
Teaching and examples	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD113/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

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

1. understand the structure of an intelligent agent.
2. recognize the characteristics of the operation of an intelligent agent and the ways in which it communicates with an environment.
3. distinguish and evaluate when a Reactive Agent is needed and when a Deliberative Agent is needed
4. apply the Sense-Decide-Act, BDI (Belief-Desire-Intention) models, in various cases of agents
5. develop path finding algorithms and plan generation
6. assess when it is necessary to implement motivation-based action planning and emotional computing in intelligent agents.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

1. Search for, analysis and synthesis of data and information by the use of appropriate technologies
2. Adapting to new situations
3. Respect for diversity (regarding behaviors and human communication)
4. Group/Team work
5. Critical thinking
6. Decision making
7. Introduction of innovative research
8. Development of free, creative and inductive thinking

(3) COURSE CONTENT

- Structure and operation of an intelligent agent within an environment.
- Reactive Agents and Deliberative Agents.
- The Sense-Decide-Act cycle,
- the BDI model (Belief-Desire-Intention), path finding (path finding), representation of actions (action representation)
- plan generation, motivation-based action planning and the Maslow pyramid,
- Affective computing in intelligent agents.
- The development of relevant systems of intelligent agents.
- The applications on the Unity3D platform.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use of ICT in teaching
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	26
Algorithm and system development in class	26
Independent study	40
Team project for specific case study	33
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Presentation of Teamwork of 2-3 people Evaluation criteria: Quality of report Quality of Powerpoint presentation Quality of short video produced Application complexity (2D or 3D) Level of autonomy of intelligent agents Platform complexity (Unity3D) Innovation in approach

(5) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
   Ι. Βλαχάβας, Π. Κεφαλάς, Ν. Βασιλειάδης, Φ. Κόκκορας, Η. Σακελλαρίου,
   Τεχνητή Νοημοσύνη - Γ' Έκδοση, ISBN: 978-960-8396-64-7,
   Published / Available: University of Macedonia Publications, 2011,
   Book Code in Eudoxus: 12867416

   Russell Stuart, Norvig Peter, Τεχνητή νοημοσύνη : Μια σύγχρονη προσέγγιση
   Publisher: Κλειδάριθμος, ISBN: 9789602098738, 2004

2. Related scientific journals:

ERP/CRM

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLSYS02	**Semester**	8th
COURSE TITLE	ERP/CRM SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4		

COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Major concentration
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION:	Greek
LANGUAGE OF EXAMINATION/ASSESSMENT:	
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMA109/

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

By the end of this course students will be able to:

1. Know the basic concepts of enterprise activities
2. Identify the methods of completing the management of information systems
3. Understand the range of possibilities of ERP and CRM systems.
4. Identify the methodologies of application of an ERP system within a business/organization.
5. Looking for data and information for identifying and solving problems
6. Analyze and compose data and information taking advantage the most suitable in every occasion technologies
7. Compare and evaluate the modern trends in enterprise resource planning

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Search, analysis and composition of data and information with the use of appropiate technological tools.
- Independent work
- Team work
- Problem solving
- Decision making
- Working in an interdisciplinary environment

(3) COURSE CONTENT

Basic course content: • Basic concepts of the enterprise procedures • Description of methods of completing information systems for enterprise resource planning / information. • Areas of application and methodologies of development • Evaluation of commercial applications ERP • Systems of Enterprise applications in businesses (architectures, types, evaluation) • Customer relationship management (architectures, types, evaluation) • Case studies

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	in class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	The learning process in supported through the electronic platform e-class.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	40
Group assignment in case study	40
Study and analysis of bibliography	15
Independent study	30
Total	125

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Written assignment (100%) that includes essay / report.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

Recommended textbooks through two evdoxos:

[22945] Enterprise resource planning systems, Ioannou Georgios

[2219] information systems Enterprise resource planning: Strategies & Applications, Giannis Pollalis, Athanasios Bozikis

Journal of Enterprise Information Management

https://www.emeraldinsight.com/journal/jeim

ADVANCED TOPICS IN NETWORK AND MOBILE COMMUNICATION MANAGEMENT

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	**PLTHEDDE01**		**8th**
COURSE TITLE	Advanced Topics in Network and Mobile Communications Management		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
		6	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Specialization of general knowledge		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION:	GREEK (& ENGLISH)		
LANGUAGE OF EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMC144/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

With the successful completion of the course, the student should:

1. He understands the basic principles and architecture of management systems.
2. Knows modern management techniques/methodologies..
3. Itautomates network virtualization issues,
4. Recognizes distributed application management techniques and their impact on network performance, SDN and NFV in 5G.
5. Knows the integrated distributed application management platforms
6. Understands issues relating to the regulation of moderntelecommunications markets
7. Designs and operates systems
8. Evaluates the operation of systems
9. Ittreats system errors and failures.
10. Learns touse advanced management tools
11. Itanalyses, studies, evaluates andproposes broad solutions for a series of systems and network managementscenarios.

Contribution of the course to the coverage of professional requirements:

1. Students are introduced to basic systems management technologies and architectures.
2. Students are introduced to various kinds of technologies and standards of distributed systems and network virtualization. εικονικοποίησης
3. Students learn to design and develop management systems and evaluate their performance.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

- Autonomous work
- Teamwork
- Promoting free, creative and inductive thinking
- Search, analysis and synthesis of data, techniques and information, using the necessary tools
- Project planning and management
- Evaluation of different solutions and selection of the most appropriate

(3) COURSE CONTENT

The aim of the course is to provide students with the necessary knowledge regarding management περιεχόμενδο protocols, SNMP, CMIP, the TMN standard, modern management techniques/methodologies as well as issues related to the regulation of modern telecommunications markets. 1. Concepts related to hardware and software will be studied on a modern distributed computing system, integrated distributed application management platforms; 2 will ensure familiarity with advanced tools for managing new generation integrated networks - 5G, cloud computing architectures, and emerging models that expand their capabilities.. εικονικοποίησης overlay εικονικοποίηση3. Θα Virtualization (NFV) virtualization network functions, software-defined networks (SDNs), Virtualization techniques, overlay networks, wireless virtualization, SDN and NFV in5G will be analyzed.

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	Weekly lectures in class and in the workshop
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	• Use electronic slides in lectures. • Use of computers and network infrastructures during laboratory exercises. • Maintenance of a course website with announcements and provision of teaching material. • Posting scores through Pan's online course management platform. Piraeus. Use email to communicate with students.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self-*	(see table below)

Activity/Method	***Semester workload***
Teaching - Workshops	74
Preparation of astudy (project)	51
Total	125

directed study are given following the principles of the ECTS.	

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,* *other……etc.* *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	Laboratory Exercises - Written Examinations The final grade results 70% from the final examination, 30% from the laboratory exercises.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Network Function Virtualization, Zhang, Wiley ebooks
- Green Mobile Networks, Ansari, Wiley ebooks
- Technology of Terrestrial Cellular Mobile Communications Systems, Kotsopoulos Stavros, Publications A. Giola & Sons O.E.
- Τηλεπικοινωνιακα Συστηματα, Καραγιαννιδης Γεωργιος, Παππη Κοραλια, 4η 2017 ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- Αρχες και μοντελοποιηση ασυρματης διαδοσης, Κωτσοπουλος Σταυρος, 2016 ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- Mobile and Personal Communications Networks, Theologian M., Publications A. Giola & Sons O.E.

BLOCKCHAIN TECHNOLOGIES AND APPLICATIONS

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	INFORMATION AND COMMUNICATIONS TECHNOLOGIES		
DEPARTMENT	INFORMATICS		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	PLEPDIPR01		
COURSE TITLE	Blockchain technology and applications		
INDEPENDENT TEACHING ACTIVITIES *in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHNG HOURS**	**CREDITS**
Lectures and laboratory exercises		4	5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4			
COURSE TYPE *Background knowledge, Scientific expertise, General Knowledge, Skills Development*	Scientific expertise, General knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION:	Greek		
LANGUAGE OF EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://gunet2.cs.unipi.gr/courses/TMD140/		

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.

It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Upon completion, the students:

- Will have familiarized themselves with cutting-edge technologies
- Will have experience in using Distributed Ledger Technologies to solve selected business problems in particular areas of interest
- Will be able to describe and analyze the basic features of blockchain technology (origin, individual specifications, architectures),
- Will be able to implement and make use of Smart Contracts
- They will be exposed to blockchain's relevant applications while focusing on various business problems in key areas such as health, economy, governance, data management/security, supply chain management, etc.
- They will learn the Solidity programming language and use it in the creation of Smart Contracts in Ethereum blockchains and the development of related applications.
- Will select the appropriate blockchain configuration for addressing real-life business problems.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies, *Adapting to new situations* *Decision-making* *Individual/Independent work* *Group/Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Introduction of innovative research*	*Project planning and management* *Respect for diversity and multiculturalism* *Environmental awareness* *Social, professional and ethical responsibility and sensitivity to gender issues* *Critical thinking* *Development of free, creative and inductive thinking* *……* *(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)* *…….*

- Individual/Independent work
- Group/Team work
- Project planning and management

(3) COURSE CONTENT

- Introduction to the concepts and functionalities of Distributed Ledger Technologies
- Introduction to blockchain technology (origin, individual technical characteristics, architecture)
- Introduction to smart contracts and relevant applications
- Application of blockchain technology in key areas such as health, economy, governance, data management/security, supply chain management, etc.).
- Introduction of the Solidity programming language and development of relevant applications (Ethereum blockchain).

(4) TEACHING METHODS--ASSESSMENT

MODES OF DELIVERY *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in teaching, Laboratory Education, Communication with students*	Use of the ICT electronic platform e-class. Theoretical in-class lecturing and laboratory practice. In particular, the theoretical lectures include group discussions and analysis of case studies on real-life business cases whereas the laboratory exercise entail the usage of Solidity programming language and the development of blockchain-enabled applications. The main subjects of each module are presented by the instructor: • in the form of lectures supported by visual material • through laboratory exercises.
COURSE DESIGN *Description of teaching techniques, practices and methods:* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.* *The study hours for each learning activity as well as the hours of self- directed study are given following the principles of the ECTS.*	see table below

Activity/Method	***Semester workload***
Lectures	20 x 2 = 40
Group discussions	6 x 2 = 12
Self-study	38
Essay writing	35
Total	***125***

STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS *Detailed description of the evaluation procedures:* *Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work,*	Students will demonstrate constructive and critical responses through the final exam and writing assignment. The final exam will cover all of the chapter readings, outside readings, and discussions during the semester. The final exam consists of both multiple-choice and open questions. The final grade consists of 40% of the laboratory assignment and 60% of the final exam grade.

other……etc. *Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.*	

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- V. Dhillon, D. Metcalf, M. Hooper (2017). Blockchain Enabled Applications. Understand the blockchain ecosystem and how to make it work for you. Springer International Publishing Switzerland.
- Bheemaiah, K. (2017). The Blockchain alternative: rethinking macroeconomic policy and economic theory, Apress.
- Drescher, D. (2017). Blockchain basics, Springer.
- Morabito, V. (2017). "Business Innovation Through Blockchain." Cham: Springer International Publishing.

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