Student Handbook 2022-2023
MESSAGE FROM THE CHAIR OF THE DEPARTMENT OF INFORMATICS

PROFESSOR MARIA VIRVOU

Welcome to the Department of Informatics of the School of Information and Communication Technologies of the University of Piraeus.

The Department of Informatics was established with the aim of conducting research in the fields of modern Informatics and the training of young Informatics scientists who will contribute to the economy of our country.

Informatics is a fascinating science. Its theoretical aspects have great depth. At the same time, the range of applications of modern IT is huge and constantly expanding, as we encounter IT applications in every expression of our daily lives. Despite this huge development, one can say that Informatics, as a science and technology, still has a long way to go. This creates attractive career opportunities for young people in various IT companies, in secondary education, as well as in Academia, since the Academic IT Departments are the fastest growing Departments of Universities. I estimate that these opportunities will exist for several decades to come, as IT will be constantly expanding into new fields of application.

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 25 years and teaching and research is performed by
approximately 25 Professors of various levels, as well as a number of part-time collaborators. We offer remarkable undergraduate and graduate programs. At the same time, we are participating as an important research partner in international scientific developments. These events, in combination with the great percentage of absorption of our graduates in the labor market, made our Department sought after for both undergraduate and postgraduate studies.

The **undergraduate** program offers students a first-level specialization through various elective courses and the operation of three directions that focus on some areas of Informatics. However, the aim of the undergraduate program of Informatics is the presentation of the whole science of Informatics and not the specialization in a field. Specialization can only be provided in the context of an IT **graduate** program. As Informatics has already passed five decades of its development, it has become necessary to specialize by attending a postgraduate program in Informatics.

The Department of Informatics offers 4 Postgraduate Programs (MSc) and in addition participates in 2 Interdepartmental Postgraduate Programs. The content and the physiognomy of these programs have been designed to successfully meet the special scientific needs that arise due to the rapid development of Information Technology and new Technologies at a national, European and international level.

The MSc in ”Advanced Informatics and Computing Systems - Software Development and Artificial Intelligence”, with two academic semesters of courses and one academic semester for the preparation of a postgraduate dissertation, has an objective of coordinated development and organization of the research directions of Computer Science and new Technologies and more specifically those relating to areas of high priority for our country. The program deals with the most advanced scientific issues in the field of Informatics and new technologies and awards an MSc in one of the following three directions: (1) Intelligent Technologies for HCI, (2) Advanced Software Development Technologies and (3) e-Service and m-Service Technologies.

The MSc in ”Informatics”, with three academic semesters of courses and one academic semester of courses and elaboration of a postgraduate dissertation, has an objective of providing thorough and high level education to graduates of Universities and ATEI of diverse scientific fields in the principles and methodologies of the modern science of Informatics and the provision of specialization in its branches. The program addresses contemporary issues of technology and applications of the science of Informatics in other modern sciences. The content and physiognomy of the program has been designed to successfully meet the special scientific needs caused by the rapid development of Informatics and its applications at national, European and international level. The program is aimed
at graduates from a wide range of scientific fields, not necessarily related to Informatics.

The MSc "Digital Culture, Smart Cities, IoT and Advanced Digital Technologies", with two academic semesters of courses and one academic semester for the preparation of a postgraduate dissertation, has an objective of coordinated development and organization of research in high priority areas for our country, such as Digital Culture, Smart Cities, Internet of Things (IoT), as well as Modern Communications and Digital Technologies. The program awards an MSc entitled "Digital Culture, Smart Cities, IoT and Advanced Digital Technologies" with a specialization in one of the following three areas: (1) Digital Culture, (2) Smart Cities and Advanced Digital Technologies and (3) Internet of Things (IoT) and Advanced Digital Technologies. The program is addressed to graduates from different scientific fields.

The MSc "Distributed Systems, Security and Emerging Information Technologies", with two academic semesters of courses and one academic semester for the preparation of a postgraduate dissertation, has an objective of training young scientists in the scientific areas of Network and Computer Security, Distributed and Computing Systems, Business Analytics and Emerging Technologies and Information Services. The purpose of the program is the scientific and technological training of University graduates from Departments of Informatics, Telecommunications and related fields, in fields of Informatics that demonstrate rapid scientific development, high dynamics and ever-increasing demand in the national, European and international market.

The Department of Informatics of the University of Western Macedonia in collaboration with the Department of Informatics of the University of Piraeus organize and operate from the academic year 2018-2019 an Interdepartmental Postgraduate Program entitled "Modern Information Technologies and Services". The program awards a Postgraduate Diploma entitled "Master of Science (MSc) in Modern Information Technologies and Services" with a specialization in one of the following two directions: (1) Modern Telecommunication Systems, Internet Technologies, Internet of Things and Systems Security and (2) Information and Communication Technologies in Education.

The Interdepartmental MSc "Health Care Management - Health Informatics " is organized by the Departments of Nursing, Economics and Informatics & Telecommunications of the National and Kapodistrian University of Athens, the Departments of Informatics, Digital Systems and Industrial Management & Technology of the University of Piraeus. The objective of the program is the provision of specialized scientific knowledge to graduates of higher education in order to meet the needs of Health Care services with modern
methods of Management Organization, Financial Management of Health Care Services, IT and Technology.

In addition to the undergraduate and graduate programs, our Department also offers the possibility of earning a **doctoral degree**. During the years of operation of the Department, about 60 doctoral dissertations have been successfully defended. Many of these 60 Doctors of our Department are currently members of the Teaching and Research Staff of Greek and foreign Universities and TEI, as well as at research centers. Currently, there are about 80 PhD Candidates registered in the Department. The subjects of the ongoing doctoral research covers a wide range of research areas of modern Informatics. As part of the preparation of doctoral dissertations, PhD candidates prepare and present original papers which are announced at international conferences and published in reputable scientific journals of very high prestige. A highlight of the very high level of research carried out in our Department is the fact that in recent years publications of faculty members and PhD candidates have not only been published, but have also been acclaimed in recognized international conferences and journals, by either receiving “best paper awards”, or receiving flattering comments from other researchers from other countries or being highly ranked in the lists of the most widely read articles in scientific journals in which they have been published. These achievements are not insignificant, as international conferences and journals publish articles in renowned scientific publishing houses based in countries that are considered technologically more advanced than our country and where articles from many other countries are presented.

In addition to the above, the Department of Informatics provides the possibility of remote attendance of seminar courses on many current topics of Informatics that address wider audiences. The seminar courses are carried out through an e-learning program.

The Department of Informatics has been recognized through significant international distinctions. Such a significant international recognition is reflected in the results of the Microsoft Academic Search tool developed by the well-known company Microsoft. According to the tool, the University of Piraeus is ranked in the top 100 in the world, specifically at position 73, among 4,333 other universities and organizations worldwide in the area of Computer Education. The same tool ranks members of the Department of Informatics among the top scientists in this and other areas among tens of thousands of scientists worldwide.

Recently, on April 29, 2014, our Department had the special honor to accept in its academic community the leading Greek scientist of Informatics, Prof. Joseph Sifakis, awarding him an Honorary Doctorate. Prof. J. Sifakis is the only Greek among the few European Scientists to have received the Turing Prize, which is considered equivalent to the Nobel Prize in Informatics.
Thank you very much for your interest in the Department of Informatics of the University of Piraeus. We will be very happy to provide more information about our Department to anyone interested, either by phone (210-4142263 and 210-4142105) or through the website http://www.cs.unipi.gr.

Dr. Maria Virvou
Professor
Chair of the Department of Informatics
ADMINISTRATIVE BODIES OF THE UNIVERSITY

1. Senate
2. Rector’s Council
3. Rector
4. Vice Rectors

ADMINISTRATIVE BODIES OF THE SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGIES

1. General Assembly
2. Dean’s Office
3. Dean

ADMINISTRATIVE BODIES & STAFF OF THE DEPARTMENT OF INFORMATICS

1. General Assembly of the Department
2. Department Chair

Department Chair: Professor M. Virvou

Staff:

Professors
Apostolou Dimitrios
Vergados Dimitrios
Virvou Maria
Douligeris Christos
Theodorides Ioannis
Konstantopoulos Charalampos
Metaxiotis Konstantinos
Panagiotopoulos Themistoklis
Polemi Despoina
Tsihrintzis George

Associate Professors
Alepis Efthimios
Vougiouklidou Anna
Kotzanikolaou Panagiotis
Patsakis Constantinos
Sakkopoulos Evangelos
Psarakis Michael

Assistant Professors
Venetis Ioannis
Pikrakis Angelos
Sotiropoulos Dionisios
Tasoulas Ioannis

Administrative staff
Gotsi Vasiliki (Secretary)
Evgenia Tomara
Katsiadrami Aristeia
Koskina Spyridoula

www.cs.unipi.gr
**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

### 1st Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Type of course</th>
<th>Hours (per week)</th>
<th>Credits</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGIC DESIGN OF DIGITAL SYSTEMS</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Psarakis Michael</td>
</tr>
<tr>
<td>ANALYSIS I</td>
<td>M</td>
<td>4+2T</td>
<td>5</td>
<td>Tasoulas Ioannis</td>
</tr>
<tr>
<td>INTRODUCTION TO PROGRAMMING</td>
<td>M</td>
<td>4</td>
<td>5</td>
<td>Apostolou Dimitrios</td>
</tr>
<tr>
<td>INTERNET TECHNOLOGIES</td>
<td>M</td>
<td>4+2W</td>
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<td>Douligeris Christos</td>
</tr>
<tr>
<td>INTRODUCTION TO COMPUTER SCIENCE</td>
<td>M</td>
<td>4+2T</td>
<td>5</td>
<td>Patsakis Constantinos</td>
</tr>
<tr>
<td>MATHEMATICS FOR COMPUTER SCIENCE</td>
<td>M</td>
<td>4+2T</td>
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### 2nd Semester

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<tr>
<td>ANALYSIS II</td>
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<tr>
<td>DISCRETE MATHEMATICS</td>
<td>M</td>
<td>4+2T</td>
<td>5</td>
<td>Tasoulas Ioannis</td>
</tr>
<tr>
<td>DATA STRUCTURES</td>
<td>M</td>
<td>4</td>
<td>5</td>
<td>Konstantopoulos Charalampos, Venetis Ioannis</td>
</tr>
<tr>
<td>OBJECT ORIENTED PROGRAMMING</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Alepis Efthimios</td>
</tr>
<tr>
<td>COMPUTER ARCHITECTURE</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Psarakis Michael</td>
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<tr>
<td>APPLIED ALGEBRA</td>
<td>M</td>
<td>4+2T</td>
<td>5</td>
<td>Tasoulas Ioannis, Venetis Ioannis</td>
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### 3rd Semester

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<th>Type of course</th>
<th>Hours (per week)</th>
<th>Credits</th>
<th>Lecturers</th>
</tr>
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<tbody>
<tr>
<td>MATHEMATICAL PROGRAMMING</td>
<td>M</td>
<td>4</td>
<td>5</td>
<td>Apostolou Dimitrios, Koronakos Gregory</td>
</tr>
<tr>
<td>OBJECT ORIENTED APPLICATION DEVELOPMENT</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Alepis Efthimios</td>
</tr>
<tr>
<td>OPERATING SYSTEMS</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Venetis Ioannis, Kotzanikolaou Panagiotis</td>
</tr>
<tr>
<td>COMPILERS</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Pikrakis Aggelos, Chrysafiadi Konstantina</td>
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<tr>
<td>PROBABILITY AND STATISTICS</td>
<td>M</td>
<td>4+2T</td>
<td>5</td>
<td>Tasoulas Ioannis, Sotiropoulos Dionisios</td>
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<tr>
<td>APPLICATIONS OF GRAPH THEORY</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Tasoulas Ioannis</td>
</tr>
<tr>
<td>MANAGEMENT</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Ntalianis Filotheos</td>
</tr>
<tr>
<td>PEDAGOGICS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Vougiouklidou Anna</td>
</tr>
<tr>
<td>INFORMATICS LAW</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Sinanioti Aristea</td>
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<tr>
<td>ENGLISH III</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
<td>Mormori Pelagia</td>
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<tr>
<td>FRENCH III</td>
<td>F.L.</td>
<td>4</td>
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Students select one of the offered selection courses.

### 4th Semester

<table>
<thead>
<tr>
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<th>Type of course</th>
<th>Hours (per week)</th>
<th>Credits</th>
<th>Lecturers</th>
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<tbody>
<tr>
<td>COMPUTER NETWORKS</td>
<td>M</td>
<td>4+1W</td>
<td>5</td>
<td>Douligeris Christos</td>
</tr>
<tr>
<td>ALGORITHMS</td>
<td>M</td>
<td>4</td>
<td>5</td>
<td>Konstantopoulos Charalampos</td>
</tr>
<tr>
<td>DATABASES</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Theodorides Ioannis</td>
</tr>
<tr>
<td>INTERNET AND WEB PROGRAMMING</td>
<td>M</td>
<td>4+2W</td>
<td>5</td>
<td>Kotzanikolaou Panagiotis</td>
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<tr>
<td>PRINCIPLES AND APPLICATIONS OF SIGNALS AND SYSTEMS</td>
<td>M</td>
<td>4+1W</td>
<td>5</td>
<td>Douligeris Christos, Tsihrintzis George</td>
</tr>
<tr>
<td>INFORMATICS IN EDUCATION</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Chrysafiadi Konstantina</td>
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<tr>
<td>INFORMATION AND CODING THEORY</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Patsakis Constantinos</td>
</tr>
<tr>
<td>APPLIED COMBINATORICS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Tasoulas Ioannis</td>
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<tr>
<td>BUSINESS STRATEGY</td>
<td>S</td>
<td>4</td>
<td>5</td>
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<tr>
<td>DYNAMICAL SYSTEMS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Mormori Pelagia</td>
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<tr>
<td>ENGLISH IV</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
<td>Vougiouklidou Anna</td>
</tr>
<tr>
<td>FRENCH IV</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
<td>Vougiouklidou Anna</td>
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Students select one of the offered selection courses.
### 5th Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Type of course</th>
<th>Hours (per week)</th>
<th>Credits</th>
<th>Lecturers</th>
</tr>
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<tbody>
<tr>
<td>HUMAN COMPUTER INTERACTION</td>
<td>M(D)</td>
<td>4+2W</td>
<td>5</td>
<td>Virvou Maria</td>
</tr>
<tr>
<td>INFORMATION SYSTEMS</td>
<td>M(D)</td>
<td>4</td>
<td>5</td>
<td>Metaxiotis Konstantinos</td>
</tr>
<tr>
<td>PATTERN RECOGNITION</td>
<td>M(D)</td>
<td>4</td>
<td>5</td>
<td>Tsihrintzis George, Sotiropoulos Dionisios</td>
</tr>
<tr>
<td>SCIENTIFIC WRITING IN EDUCATION</td>
<td>M(D)</td>
<td>4</td>
<td>5</td>
<td>Vougiouklidou Anna</td>
</tr>
<tr>
<td>ADVANCED COMPUTER ARCHITECTURE</td>
<td>M(D) NCS</td>
<td>4</td>
<td>5</td>
<td>Psarakis Michael</td>
</tr>
<tr>
<td>ADVANCED TOPICS IN COMMUNICATIONS</td>
<td>M(D) NCS</td>
<td>4+2W</td>
<td>5</td>
<td>Vergados Dimitrios</td>
</tr>
<tr>
<td>PROGRAMMING IN LOGIC</td>
<td>M(D) TSIS</td>
<td>4+2W</td>
<td>5</td>
<td>Apostolou Dimitrios</td>
</tr>
<tr>
<td>DATABASE MANAGEMENT SYSTEMS</td>
<td>M(D) TSIS,IS</td>
<td>4+2W</td>
<td>5</td>
<td>Theodorides Ioannis</td>
</tr>
<tr>
<td>CRYPTOGRAPHY</td>
<td>MD(IS)</td>
<td>4</td>
<td>5</td>
<td>Patsakis Constantinos</td>
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<tr>
<td>SPECIAL TOPICS ON OPERATIONAL RESEARCH</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Apostolou Dimitrios, Koronakos Gregory</td>
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<tr>
<td>THEORY OF COMPUTATION</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Konstantopoulos Charalampos</td>
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<tr>
<td>LEARNING MANAGEMENT SOFTWARE</td>
<td>E</td>
<td>4</td>
<td>5</td>
<td>Tsakonas Panagiotis, Chrysafiadi Konstantina</td>
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<tr>
<td>QUEUING THEORY</td>
<td>E</td>
<td>4</td>
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<tr>
<td>ENGLISH V</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
<td>Mormori Pelagia</td>
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<tr>
<td>FRENCH V</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
<td>Vougiouklidou Anna</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Type of course</th>
<th>Hours (per week)</th>
<th>Credits</th>
<th>Lecturers</th>
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<tbody>
<tr>
<td>SOFTWARE ENGINEERING</td>
<td>M(D)</td>
<td>4+2W</td>
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<td>Virvou Maria, Alepis Efthimios</td>
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<tr>
<td>ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS</td>
<td>M(D)</td>
<td>4</td>
<td>5</td>
<td>Apostolou Dimitrios</td>
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<tr>
<td>COMPUTER SYSTEMS DESIGN</td>
<td>M(D) NCS</td>
<td>4</td>
<td>5</td>
<td>Psarakis Michael</td>
</tr>
<tr>
<td>HIGH SPEED NETWORKS</td>
<td>M(D) NCS</td>
<td>4+2W</td>
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<td>Vergados Dimitrios</td>
</tr>
<tr>
<td>TELECOMMUNICATIONS, SERVICES AND SYSTEMS PROGRAMMING</td>
<td>M(D) NCS</td>
<td>4+2W</td>
<td>5</td>
<td>Vergados Dimitrios</td>
</tr>
<tr>
<td>DATA ANALYTICS</td>
<td>M(D) IS</td>
<td>3+2W</td>
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<tr>
<td>SYSTEMIC ANALYSIS</td>
<td>M(D) IS</td>
<td>4+1W</td>
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<td>DECISION SUPPORT SYSTEMS</td>
<td>M(D) IS</td>
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<tr>
<td>MULTIMEDIA SYSTEMS</td>
<td>M(D) TSIS</td>
<td>4</td>
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<tr>
<td>NATURAL LANGUAGE PROCESSING</td>
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<tr>
<td>BIOINFORMATICS</td>
<td>M(D) TSIS</td>
<td>4</td>
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<tr>
<td>DIDACTICS OF INFORMATICS</td>
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<td>4</td>
<td>5</td>
<td>Tsakonas Panagiotis</td>
</tr>
<tr>
<td>Course</td>
<td>Type of course</td>
<td>Hours (per week)</td>
<td>Credits</td>
<td>Lecturers</td>
</tr>
<tr>
<td>---------------------------------------------</td>
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<td>---------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>SECURITY GOVERNANCE</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Polemi Despoina, Patsakis Constantinos</td>
</tr>
<tr>
<td>INTELLIGENT SOCIAL NETWORKS INTERACTION</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Sotiropoulos Dionisios</td>
</tr>
<tr>
<td>SOFTWARE DESIGN PATTERNS</td>
<td>S</td>
<td>4+2W</td>
<td>5</td>
<td>Sakkopoulovs Evagelos</td>
</tr>
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<td>PARALLEL COMPUTING</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Venetis Ioannis</td>
</tr>
<tr>
<td>ENGLISH VI</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
<td>Mormori Pelagia</td>
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<tr>
<td>FRENCH VI</td>
<td>F.L.</td>
<td>4</td>
<td>3</td>
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Students select one of the offered selection courses or one course from another direction.

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<tr>
<th>Course</th>
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<th>Credits</th>
<th>Lecturers</th>
</tr>
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<tr>
<td>7th Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISSERTATION A</td>
<td>M(D)</td>
<td>4</td>
<td>5</td>
<td></td>
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<tr>
<td>DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEMS</td>
<td>M(D) NCS</td>
<td>4</td>
<td>5</td>
<td>Douligeris Christos, Psarakis Michael</td>
</tr>
<tr>
<td>MOBILE AND WIRELESS COMMUNICATIONS</td>
<td>M(D) NCS</td>
<td>4+2W</td>
<td>5</td>
<td>Vergados Dimitrios</td>
</tr>
<tr>
<td>INFORMATION SYSTEMS SECURITY</td>
<td>M(D) NCS, IS</td>
<td>4+2W</td>
<td>5</td>
<td>Kotzanikolaou Panagiotis</td>
</tr>
<tr>
<td>DATA SCIENCE TOPICS</td>
<td>M(D) IS</td>
<td>3+2W</td>
<td>5</td>
<td>Theodorides Ioannis, Pikrakis Aggelos</td>
</tr>
<tr>
<td>SYSTEMS’ SIMULATION</td>
<td>M(D) IS</td>
<td>4+1W</td>
<td>5</td>
<td>Asimakopoulos Nikitas</td>
</tr>
<tr>
<td>VIRTUAL REALITY</td>
<td>M(D) TSIS</td>
<td>4+2W</td>
<td>5</td>
<td>Panagiotopoulos Themistoklis</td>
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<td>IMAGE ANALYSIS</td>
<td>M(D) TSIS</td>
<td>4+2W</td>
<td>5</td>
<td>Tsihintzis George</td>
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<td>CURRENT TOPICS OF SOFTWARE ENGINEERING</td>
<td>M(D) TSIS</td>
<td>4+2W</td>
<td>5</td>
<td>Virvou Maria, Alepis Efthimios</td>
</tr>
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<td>INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB</td>
<td>M(D) IS</td>
<td>4</td>
<td>5</td>
<td>Konstantopoulos Charalamos, Venetis Ioannis</td>
</tr>
<tr>
<td>TUTORING PROGRAMS EVALUATION</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Tsakonas Panagiotis</td>
</tr>
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<td>PRACTICAL TRAINING</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Panagiotopoulos Themistoklis, Tsihintzis George</td>
</tr>
<tr>
<td>NEXT GENERATION VEHICULAR NETWORKS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Vergados Dimitrios</td>
</tr>
<tr>
<td>KNOWLEDGE MANAGEMENT</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Metaxiotis Konstantinos</td>
</tr>
<tr>
<td>SMART CITIES AND INTERNET OF THINGS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Dasaklis Thomas</td>
</tr>
<tr>
<td>E-LEARNING AND SOCIAL NETWORKS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Sotiropoulos Dionisios</td>
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<td>INFORMATION SYSTEMS IN SHIPPING</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Polemi Despoina</td>
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<td>COMPUTER GAME DEVELOPMENT TECHNOLOGIES</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Panagiotopoulos Themistoklis</td>
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<td>SERVICE ORIENTED PROGRAMMING</td>
<td>S</td>
<td>4+2W</td>
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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

<table>
<thead>
<tr>
<th>Course</th>
<th>Type of course</th>
<th>Hours (per week)</th>
<th>Credits</th>
<th>Lecturers</th>
</tr>
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<tbody>
<tr>
<td>DISSERTATION B</td>
<td>M(D)</td>
<td>4</td>
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<tr>
<td>NETWORK SECURITY</td>
<td>M(D) NCS</td>
<td>3+1W</td>
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<td>Kotzanikolaou Panagiotis</td>
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<td>E-BUSINESS AND INNOVATION</td>
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<td>4+2W</td>
<td>5</td>
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<td>M(D) NCS, IS</td>
<td>4+2W</td>
<td>5</td>
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<td>M(D) IS</td>
<td>4</td>
<td>5</td>
<td>Metaxiotis Konstantinos</td>
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<tr>
<td>EDUCATIONAL SOFTWARE</td>
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<td>4+2W</td>
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<td>Virvou Maria, Sakkopoulos Evangelos</td>
</tr>
<tr>
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<td>M(D) TSIS</td>
<td>2+2W</td>
<td>5</td>
<td>Pikrakis Aggelos</td>
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<td>INTELLIGENT AGENTS</td>
<td>M(D) TSIS</td>
<td>4+2W</td>
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<td>Panagiotopoulos Themistoklis</td>
</tr>
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<td>S</td>
<td>4</td>
<td>5</td>
<td>Tsihrintzis George</td>
</tr>
<tr>
<td>ERP/CRM</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Metaxiotis Konstantinos</td>
</tr>
<tr>
<td>ADVANCED TOPICS IN NETWORK AND MOBILE</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Vergados Dimitrios</td>
</tr>
<tr>
<td>COMMUNICATION MANAGEMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>TOTAL QUALITY MANAGEMENT</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Apostolou Dimitrios</td>
</tr>
<tr>
<td>BLOCKCHAIN TECHNOLOGIES AND APPLICATIONS</td>
<td>S</td>
<td>4</td>
<td>5</td>
<td>Patsakis Konstantinos</td>
</tr>
</tbody>
</table>

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" or "FRENCH III").

Regarding the foreign language course ("ENGLISH III" or "FRENCH 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" or "FRENCH IV").

Regarding the foreign language course ("ENGLISH IV" or "FRENCH 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" or "FRENCH V").

Regarding the foreign language course ("ENGLISH V" or "FRENCH 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") or "FRENCH VI").

Regarding the foreign language course ("ENGLISH VI" or "FRENCH 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 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, are given the opportunity to be examined at the end of each spring semester in only one of the courses "NATURAL LANGUAGE PROCESSING" or "GRAPHICS WITH COMPUTERS". It is noted that the latter will continue to be examined, without being taught, for the academic years 2018-2019 and 2019-2020.

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.

The 8th semester course “INTELLIGENT AGENTS” of the TSIS direction replaces the course “DISTRIBUTED ARTIFICIAL INTELLIGENCE”. 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.

**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:

$$\text{Grade of Degree} = \frac{4 \times \beta_π + \sum_{i=1}^{46} \beta_i}{50}$$

where \(\beta_π\): grade of dissertation and \(\beta_i\): grade of \(i^{th}\) 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 [students.unipi.gr](http://students.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 [sittisi.unipi.gr](http://sittisi.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](http://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](http://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**

**DreamSpark**: Microsoft software for learning, teaching and research

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://gunet2.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.
MAI N 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”


❖ “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”


❖ “Master of Science (M.Sc) in Distributed Systems, Security and Emerging Information Technologies”


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

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.

Applications & 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.
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 one's 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 Engineering Lab.
  Director: Prof. Virvou Maria.
- Decision Support Systems Laboratory.
  Director: Associate Prof. Apostolou Dimitrios.
- Information Systems Lab.
  Director: Associate 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: Assistant Prof. Psarakis Michael.
- Security Lab.
  Director: Associate Prof. Kotzanikolaou Panagiotis.
- Pattern Recognition and Machine Learning – Multimedia Laboratory.
  Director: Prof. Tsihrintzis George.
- Discrete Mathematics and Theoretical Informatics Laboratory.
  Director: Associate 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:

- 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.
- Computer architecture.
- Embedded Systems.
- Discrete mathematics.
- Operating Systems.
# Detailed Description – Course Information

## 1st Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logic Design of Digital Systems</td>
<td>34</td>
</tr>
<tr>
<td>Analysis I</td>
<td>34</td>
</tr>
<tr>
<td>Introduction to Programming</td>
<td>38</td>
</tr>
<tr>
<td>Internet Technologies</td>
<td>42</td>
</tr>
<tr>
<td>Introduction to Computer Science</td>
<td>46</td>
</tr>
<tr>
<td>Mathematics for Computer Science</td>
<td>50</td>
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<tr>
<td>Applied Algebra</td>
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## 2nd Semester

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Analysis II</td>
<td>58</td>
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<tr>
<td>Discrete Mathematics</td>
<td>62</td>
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<tr>
<td>Data Structures</td>
<td>66</td>
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<tr>
<td>Object Oriented Programming</td>
<td>70</td>
</tr>
<tr>
<td>Computer Architecture</td>
<td>73</td>
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<tr>
<td>Applied Algebra</td>
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## 3rd Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Mathematical Programming</td>
<td>81</td>
</tr>
<tr>
<td>Object Oriented Application Development</td>
<td>85</td>
</tr>
<tr>
<td>Operating Systems</td>
<td>88</td>
</tr>
<tr>
<td>Compilers</td>
<td>92</td>
</tr>
<tr>
<td>Probability and Statistics</td>
<td>96</td>
</tr>
<tr>
<td>Applications of Graph Theory</td>
<td>100</td>
</tr>
<tr>
<td>Management</td>
<td>103</td>
</tr>
<tr>
<td>Pedagogics</td>
<td>107</td>
</tr>
<tr>
<td>Informatics Law</td>
<td>111</td>
</tr>
<tr>
<td>English III</td>
<td>114</td>
</tr>
<tr>
<td>French III</td>
<td>118</td>
</tr>
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</table>

## 4th Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Pages</th>
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<tbody>
<tr>
<td>Computer Networks</td>
<td>122</td>
</tr>
<tr>
<td>Algorithms</td>
<td>127</td>
</tr>
<tr>
<td>Databases</td>
<td>131</td>
</tr>
<tr>
<td>Internet and Web Programming</td>
<td>135</td>
</tr>
<tr>
<td>Principles and Applications of Signals and Systems</td>
<td>139</td>
</tr>
<tr>
<td>Informatics in Education</td>
<td>143</td>
</tr>
<tr>
<td>Information and Coding Theory</td>
<td>147</td>
</tr>
<tr>
<td>Applied Combinatorics</td>
<td>151</td>
</tr>
<tr>
<td>Business Strategy</td>
<td>155</td>
</tr>
<tr>
<td>Dynamical Systems</td>
<td>160</td>
</tr>
<tr>
<td>English IV</td>
<td>164</td>
</tr>
<tr>
<td>French IV</td>
<td>169</td>
</tr>
</tbody>
</table>

## 5th Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Computer Interaction</td>
<td>173</td>
</tr>
<tr>
<td>Information Systems</td>
<td>177</td>
</tr>
<tr>
<td>Pattern Recognition</td>
<td>181</td>
</tr>
<tr>
<td>Scientific Writing in Education</td>
<td>186</td>
</tr>
<tr>
<td>Advanced Computer Architecture</td>
<td>190</td>
</tr>
</tbody>
</table>
ADVANCED TOPICS IN COMMUNICATIONS ................................................................. 194
PROGRAMMING IN LOGIC ...................................................................................... 198
DATABASE MANAGEMENT SYSTEMS ........................................................................ 201
CRYPTOGRAPHY ........................................................................................................ 205
SPECIAL TOPICS ON OPERATIONAL RESEARCH ......................................................... 209
THEORY OF COMPUTATION ...................................................................................... 215
LEARNING MANAGEMENT SOFTWARE ..................................................................... 219
QUEUING THEORY ....................................................................................................... 223
ENGLISH V ..................................................................................................................... 227
FRENCH V .................................................................................................................... 231
6th SEMESTER ............................................................................................................... 235
SOFTWARE ENGINEERING ......................................................................................... 235
ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS ................................................. 238
COMPUTER SYSTEMS DESIGN ................................................................................. 241
HIGH SPEED NETWORKS .............................................................................................. 245
TELECOMMUNICATIONS, SERVICES AND SYSTEMS PROGRAMMING ......................... 249
DATA ANALYTICS ......................................................................................................... 253
SYSTEMIC ANALYSIS ................................................................................................. 257
DECISION SUPPORT SYSTEMS .................................................................................... 261
MULTIMEDIA SYSTEMS ............................................................................................... 265
NATURAL LANGUAGE PROCESSING ............................................................................ 269
BIOINFORMATICS ......................................................................................................... 272
DIDACTICS OF INFORMATICS .................................................................................... 276
SECURITY GOVERNANCE ............................................................................................ 280
INTELLIGENT SOCIAL NETWORKS INTERACTION ....................................................... 284
SOFTWARE DESIGN PATTERNS .................................................................................. 288
PARALLEL COMPUTING .............................................................................................. 292
ENGLISH VI .................................................................................................................... 296
FRENCH VI ..................................................................................................................... 300
7th SEMESTER ............................................................................................................... 304
DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEMS ................................. 304
MOBILE AND WIRELESS COMMUNICATIONS ......................................................... 308
INFORMATION SYSTEMS SECURITY .......................................................................... 312
DATA SCIENCE TOPICS .............................................................................................. 316
SYSTEMS’ SIMULATION ............................................................................................... 320
VIRTUAL REALITY ........................................................................................................ 324
IMAGE ANALYSIS ........................................................................................................ 327
CURRENT TOPICS OF SOFTWARE ENGINEERING – SOFTWARE FOR MOBILE DEVICES .. 331
INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB ............... 335
TUTORING PROGRAMS EVALUATION ........................................................................ 339
NEXT GENERATION VEHICULAR NETWORKS .............................................................. 343
KNOWLEDGE MANAGEMENT ..................................................................................... 347
SMART CITIES AND INTERNET OF THINGS ............................................................... 351
E-LEARNING AND SOCIAL NETWORKS ....................................................................... 355
INFORMATION SYSTEMS IN SHIPPING .................................................................... 359
COMPUTER GAME DEVELOPMENT TECHNOLOGIES .................................................. 360
SERVICE ORIENTED PROGRAMMING ....................................................................... 363
8th SEMESTER ............................................................................................................... 367
NETWORK SECURITY .................................................................................................... 367
E-BUSINESS AND INNOVATION ................................................................. 371
INTERNET-BASED INFORMATION SYSTEMS ........................................ 375
IT PROJECT MANAGEMENT ................................................................. 383
EDUCATIONAL SOFTWARE ................................................................. 387
SPEECH AND AUDIO PROCESSING ...................................................... 390
INTELLIGENT AGENTS ........................................................................ 394
ERP/CRM ............................................................................................. 398
ADVANCED TOPICS IN NETWORK AND MOBILE COMMUNICATION MANAGEMENT ........... 402
TOTAL QUALITY MANAGEMENT ........................................................... 406
BLOCKCHAIN TECHNOLOGIES AND APPLICATIONS ................................. 411
1st SEMESTER

LOGIC DESIGN OF DIGITAL SYSTEMS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>PLHL68</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>1st</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>LOGIC DESIGN OF DIGITAL SYSTEMS</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures + Laboratory Exercises</td>
<td>4 + 2 = 6</td>
<td>5</td>
</tr>
</tbody>
</table>

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:

Greek / Greek

LANGUAGE OF EXAMINATION/ASSESSMENT:

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?*

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

- Search for, analysis and synthesis of data and information by the use of appropriate technologies
- Individual/Independent work
- Group/Team work

(3) **COURSE CONTENT**

4. Arithmetic circuits.
6. Modern sequential circuits.
8. Memories.
11. Introduction to hardware description languages.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
</table>
| Face-to-face, in-class lecturing, distance teaching and distance learning etc. | • In-class lecturing  
• Face-to-face in lab courses |

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
</tr>
</thead>
</table>
| 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>22 x 2 = 44</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>8 x 2 = 16</td>
</tr>
<tr>
<td>Tutorials</td>
<td>4 x 2 = 8</td>
</tr>
<tr>
<td>Autonomous study</td>
<td>32</td>
</tr>
<tr>
<td>Student projects</td>
<td>25</td>
</tr>
</tbody>
</table>

The total workload is 125 hours.

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
</tr>
</tbody>
</table>

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, 6η edition, Mano Morris, Ciletti Michael
3. Login and computer design fundamentals, 5th edition, Morris Mano, Charles R. Kime, Tom Martin
ANALYSIS I

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th><strong>FACULTY/SCHOOL</strong></th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEPARTMENT</strong></td>
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</tr>
<tr>
<td><strong>LEVEL OF STUDY</strong></td>
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<tr>
<td><strong>COURSE TITLE</strong></td>
<td>ANALYSIS I</td>
</tr>
</tbody>
</table>

**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*

<table>
<thead>
<tr>
<th><strong>WEEKLY TEACHING HOURS</strong></th>
<th><strong>CREDITS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching + Tutorial</td>
<td>4+2</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Additional 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:**

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 | (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

**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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

| Total           | 125               |

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam: 100%</td>
</tr>
<tr>
<td>Bonus from exercises throughout the semester: 15%</td>
</tr>
<tr>
<td>Language of evaluation: Greek</td>
</tr>
</tbody>
</table>
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.

SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
   Book[4202]: Analysis and Applications 1, A. G. Sapounakis, E. X. Fountas
   Book[23070]: Infinite Calculus, Volume I, A. X. Panagiotopoulos, A. G. Sapounakis
INTRODUCTION TO PROGRAMMING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Introduction to Programming</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures and Practice exercises</td>
<td>4</td>
</tr>
</tbody>
</table>

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: 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.

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, 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.

In class
Both Microsoft Developer Studio and GNU C++ compiler development environments are used and given to students.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>50</td>
</tr>
<tr>
<td>Practice exercises that focus on program development</td>
<td>24</td>
</tr>
<tr>
<td>Independent Study</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL/DEPARTMENT</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ90</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>INTERNET TECHNOLOGIES</td>
</tr>
<tr>
<td>INDEPENDENT TEACHING ACTIVITIES</td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>WEEKLY TEACHING HOURS</td>
<td>CREDITS</td>
</tr>
<tr>
<td>Lectures 4 hours/week x 13 weeks</td>
<td>5</td>
</tr>
<tr>
<td>Laboratories 2 hours/week, x 6 weeks</td>
<td></td>
</tr>
<tr>
<td>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4</td>
<td></td>
</tr>
<tr>
<td>COURSE TYPE</td>
<td>Background</td>
</tr>
<tr>
<td>PREREQUISITE COURSES:</td>
<td>No</td>
</tr>
<tr>
<td>LANGUAGE OF INSTRUCTION:</td>
<td>Greek</td>
</tr>
<tr>
<td>LANGUAGE OF EXAMINATION/ASSESSMENT:</td>
<td></td>
</tr>
<tr>
<td>THE COURSE IS OFFERED TO ERASMUS STUDENTS</td>
<td>Yes it can be offered</td>
</tr>
<tr>
<td>COURSE WEBSITE (URL)</td>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMA110">https://gunet2.cs.unipi.gr/courses/TMA110</a></td>
</tr>
</tbody>
</table>

### (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?*

<table>
<thead>
<tr>
<th>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</th>
<th>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.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search, analysis and synthesis of data and information, using the necessary technologies</td>
<td>Autonomous work, Teamwork, Project planning and management, Respect for diversity and multiculturalism, Promoting free, creative and inductive thinking</td>
</tr>
</tbody>
</table>

**(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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Lectures in the amphitheatre as well as laboratory exercises are provided.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>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.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weekly laboratory exercises</td>
<td>Weekly</td>
</tr>
<tr>
<td>1 computer/programming project</td>
<td>One per semester</td>
</tr>
<tr>
<td>26 weekly 2-hour lectures</td>
<td></td>
</tr>
</tbody>
</table>

| 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 according to 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
Version Number 1
Year of Run. Issue 2017
KEYWORDS HTML, Javascript, Php, XML, email, json, Internet, Apps
New Technologies Publications
Soft Cover Dimensions [17 x 24]
Number of Pages 816
Type: Textbook

INTRODUCTION TO COMPUTER SCIENCE

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ01</td>
</tr>
<tr>
<td>Semester</td>
<td>1</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Introduction to Computer Science</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>Teaching + Labs</td>
<td>4+2</td>
</tr>
</tbody>
</table>

COURSE TYPE
Background knowledge, Scientific expertise, General Knowledge, 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/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:

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:

- 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, select, differentiate, understand and combine the basic programming notion, structures and techniques.
- Perform simple and complex arithmetic calculations through programming.
- Use control flows, conditions, decision structures 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, Project planning and management
Adapting to new situations Social, professional and ethical responsibility and sensitivity to gender issues
Decision-making Critical thinking
Individual/Independent work Development of free, creative and inductive thinking
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research

Introduction of innovative research

(Other.........citizenship, spiritual freedom, social awareness, altruism etc.)

(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**

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

**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 debugging
- 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.*

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>13*4=52</td>
</tr>
<tr>
<td>Lab practice</td>
<td>11*2=22</td>
</tr>
<tr>
<td>Project</td>
<td>1.5</td>
</tr>
<tr>
<td>Study hours</td>
<td>36</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

**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:

*Suggested bibliography:*
MATHEMATICS FOR COMPUTER SCIENCE

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΜΑΘΥ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>MATHEMATICS FOR COMPUTER SCIENCE</td>
</tr>
<tr>
<td>INDEPENDENT TEACHING ACTIVITIES</td>
<td>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</td>
</tr>
<tr>
<td>WEEKLY TEACHING HOURS</td>
<td>CREDITS</td>
</tr>
<tr>
<td>Teaching + Tutorial</td>
<td>4+2</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
<th>Greek</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANGUAGE OF EXAMINATION/ASSESSMENT:</td>
<td>Greek</td>
</tr>
<tr>
<td>THE COURSE IS OFFERED TO ERASMUS STUDENTS</td>
<td>Yes</td>
</tr>
<tr>
<td>COURSE WEBSITE (URL)</td>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMA123/">https://gunet2.cs.unipi.gr/courses/TMA123/</a></td>
</tr>
</tbody>
</table>

(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
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

| 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 | (Other......citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |

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


(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

- 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Independent study</td>
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<td>Team projects</td>
<td>47</td>
</tr>
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<td><strong>Total</strong></td>
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</table>

**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
2. **Suggested bibliography:**
   
   
   Book[23085]: Discrete Mathematics, A. Panayotopoulos
2nd SEMESTER

ANALYSIS II

COURSE OUTLINE

(1) General information

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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

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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

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<tr>
<th>COURSE TYPE</th>
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<td>Background Knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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<table>
<thead>
<tr>
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<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMA120/">https://gunet2.cs.unipi.gr/courses/TMA120/</a></td>
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</table>

(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.
- 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
- Working in an international environment
- 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.
5. Adapting to new situations.
6. Development of free, creative and inductive thinking.

**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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
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<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
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Face-to-face

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- Use of ICT in teaching and laboratories
- Support of the learning process and teaching through an eclass electronic platform (gunet2)

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
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<tr>
<td>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>
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The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.

<table>
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<th>Activity/Method</th>
<th>Semester workload</th>
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<td>Lectures</td>
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<td>Independent study</td>
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<td>Team projects</td>
<td>47</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
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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.

3. Suggested bibliography:
   Book [50656504]: Analysis and Applications 2, A. G. Sapounakis, E. X. Fountas
   Book [23071]: Infinite Calculus, Volume II, A. X. Panagiotopoulos, A. G. Sapounakis
DISCRETE MATHEMATICS

COURSE OUTLINE

(1) General information

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<th>CREDITS</th>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

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<th>COURSE TYPE</th>
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<td>General Knowledge,</td>
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<td>Skills Development</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>Greek</th>
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| 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

**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, | 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 | (Other......citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |

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


Combinatorial numbers: Fibonacci numbers, Catalan, Motzkin, Narayana, Stirling, Bell.


Recurrence equations: Solving linear recurrence equations using the characteristic polynomial. Solving recurrence equations using generating functions.

(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

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.

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<tr>
<th>Activity/Method</th>
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<tbody>
<tr>
<td>Lectures</td>
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<td>Independent study</td>
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<td>Team projects</td>
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<td>Total</td>
<td>125</td>
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</table>

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:


DATA STRUCTURES

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
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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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

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<tr>
<th>COURSE TYPE</th>
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<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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<th>PREREQUISITE COURSES:</th>
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</table>

(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
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- 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 | 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.) |
| 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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**USE OF INFORMATION AND COMMUNICATION TECHNOLOGY**
Use of ICT in teaching, Laboratory Education, 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.

**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**
- 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
  - Related scientific journals:
    Theoretical computer science, Elsevier
    Algorithmica, Springer
# OBJECT ORIENTED PROGRAMMING

## COURSE OUTLINE

### (1) General information

<table>
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<tr>
<th>FACULTY/SCHOOL DEPARTMENT</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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**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*

<table>
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<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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*Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4*

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### 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/](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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In Class and in Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use ICT in Teaching and in Laboratories. Support the learning process through the course’s website (eclass gunet). Notes and educational material, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching,</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>26</td>
</tr>
<tr>
<td>Project Case-Study</td>
<td>21</td>
</tr>
<tr>
<td>Independent Study</td>
<td>26</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Educational activity</th>
<th>Study hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Course: 125 (25 hours per ECTS point)

**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:

COMPUTER ARCHITECTURE

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
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<td>COURSE UNIT CODE</td>
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<tr>
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<td>2nd</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>COMPUTER ARCHITECTURE</td>
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</table>

**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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures + Laboratory Exercises</td>
<td>4 + 2 = 6</td>
</tr>
</tbody>
</table>

**PREREQUISITE COURSES:**

NO

**LANGUAGE OF INSTRUCTION:**

Greek / Greek

**LANGUAGE OF EXAMINATION/ASSESSMENT:**

No

**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
- 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

15. Machine Language, Symbolic Language (Assembly) and Assemblers.
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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
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<td>Laboratory practice</td>
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<td>Tutorials</td>
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<td>Autonomous study</td>
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<td>Student projects</td>
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</tr>
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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:

APPLIED ALGEBRA

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL/DEPARTMENT</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES INFORMATICS</th>
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<tr>
<td>LEVEL OF STUDY</td>
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<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>TEACHING + TUTORIAL</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

| COURSE TYPE | Background knowledge
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Background knowledge</td>
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<table>
<thead>
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<th>PREREQUISITE COURSES:</th>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>Greek</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
<th><a href="https://gunet2.cs.unipi.gr/courses/TMA119/">https://gunet2.cs.unipi.gr/courses/TMA119/</a></th>
</tr>
</thead>
</table>

(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, | 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 | (Other……citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |
| ...... | ...... |

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**
(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 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Independent study</td>
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<tr>
<td>Team projects</td>
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</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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[22999]: Elements of linear algebra, M. A. Georgiakodis, P. N Georgiadis

   Book[95921]: Linear Algebra – 2nd Ed., M. A. Georgiakodis, P. N Georgiadis
3rd SEMESTER

MATHEMATICAL PROGRAMMING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΜΑ006-1</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Mathematical Programming</td>
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</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Tutorials and Exercises</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

COURSE TYPE

- Background knowledge

PREREQUISITE COURSES:

- Background knowledge

LANGUAGE OF INSTRUCTION: Greek

LANGUAGE OF EXAMINATION/ASSESSMENT: Yes

THE COURSE IS OFFERED TO ERASMUS STUDENTS: Yes


(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

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- 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,
- Respecting diversity and multiculturalism
- Environmental awareness
- Social, professional and ethical responsibility and sensitivity to gender issues
- Critical thinking
- Development of free, creative and inductive thinking
- Working in an international environment
- Working in an interdisciplinary environment
- (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
(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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
<td>Lectures and Tutorials</td>
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</tr>
<tr>
<td>Tutorials and Exercises</td>
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</tr>
<tr>
<td>Individual Study</td>
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<tr>
<td></td>
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<tr>
<td>Total</td>
<td>125</td>
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</table>

**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.

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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<td>COURSE TITLE</td>
<td>Object Oriented Application Development</td>
</tr>
<tr>
<td>INDEPENDENT TEACHING ACTIVITIES</td>
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<td>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</td>
<td></td>
</tr>
<tr>
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<td>Skills Development</td>
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<td>PREREQUISITE COURSES:</td>
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<tr>
<td>LANGUAGE OF INSTRUCTION:</td>
<td>Greek</td>
</tr>
<tr>
<td>LANGUAGE OF EXAMINATION/ASSESSMENT</td>
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</tr>
<tr>
<td>THE COURSE IS OFFERED TO ERASMUS STUDENTS</td>
<td>Yes</td>
</tr>
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<td>COURSE WEBSITE (URL)</td>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMB121/">https://gunet2.cs.unipi.gr/courses/TMB121/</a></td>
</tr>
</tbody>
</table>

(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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In Class and in Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Use ICT in Teaching and in Laboratories. Support the learning process through the course’s website (eclass gunet). Notes and educational material, etc.</td>
</tr>
</tbody>
</table>

| USE OF INFORMATION AND COMMUNICATION TECHNOLOGY | |
|-----------------------------------------------| Use of ICT in teaching, Laboratory Education, 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. | |

<table>
<thead>
<tr>
<th>Activity/Method</th>
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<tbody>
<tr>
<td>Lectures</td>
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<td>Project Case-Study</td>
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<td>Independent Study</td>
<td>26</td>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Individual software development tasks with a total weight of 40% on the final grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Team Project of total weight 60% on the final grade</td>
</tr>
</tbody>
</table>

(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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΑΠΗ41-1</td>
</tr>
<tr>
<td>3rd semester</td>
<td></td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Operating Systems</td>
</tr>
</tbody>
</table>

**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*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weekly Teaching Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Lab exercises</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

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:**

None

**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/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 management 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?*

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

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.*

### USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

*Use of ICT in teaching, Laboratory Education, 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>10</td>
</tr>
<tr>
<td>Lab exercises</td>
<td>20</td>
</tr>
<tr>
<td>Fieldwork project</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

Face-to-face, in-class lecturing
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 (multiple choice and short answer questions): 70%. Laboratory Examination: 30%.

An additional 10% bonus is the final grade is given, based for a non-obligatory programming exercise involving the development of algorithms related with O.S.

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 Operating Systems from the Eydoxos platform.
COMPILERS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ08</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Compilers</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

\textit{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}

\begin{tabular}{|l|c|c|}
\hline
\textbf{WEEKLY TEACHNG HOURS} & \textbf{CREDITS} \\
\hline
Lectures & 4 & 5 \\
\hline
\end{tabular}

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:

Greek/English

LANGUAGE OF EXAMINATION/ASSESSMENT:

THE COURSE IS OFFERED TO ERASMUS STUDENTS

Yes

COURSE WEBSITE (URL)

https://gunet2.cs.unipi.gr/courses/TMB100/

(2) LEARNING OUTCOMES

\textbf{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:

\textbf{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

\textbf{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, | 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 | (Other....citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | |

• 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use of ICT in teaching. Communication is supported by a e-class platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>Lectures</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Individual study</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Project assignment to teams of students</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
<td>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.</td>
</tr>
<tr>
<td>Language of evaluation, assessment methods, formative or summative</td>
<td>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</td>
</tr>
</tbody>
</table>
(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.

<table>
<thead>
<tr>
<th>SUGGESTED BIBLIOGRAPHY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Suggested bibliography:</td>
</tr>
<tr>
<td>[2] Μ. Βιρνου, Μεταγλώττιστές, εκδόσεις Βαρβαρήγου, 2014 (in Greek)</td>
</tr>
</tbody>
</table>
PROBABILITY AND STATISTICS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΜΑΘ35-1</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>3</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>PROBABILITY AND STATISTICS</td>
</tr>
</tbody>
</table>

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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4+2</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

COURSE TYPE

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 acquired 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
- 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.)

(3) COURSE CONTENT

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

2. Conditional probability - Independence.


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

5. Inequalities Markov, Chernoff, Chebyshev, Jensen.


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


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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>distance teaching and distance learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</em></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Live interactive lectures via MS Teams</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Use of ICT in teaching, Laboratory Education, Communication with students</em></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Description of teaching techniques, practices and methods:</em> 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></td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Projects</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Study hours</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th>Written exam (100%) in Greek</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Detailed description of the evaluation procedures:</em></td>
<td></td>
</tr>
</tbody>
</table>

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended questions, problem solving, written

<table>
<thead>
<tr>
<th></th>
<th>Individual written work on solving various problems during the semester (bonus 15%)</th>
</tr>
</thead>
</table>

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 [12561271]: Elements of Probability and Statistics in Computer Science, F. Georgiakodis, I. Triantafyllou
APPLICATIONS OF GRAPH THEORY

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΜΑΘ 35-1  Semester 3</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>APPLICATIONS OF GRAPH THEORY</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
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</thead>
<tbody>
<tr>
<td>Greek</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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<tbody>
<tr>
<td>Greek</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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</thead>
<tbody>
<tr>
<td>Greek</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TM114/">https://gunet2.cs.unipi.gr/courses/TM114/</a></td>
</tr>
</tbody>
</table>

(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
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- 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.
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 | (Other...citizenship, spiritual freedom, social awareness, altruism etc.) |

1. Individual work
2. Development of free, creative and inductive thinking
3. Introduction of innovative research
4. Application of Mathematics to modern technology environments

(3) COURSE CONTENT

Introduction.


(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

- 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</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. Spyrikis, G. Stamatiou.
MANAGEMENT

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>3</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>MANAGEMENT</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LECTURES, CASE STUDIES</td>
<td>4 hours/week</td>
</tr>
</tbody>
</table>

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:

Greek

LANGUAGE OF INSTRUCTION:

Greek

LANGUAGE OF EXAMINATION/ASSESSMENT:

THE COURSE IS OFFERED TO ERASMUS STUDENTS

NO

COURSE WEBSITE (URL)

http://sites.google.com/site/profichytiris

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?
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.

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>50</td>
</tr>
<tr>
<td>Study and Preparation for the</td>
<td>75</td>
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<tr>
<td>Exam</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
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</table>

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

(S) SUGGESTED BIBLIOGRAPHY:

1. Suggested bibliography:
   1. Χιτήρης, Λ. (2013). Μάνατζμεντ, Εκδόσεις Φαίδιμος, Αθήνα.

2. Related scientific journals:
PEDAGOGICS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>3rd</td>
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</tbody>
</table>

**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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

**COURSE TYPE**

*Scientific expertise, Skills Development*

**PREREQUISITE COURSES:**

None

**LANGUAGE OF INSTRUCTION:**

Greek

**LANGUAGE OF EXAMINATION/ASSESSMENT:**

THE COURSE IS OFFERED TO ERASMUS STUDENTS: YES

**COURSE WEB SITE (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?

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

### (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.

**USE OF INFORMATION AND COMMUNICATION TECHNOLOGY**
Use of ICT in teaching, Laboratory Education, 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tr>
<td>Lectures</td>
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<tr>
<td>Self-study</td>
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<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

**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:
  - Introduction to Pedagogics, Matsagouras Ilias, Gutenberg publ., 2009
INFORMATICS LAW

COURSE OUTLINE

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
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<td>COURSE TITLE</td>
<td>INFORMATICS LAW</td>
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<table>
<thead>
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<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>Teaching</td>
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<td>5</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>General Knowledge</th>
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<table>
<thead>
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<th>PREREQUISITE COURSES:</th>
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<tbody>
<tr>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>Greek</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
<th></th>
</tr>
</thead>
</table>

(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, | 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 | (Other......citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |

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 |
| 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

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.

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>30</td>
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<tr>
<td>Team project</td>
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</tr>
<tr>
<td>Independent study</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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:

ENGLISH III

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
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<tr>
<td>COURSE TITLE</td>
<td>English III</td>
</tr>
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<td>3rd semester</td>
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**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*

| 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:**

| English |

**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?

<table>
<thead>
<tr>
<th>General Competences</th>
<th></th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Interactive teaching in class.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Presentations with overhead projector, YouTube videos or PowerPoint.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Listening Comprehension</th>
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</thead>
<tbody>
<tr>
<td>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>
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</tbody>
</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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching</td>
<td>3 hours a week 13 weeks=39</td>
</tr>
<tr>
<td>Tutoring</td>
<td>1 hour a week</td>
</tr>
<tr>
<td>Study hours</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>75 hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
</tr>
</tbody>
</table>

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:

FRENCH III

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΑΓΑΛ03</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>3rd</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>French III</td>
</tr>
</tbody>
</table>

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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

COURSE TYPE

Background knowledge, Skills Development

PREREQUISITE COURSES:

None

LANGUAGE OF INSTRUCTION:

French

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 students are expected to:

- Have an advanced knowledge of the French language in written and oral form,
- Comprehend specialized French texts from various sources (literature, scientific
publications etc.), through which they develop an interdisciplinary, overall skills development such as soft skills (conflict management, active hearing, cooperative-team spirit, etc.) as well as exchange of know-how in specialized topics of 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?*

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

Adapting to new situations

Working in an international environment

Working in an interdisciplinary environment

Respect for diversity and multiculturalism

Environmental awareness

Social, professional and ethical responsibility and sensitivity to gender issues

Introduction of innovative research

(3) COURSE CONTENT

1. Wider culture subject of French speaking countries

2. Environmental subjects

3. Finance

4. Travel

5. Exchanges

6. Erasmus

7. Oral communication: Understanding specialized discussions

8. Oral communication: Interactive exercises

9. Oral communication: Monologue
## (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.*

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>75</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
</tr>
</tbody>
</table>

### 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.*

*Written examinations in the middle and at the end of the semester.*
Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.

<table>
<thead>
<tr>
<th>(5) SUGGESTED BIBLIOGRAPHY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Suggested bibliography:</td>
</tr>
<tr>
<td>Teacher notes</td>
</tr>
</tbody>
</table>
## 4th SEMESTER

### COMPUTER NETWORKS

#### COURSE OUTLINE

##### (1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ44</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>COMPUTER NETWORKS</td>
</tr>
</tbody>
</table>

#### 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.*

<table>
<thead>
<tr>
<th>Weekly Teaching Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4 hours/week x 13 weeks 5</td>
</tr>
<tr>
<td>Laboratories</td>
<td>2 hours/week x 4 weeks</td>
</tr>
</tbody>
</table>

*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:

*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:

- 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 state algorithms, 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

- 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 weekly laboratory exercises</td>
<td>Weekly</td>
</tr>
<tr>
<td>3 tests</td>
<td>Every 3 weeks</td>
</tr>
<tr>
<td>26 weekly 2-hour lectures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1258</strong></td>
</tr>
</tbody>
</table>

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 $0.3 \times \text{(average weekly work)} + 0.7 \times \text{(progress grade or grade of written examinations)}$ 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.

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**  
    *Book Code in Eudoxos: 41962269*  
    *Release: 1st/2014*  
    *Authors: Mung Chiang, (translated by C. Douligeris)*  
    *ISBN: 978-960-6759-99-4*  
    *Type: Textbook*  
    *Publisher: NEW TECHNOLOGY Publications, PRIVATE CAPITAL COMPANY*
ALGORITHMS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td></td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Algorithms</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greek</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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</thead>
<tbody>
<tr>
<td>Greek</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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</thead>
<tbody>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMB101/">https://gunet2.cs.unipi.gr/courses/TMB101/</a></td>
</tr>
</tbody>
</table>

(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?

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

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Tutorials</td>
<td>30</td>
</tr>
<tr>
<td>Projects</td>
<td>43</td>
</tr>
</tbody>
</table>

**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
  
  ΑΛΓΟΡΙΘΜΟΙ, ΜΠΟΖΆΝΗΣ ΠΑΝΑΓΙΩΤΗΣ, ΕΚΔΟΣΕΙΣ ΤΖΙΟΛΑ

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

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE TITLE</td>
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</tr>
<tr>
<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, Laboratory hours</td>
<td>6</td>
</tr>
</tbody>
</table>

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: 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.

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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>in-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>
### USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

Use of ICT in teaching, Laboratory Education, 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.

### Use of ICT in teaching, laboratory education, communication with students, etc. (e-class platform)

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>40</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>20</td>
</tr>
<tr>
<td>team-work</td>
<td>20</td>
</tr>
<tr>
<td>independent (self) study</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

### 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.

### SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:
• A. Silberschatz, H. F. Korth, S. Sudarshan, "Συστήματα Βάσεων Δεδομένων" (6η 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.
• Γ. Βασιλακόπουλος, "Σχεδιασμός Βάσεων Δεδομένων". Αθήνα, 2009.
INTERNET AND WEB PROGRAMMING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Internet and Web Programming</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΑΠΙ01 4th semester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Lab exercises</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
<th>None</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
<th>Greek</th>
<th>Greek</th>
</tr>
</thead>
</table>

| LANGUAGE OF EXAMINATION/ASSESSMENT: | |
|-------------------------------------| |

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
<th>Yes</th>
</tr>
</thead>
</table>

| 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?

<table>
<thead>
<tr>
<th>Search for, analysis and synthesis of data and information by the use of appropriate technologies,</th>
<th>Project planning and management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapting to new situations</td>
<td>Respect for diversity and multiculturalism</td>
</tr>
<tr>
<td>Decision-making</td>
<td>Environmental awareness</td>
</tr>
<tr>
<td>Individual/Independent work</td>
<td>Social, professional and ethical responsibility and sensitivity to gender issues</td>
</tr>
<tr>
<td>Group/Team work</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>Working in an international environment</td>
<td>Development of free, creative and inductive thinking</td>
</tr>
<tr>
<td>Working in an interdisciplinary environment</td>
<td>......</td>
</tr>
<tr>
<td>Introduction of innovative research</td>
<td>......</td>
</tr>
</tbody>
</table>

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.
(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-tier architectures)
6. Server programming (Java servlets)
7. Permanent storage of data in web applications.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT in teaching. Laboratory Education.</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>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>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>10</td>
</tr>
<tr>
<td>Lab exercises</td>
<td>20</td>
</tr>
<tr>
<td>Fieldwork project</td>
<td>45</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
<tr>
<td><strong>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</strong></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Detailed description of the evaluation procedures:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</td>
<td></td>
</tr>
</tbody>
</table>

Fieldwork project: 60%, Laboratory Exercises: 40%

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 Internet and Web programming from the Eydoxos platform.
PRINCIPLES AND APPLICATIONS OF SIGNALS AND SYSTEMS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ10-1</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>PRINCIPLES AND APPLICATIONS OF SIGNALS AND SYSTEMS</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4 hours/week x 13 weeks</td>
<td>5</td>
</tr>
<tr>
<td>Laboratories</td>
<td>2 hours/week x 4 weeks</td>
<td></td>
</tr>
</tbody>
</table>

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:

Greek

LANGUAGE OF EXAMINATION/ASSESSMENT:

Yes it can be offered

THE COURSE IS OFFERED TO ERASMUS STUDENTS

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 invariance
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-invariant 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 bandpass 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
- 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

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 transforms
- 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Lectures in the amphitheatre as well as laboratory practices are provided.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>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.</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>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>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures/Labs</td>
<td>40</td>
</tr>
<tr>
<td>Group project of development and implementation of Image Processing application</td>
<td>40</td>
</tr>
<tr>
<td>Individual study</td>
<td>45</td>
</tr>
</tbody>
</table>

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


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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗΕΚ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>INFORMATICS IN EDUCATION</td>
</tr>
</tbody>
</table>

**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.

| 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**

Scientific expertise, skills development

**PREREQUISITE COURSES:**

Greek

**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/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 Education

**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?

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

- 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>SEMESTER WORKLOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>In-class lecturing and in laboratory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>SEMESTER WORKLOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td>In-class lecturing and in laboratory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>SEMESTER WORKLOAD</th>
</tr>
</thead>
</table>
| 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. | Use of ICT in teaching and laboratories. 
Existing educational software. 
Support of the learning process and teaching through an electronic e-class platform (gunet2) |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>30</td>
</tr>
<tr>
<td>Study</td>
<td>26</td>
</tr>
<tr>
<td>Projects</td>
<td>43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

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

- Kevin Pitts and Renu Kumar, “Issues in Digital Technology in Education, Publisher: Wikibooks 2011, 2018 (e-book)

-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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ73-1</td>
</tr>
<tr>
<td>Semester</td>
<td>4</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Information and Coding Theory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
</tr>
</thead>
</table>

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, | 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 | (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

Error 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</strong></td>
<td></td>
</tr>
</tbody>
</table>

| USE OF INFORMATION AND COMMUNICATION TECHNOLOGY | |
| Use of ICT in teaching, Laboratory Education, 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Διαλέξεις</td>
<td>13*4=52</td>
</tr>
<tr>
<td>Εργαστηριακή άσκηση</td>
<td>11*2=22</td>
</tr>
<tr>
<td>Συγγραφή εργασίας</td>
<td>15</td>
</tr>
<tr>
<td>Ορες Μελέτης</td>
<td>36</td>
</tr>
<tr>
<td>Ώρες Μελέτης</td>
<td></td>
</tr>
<tr>
<td>Συνολικό</td>
<td>125</td>
</tr>
</tbody>
</table>

Total
### 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.

<table>
<thead>
<tr>
<th>Laboratory work</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) SUGGESTED BIBLIOGRAPHY:</td>
</tr>
</tbody>
</table>
| - Εισαγωγή στη θεωρία Πληροφοριών, Κωδίκων και Κρυπτογραφίας, Ν. Αλεξανδρής, Β. Χρυσικόπουλος, Κ. Παταάκης  
- 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>APPLIED COMBINATORICS</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΕΦΣ01</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>4</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

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


(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 | 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 | (Other....citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | |

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Projects</td>
<td>34</td>
</tr>
<tr>
<td>Study hours</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

## 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.


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

BUSINESS STRATEGY

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>4th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>BUSINESS STRATEGY</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>lectures</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

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?

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

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

Development 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>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</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>Lectures</td>
<td>48</td>
</tr>
<tr>
<td>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>Essay writing</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Study</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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.

### SUGGESTED BIBLIOGRAPHY:


DYNAMICAL SYSTEMS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>4th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Dynamical Systems</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

COURSE TYPE

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.
- 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Lectures are supported by the use of ICT</td>
</tr>
</tbody>
</table>

| USE OF INFORMATION AND COMMUNICATION TECHNOLOGY | |
| Use of ICT in teaching, Laboratory Education, 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. | |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
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<tr>
<td>Tutoring</td>
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</tr>
<tr>
<td>Studying</td>
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<tr>
<td>Personal Exercises</td>
<td>26</td>
</tr>
<tr>
<td>Exams</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

| 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.

<table>
<thead>
<tr>
<th>5</th>
<th>SUGGESTED BIBLIOGRAPHY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Suggested bibliography:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P. Tsikouras, Dynamical Systems, Department of Computer Science, University of Piraeus, 2010</td>
</tr>
<tr>
<td></td>
<td>A. Bountis, Dynamical Systems and Chaos, A. Papasotiriou &amp; Co. GP. 1995</td>
</tr>
<tr>
<td></td>
<td>N. Stavrakakis, Ordinary Differential Equations, A. Papasotiriou &amp; Co. GP. 2010</td>
</tr>
<tr>
<td>-Related bibliography:</td>
<td></td>
</tr>
</tbody>
</table>
ENGLISH IV

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
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<tr>
<td>COURSE TITLE</td>
<td>English 4</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>4th semester</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
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<tbody>
<tr>
<td>Seminars + Tutorials</td>
<td>4</td>
</tr>
<tr>
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<td>3</td>
</tr>
</tbody>
</table>

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. Independent 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching</td>
<td>3 hours a week 13 weeks = 39</td>
</tr>
<tr>
<td>Tutoring</td>
<td>1 hour a week</td>
</tr>
<tr>
<td>Study hours</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75 hours</strong></td>
</tr>
</tbody>
</table>

### 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:

FRENCH IV

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΑΓΑΛ04</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>4th</td>
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</tbody>
</table>

COURSE TITLE: French IV

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

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:
None

LANGUAGE OF INSTRUCTION:
French

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

APPENDIX B
- Guidelines for writing Learning Outcomes
Upon successful completion of the course students are expected to:

- Have an advanced knowledge (vocabulary, syntax, wording) of the French language in written and oral form, and have enriched their vocabulary with basic terminology of Informatics.
- Be able to use terminology of their scientific field and compose specialized text.
- Locate information in scientific articles and incorporate it in exercises assigned to them in other courses of their curriculum.
- Synthesize information from data collected in foreign language publications.
- Check the validity and critically evaluate the collected information in order to structure their arguments, wherever and whenever such an approach is deemed necessary.
- Focus on the important points and formulate their opinions.
- Compose articles in a well-organized manner, resulting in substantive conclusions and proposals.
- Write high class formal letters and CVs.
- Have oral and writing skills stating strong arguments even in cases of international negotiations.

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
- Social, professional and ethical responsibility and sensitivity to gender issues
- Individual/Independent work
- Critical thinking
- Group/Team work
- Development of free, creative and inductive thinking
- Working in an international environment
- Working in an interdisciplinary environment
- Respect for diversity and multiculturalism
- Environmental awareness
- Social, professional and ethical responsibility and sensitivity to gender issues
- Introduction of innovative research
- (Other......citizenship, spiritual freedom, social awareness, altruism etc.)
(3) COURSE CONTENT

1. Reading comprehension
2. Information identification
3. Critical review article
4. Arguments formulation
5. Essay
6. Formal letter
7. Submission of candidacy
8. Negotiation
9. Submitting complaints
10. Oral communication: Understanding specialized discussions
11. Oral communication: Interactive exercises
12. Oral communication: Monologue

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>Activty/Method</td>
</tr>
<tr>
<td>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>Lectures</td>
</tr>
<tr>
<td>The study hours for each learning</td>
<td>Total</td>
</tr>
</tbody>
</table>
activity as well as the hours of self-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.

Written examinations in the middle and at the end of the semester.

(5) SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:

  Teacher notes
5th SEMESTER

HUMAN COMPUTER INTERACTION

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ20</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Human-Computer Interaction</td>
</tr>
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</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures &amp; laboratory exercises</td>
<td>4+2 5</td>
</tr>
</tbody>
</table>

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:

- General knowledge

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/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

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?*

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

- 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

Modes of Delivery
Face-to-face, in-class lecturing, distance teaching and distance learning etc.

In-class lecturing and laboratory exercises

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 the electronic eclass 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Laboratory Practice</td>
<td>20</td>
</tr>
<tr>
<td>Projects</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

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,

Presentation of 3 group assignments (100%):
• 1st task (10%): Application of the hierarchical analysis of tasks for a specific interface system and writing 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)
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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE TITLE</td>
<td>INFORMATION SYSTEMS</td>
</tr>
<tr>
<td>WEEKLY TEACHING HOURS</td>
<td>CREDITS</td>
</tr>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
</tbody>
</table>

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, | 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 | (Other......citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |

- Search, analysis and composition of data and information with the use of appropriate 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>in class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>The learning process in supported through the electronic platform e-class.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>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></td>
<td></td>
</tr>
<tr>
<td>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></td>
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<tr>
<td>Lectures</td>
<td>80</td>
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<tr>
<td>Fieldwork</td>
<td>15</td>
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<tr>
<td>Study and analysis of bibliography</td>
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<td>Total</td>
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</table>
### 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

---

### 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>5</td>
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<td>COURSE TITLE</td>
<td>PATTERN RECOGNITION</td>
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</table>

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

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
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</tbody>
</table>

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: 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
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:**

**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:**

**TEACHING METHODS—ASSESSMENT**

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of ICT in teaching, Laboratory Education, Communication with students</strong></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Team assignment to develop a pattern recognition system</td>
<td>45</td>
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<tr>
<td>Independent study</td>
<td>50</td>
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<tr>
<td>Total</td>
<td>125</td>
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</table>

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:


-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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
<td>ΠΛΕΓ01-1</td>
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<tr>
<td>SEMESTER</td>
<td>5th</td>
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<tr>
<td>COURSE TITLE</td>
<td>Scientific writing</td>
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</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
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<tbody>
<tr>
<td>4</td>
<td>5</td>
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</tbody>
</table>

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 students are expected to:

1. Have familiarized themselves with methods of searching, hierarchising and evaluating the validity and reliability of data sources,
2. Be able to prepare a scientific scheme, identifying the 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,
- Adapting to new situations
- Decision-making
- Individual/Independent work
- Project planning and management
- Group/Team work
- Working in an international environment
- Working in an interdisciplinary environment
- Respect for diversity and multiculturalism
- Social, professional and ethical responsibility and sensitivity to gender issues
- Critical thinking
- Development of free, creative and inductive thinking
- Introduction of innovative research
- Environmental awareness
- (Other...citizenship, spiritual freedom, social awareness, altruism etc.)
- Adapt 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)


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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>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,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing</td>
<td>Use of ICT</td>
</tr>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
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</tr>
<tr>
<td>Activity/Method</td>
<td>Semester workload</td>
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<td>Lectures</td>
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<tr>
<td>Self-study</td>
<td>53</td>
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</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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>125</td>
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</tbody>
</table>

**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:**

- Suggested bibliography:

  *Academic writing, Evdoridou E., Karakasidis Th., Tziolas publ., 2017*
ADVANCED COMPUTER ARCHITECTURE

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<td>SEMESTER</td>
<td>5th</td>
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<td>COURSE TITLE</td>
<td>ADVANCED COMPUTER ARCHITECTURE</td>
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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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tr>
<td>Lectures + Laboratory Exercises</td>
<td>4</td>
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</tbody>
</table>

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/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
- 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
- (Other...citizenship, spiritual freedom, social awareness, altruism etc.)

(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 focuses on the study of the following topics:

1. Performance improvement using pipelining technique.
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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>22 x 2 = 44</td>
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<tr>
<td>Tutorials</td>
<td>4 x 2 = 8</td>
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<tr>
<td>Autonomous study</td>
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<tr>
<td>Student projects</td>
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<td>Essay writing</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

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.

(S) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

ADVANCED TOPICS IN COMMUNICATIONS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
<td>PLTHE01</td>
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<tr>
<td>COURSE TITLE</td>
<td>Advanced Topics in Communications</td>
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</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tr>
<td>6</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Specialization of general knowledge</th>
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<tbody>
<tr>
<td>PREREQUISITE COURSES</td>
<td>No</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
<th>GREEK (&amp; ENGLISH)</th>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>Greek</th>
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<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS:</th>
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<table>
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<tr>
<th>COURSE WEBSITE (URL)</th>
<th><a href="https://gunet2.cs.unipi.gr/courses/TMC118/">https://gunet2.cs.unipi.gr/courses/TMC118/</a></th>
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</thead>
</table>

(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.
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.


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.

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

Use of ICT in teaching, Laboratory Education, 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.

Weekly lectures in the classroom and/or in the workshop

- 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching - Workshops</td>
<td>74</td>
</tr>
<tr>
<td>Preparation of astudy (project)</td>
<td>51</td>
</tr>
</tbody>
</table>

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.

### SUGGESTED BIBLIOGRAPHY:

- **Suggested bibliography:**
  - Principles and Modeling of Wireless Dissemination, Kotsopoulos Stavros, Publications A. Giola & Sons O.E.
PROGRAMMING IN LOGIC

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>TMC105</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>PROGRAMMING IN LOGIC</td>
</tr>
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</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Lectures and Practice Exercises</td>
<td>4</td>
</tr>
</tbody>
</table>

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:

Greek

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,
- 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In the lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Two Logic Programming program development environments are used and given to students: SWI and SICSTUS Prolog.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Practice Exercises that focus on program development</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Independent Study</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Optional job</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
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.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
<td></td>
</tr>
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</table>

**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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ33-2</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>5</td>
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</table>

**COURSE TITLE**: DATABASE MANAGEMENT SYSTEMS

**INDEPENDENT TEACHING ACTIVITIES**

- Lectures, Laboratory hours

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

*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.

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

**COURSE TYPE**: Scientific expertise

**PREREQUISITE COURSES**:

- Background knowledge,
- Scientific expertise,
- General Knowledge,
- Skills Development

**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/TM110/](https://gunet2.cs.unipi.gr/courses/TM110/)

### (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, | 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 | (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

---

**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)

---

**TEACHING METHODS--ASSESSMENT**

| MODES OF DELIVERY | in-class lecturing |
| 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

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.

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<thead>
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<th>Activity/Method</th>
<th>Semester workload</th>
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<td>Lectures</td>
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<tr>
<td>Laboratory practice</td>
<td>20</td>
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<td>team-work</td>
<td>20</td>
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<td>independent (self) study</td>
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<td>Total</td>
<td>125</td>
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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:
CRYPTOGRAPHY

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<tr>
<td></td>
<td>Semester 5th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Cryptography</td>
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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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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</table>

Add rows if necessary. The organization of teaching and the teaching
methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
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<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
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<tbody>
<tr>
<td>Greek</td>
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<table>
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<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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<td>Greek</td>
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<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
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</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMC106/">https://gunet2.cs.unipi.gr/courses/TMC106/</a></td>
</tr>
</tbody>
</table>

(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, 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

Introduction
Evolution of cryptography through the years
Revision of necessary math background
Basic algorithm (Monoalphabetic substitution, One-Time-Pad, Caesar 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)

(3) COURSE CONTENT

(4) TEACHING METHODS--ASSESSMENT
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>13 * 4 = 52</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>11 * 2 = 22</td>
</tr>
<tr>
<td>Essay writing</td>
<td>15</td>
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<tr>
<td>Study hours</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
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</table>

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.
### SUGGESTED BIBLIOGRAPHY:

- Κρυπτογραφία και Εφαρμογές, Πατσάκης Κωνσταντίνος, Φούντας Ευάγγελος
- Κρυπτογραφία για Ασφάλεια Δικτύων Αρχές και Εφαρμογές, Stallings
SPECIAL TOPICS ON OPERATIONAL RESEARCH

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
<td>ΠΑΘΕΠ01</td>
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<tr>
<td>COURSE TITLE</td>
<td>Special Topics in Operations Research</td>
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</table>

INDEPENDENT TEACHING ACTIVITIES

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

Scientific expertise

Background knowledge, Scientific expertise, General Knowledge, Skills Development

PREREQUISITE COURSES:

Mathematical Analysis I, Applied Algebra, Mathematical Programming

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/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 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?**

<table>
<thead>
<tr>
<th>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</th>
<th>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.)</th>
</tr>
</thead>
</table>
• 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**

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures and Tutorials</td>
<td>45</td>
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<tr>
<td>Assignments</td>
<td>40</td>
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<tr>
<td>Individual Study</td>
<td>40</td>
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</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, 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 assignments:
   - 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.
• 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td></td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Theory of Computation</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
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<tbody>
<tr>
<td>Scientific expertise</td>
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<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
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<tbody>
<tr>
<td>Greek</td>
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<table>
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<th>LANGUAGE OF INSTRUCTION:</th>
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<table>
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<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
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</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMC125/">https://gunet2.cs.unipi.gr/courses/TMC125/</a></td>
</tr>
</tbody>
</table>

(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,

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Face-to-face</td>
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</tbody>
</table>
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

Use of ICT in teaching, Laboratory Education, 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.

Use of ICT teaching

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tr>
<td>Lectures</td>
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<tr>
<td>Study</td>
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<tr>
<td>Assignments (Exercises)</td>
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<tr>
<td>Total</td>
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</table>

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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
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<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>5th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Learning Management Systems</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures - Laboratories</td>
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<td>5</td>
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</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Scientific expertise, Skills Development</th>
</tr>
</thead>
</table>

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 management 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, | 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 | (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 / Team 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Laboratory Practice</td>
<td>30</td>
</tr>
<tr>
<td>Studying</td>
<td>26</td>
</tr>
<tr>
<td>Group Exercises</td>
<td>44</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

### 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:
  - Activity Modules
    - Blocks
    - Themes
  - Course Formats
  - Enrollment Plugins
  - Authentication Plugins
  - Repository Plugins
  - Filters
Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.

5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Kevin Pitts and Renu Kumar, “Issues in Digital Technology in Education, Publisher: Wikibooks 2011, 2018 (e-book)

-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

<table>
<thead>
<tr>
<th>Faculty/School</th>
<th>Information and Communications Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department</td>
<td>Informatics</td>
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<td>Level of Study</td>
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<td>Course Unit Code</td>
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<tr>
<td>Course Title</td>
<td>Queuing theory</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weekly Teaching Hours</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Lectures</td>
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<td>5</td>
</tr>
</tbody>
</table>

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 (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?*

<table>
<thead>
<tr>
<th>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</th>
<th>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.)</th>
</tr>
</thead>
</table>

- Individual/Independent work
- Group/Team work
- Search for, analysis and synthesis of data and information by the use of appropriate technologies

**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.
- Simulation methodologies (programming languages, result analysis, simulation examples)

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of the ICT electronic platform e-class.</td>
</tr>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td>Theoretical in-class lecturing and group discussions. The main subjects of each module are presented by the instructor:</td>
</tr>
<tr>
<td></td>
<td>• in the form of lectures supported by visual material</td>
</tr>
<tr>
<td></td>
<td>• through group discussions and analysis of case studies on real-life business cases.</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>Description of teaching techniques, practices and methods:</td>
</tr>
<tr>
<td></td>
<td>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>
</tr>
<tr>
<td></td>
<td>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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Semester workload</th>
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<tr>
<td>Lectures</td>
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<tr>
<td>Group discussions</td>
<td>6 x 2 = 12</td>
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<tr>
<td>Self-study</td>
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<td>Essay writing</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

| 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
- Selection of scientific articles
ENGLISH V

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>SEMESTER 5</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>English 5</td>
</tr>
</tbody>
</table>

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

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge, Scientific expertise, General Knowledge, Skills Development</th>
</tr>
</thead>
</table>

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?_

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

-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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>Activity/Method</td>
</tr>
<tr>
<td>Presentation with power-point Listening exercises</td>
<td></td>
</tr>
<tr>
<td>Teaching</td>
<td>3 hours/week x 13 weeks = 39 hours</td>
</tr>
<tr>
<td>Work in groups</td>
<td>1 hour/week x 13 weeks = 13 hours</td>
</tr>
<tr>
<td>Study</td>
<td>26 hours</td>
</tr>
</tbody>
</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 | 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)
# FRENCH V

## COURSE OUTLINE

### (1) General Information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΓΑΛ05</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>French V</td>
</tr>
</tbody>
</table>

**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.*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge, Skills Development</th>
</tr>
</thead>
</table>

**PREREQUISITE COURSES:**

None

**LANGUAGE OF INSTRUCTION:**

French

**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 students are expected to:

- Have an exceptional knowledge of the French language in written and oral form.
- Compose specialized text.
• Translate text of general and specialized content to and from French.
• Comprehend scientific articles.
• Collect information from such sources and incorporate it in the scientific paper they are expected to present
• Know basic functions and capabilities of software for machine translation.
• Be able to translate text concerning the scientific field of Informatics.

(3) COURSE CONTENT

Vocabulary specialized in Informatics.
Translation of specialized texts to and from French.

Human or Machine Translation of texts referring to Compilers, Cryptography, OOP Languages, Databases, Dynamic Systems. etc.

Search for scientific publications in reliable databases.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>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>
</tr>
<tr>
<td>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></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>75</td>
</tr>
<tr>
<td>Written examinations in the middle and at the end of the semester.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
<td>Written examinations in the middle and at the end of the semester.</td>
</tr>
<tr>
<td>Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended questions, problem solving, written</td>
<td></td>
</tr>
</tbody>
</table>
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:

  Teacher notes
6th SEMESTER

SOFTWARE ENGINEERING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ46</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Software Engineering</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures – Laboratory Exercises</td>
<td>4+2</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

COURSE TYPE
SPECIALTY TRACK (EY)

Background knowledge, Scientific expertise, General Knowledge, 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In Class and in Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use ICT in Teaching and in Laboratories. Support the learning process through the course’s website (eclass gunet). Notes and educational material, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The study hours for each learning activity as well as the hours of self-directed study are given following the</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>26</td>
</tr>
<tr>
<td>Project Case-Study</td>
<td>21</td>
</tr>
<tr>
<td>Independent Study</td>
<td>26</td>
</tr>
<tr>
<td>Total Course</td>
<td>125</td>
</tr>
<tr>
<td>(25 hours per ECTS point)</td>
<td></td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>TMB109</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS</td>
</tr>
</tbody>
</table>

**INDEPENDENT TEACHING ACTIVITIES**

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures and Practice exercises</td>
<td>4</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Background</td>
</tr>
</tbody>
</table>

| Background knowledge, Scientific expertise, General Knowledge, Skills Development |

**PREREQUISITE COURSES:**

- Greek

**LANGUAGE OF INSTRUCTION:**

- Greek

**LANGUAGE OF EXAMINATION/ASSESSMENT:**

- Passed

**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 Artificial Neural Networks

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In the class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>The course has a website. Course are taught using a computer and an image projector.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching.</td>
<td>Lectures</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Practice Exercises that focus on program development</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Independent Study</td>
<td>45</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Educational visits, projects, Essay writing, Artistic creativity, etc.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th>I. Written final exam (100%) that includes solving artificial intelligence problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. Optional work to develop an artificial intelligence problem solving program (20% grade).</td>
<td></td>
</tr>
</tbody>
</table>

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 KIDARITHMOS Publications

- Related scientific journals:

IEEE Intelligent Systems
# COMPUTER SYSTEMS DESIGN

## COURSE OUTLINE

### (1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
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<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>6th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>COMPUTER SYSTEM DESIGN</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Weekly Teaching Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures + Laboratory Exercises</td>
<td>4 + 2 = 6</td>
</tr>
</tbody>
</table>

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:**

- 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 focuses on the study of the following topics:

7. Introduction to hardware description languages. Digital circuit design using VHDL language.
8. Design of combinational circuits.
11. Memory design.
12. Microprocessor design.
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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>20 x 2 = 40</td>
</tr>
<tr>
<td>Laboratory exercises</td>
<td>12 x 2 = 22</td>
</tr>
<tr>
<td>Autonomous study</td>
<td>18</td>
</tr>
<tr>
<td>Student projects</td>
<td>25</td>
</tr>
<tr>
<td>Essay writing</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

### 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 using 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>PLPLE49</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>High Speed Networks</td>
</tr>
</tbody>
</table>

**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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

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/](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.

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

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

- Environmental awareness
- 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 following topics/content:

- The development and development of high-speed networks and the presentation of the latest scientific and technological developments in 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Weekly lectures in class and in the workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

| USE OF INFORMATION AND COMMUNICATION TECHNOLOGY | 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. |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Use email to communicate with students.</th>
</tr>
</thead>
<tbody>
<tr>
<td>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></td>
</tr>
<tr>
<td>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></td>
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<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Teaching - Workshops</td>
<td>74</td>
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<tr>
<td>Preparation of a study (project)</td>
<td>51</td>
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<tr>
<td>Total</td>
<td>125</td>
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<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th>Laboratory Exercises -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
<td>Written Examinations</td>
</tr>
</tbody>
</table>

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, 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.
  - Mobile communications systems, Kanatas, Konstantinos, Pantos, Papasotiriou Publications.
  - Satellite Communications, Pratt, Bostian, Allnutt, Papasotiriou Publications.
  - Provisioning, Recovery, and In-operation Planning in Elastic Optical Networks, Velasco, Wiley ebooks
TELECOMMUNICATIONS, SERVICES AND SYSTEMS PROGRAMMING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
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<td>COURSE UNIT CODE</td>
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<td>COURSE TITLE</td>
<td>Systems, Telecommunications and Services Programming</td>
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<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
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<td>5</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

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<thead>
<tr>
<th>COURSE TYPE</th>
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<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
<th>No</th>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
<th>GREEK (&amp; ENGLISH)</th>
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<table>
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<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>GREEK</th>
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</table>

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<tr>
<th>COURSE WEBSITE (URL)</th>
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(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/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
- Environmental awareness
- Adapting 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

**Course Content**


**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.

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<td>Preparation of a study (project)</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

### 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:

- The programming environment, Brian W. Kernighan, Rob Pike, Publications I. Faldamis and 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<tr>
<td>SEMESTER</td>
<td>6</td>
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<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, Laboratory hours</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>scientific expertise</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
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</thead>
<tbody>
<tr>
<td>Greek</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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<tbody>
<tr>
<td>Greek</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greek</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
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<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMD104/">https://gunet2.cs.unipi.gr/courses/TMD104/</a></td>
</tr>
</tbody>
</table>

(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:

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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?

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

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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>in-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
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</tr>
</tbody>
</table>
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY
Use of ICT in teaching, Laboratory Education, 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory practice</td>
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</tr>
<tr>
<td>team-work</td>
<td>50</td>
</tr>
<tr>
<td>independent (self) study</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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.
• Μανωλόπουλος Ι., Νανόπουλος Αλ. “Εισαγωγή στην Εξόρυξη Δεδομένων και τις Αποθήκες Δεδομένων”. Εκδόσεις Νέων Τεχνολογιών, 2009.
SYSTEMIC ANALYSIS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
<td>ΠΑΠΛΗ69-1</td>
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<tr>
<td>COURSE TITLE</td>
<td>SYSTEMIC ANALYSIS</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>13 weeks x 4 hours/week</td>
<td>5</td>
</tr>
<tr>
<td>Laboratories</td>
<td>4 weeks x 2 hours/week</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scientific expertise</td>
</tr>
<tr>
<td></td>
<td>General Knowledge,</td>
</tr>
<tr>
<td></td>
<td>Skills Development</td>
</tr>
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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

1. Define and recognize the Systems by type, as well as the meaning of a Metasystem.
2. Understand the use of Systemic Methodologies.
3. Distinguish the appropriate methodology for each type of Systems.
4. Deepen in the content and applications of Systemic Methodologies and Multimethodologies for the development of information systems.
5. Familiarize with the creation of Systems Analysis models.
6. Achieve distinction of dynamic systemic levels.
7. Focus on applications within a real work environment using relevant software.
8. 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.
- Οργανωτική Κυβέρνητική Συστημάτων.???
- Strategic Hypothesis, System Configuration and Testing Methodology.
- Interactive Systems Design Methodology.
- Soft Systems Methodology.
- Critical System Heuristics.
- The Metasystem Approach to Systems Analysis.
- 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.
## 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 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures/Labs</td>
<td>40</td>
</tr>
<tr>
<td>Team assignment in System Dynamics</td>
<td>40</td>
</tr>
<tr>
<td>Independent study</td>
<td>45</td>
</tr>
<tr>
<td>Additional activities:</td>
<td></td>
</tr>
<tr>
<td>Presentations of relevant software</td>
<td></td>
</tr>
<tr>
<td>regarding systemic methodologies.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td></td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>DECISION SUPPORT SYSTEMS</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

COURSE TYPE

<table>
<thead>
<tr>
<th>BACKGROUNDS KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
</tr>
</tbody>
</table>

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 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, | 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 | (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

- Special software for data envelopment analysis
- Learning process support through the platform e-class

### 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

### 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>30</td>
</tr>
<tr>
<td>Study</td>
<td>70</td>
</tr>
<tr>
<td>Essay writing</td>
<td>25</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

### 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%)
SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:

Γ. Σίσκος, Μοντέλα αποφάσεων, Εκδόσεις νέων τεχνολογιών, Αθήνα 2012
MULTIMEDIA SYSTEMS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
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<td>COURSE TITLE</td>
<td>Multimedia Systems</td>
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</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
</tbody>
</table>

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/English

LANGUAGE OF EXAMINATION/ASSESSMENT:

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 | 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 | (Other.......citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |

- 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
Section 8: 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</strong></td>
<td>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 an e-class platform.</td>
</tr>
</tbody>
</table>

| 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. | |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Project assignment to teams of students asking for the design and implementation of a multimedia system.</td>
<td>45</td>
</tr>
<tr>
<td>Individual study</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong> (25 workload units per credit unit)</td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

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:


- Related scientific journals

NATURAL LANGUAGE PROCESSING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>SEMESTER</td>
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<td>COURSE TITLE</td>
<td>NATURAL LANGUAGE PROCESSING</td>
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</table>

**INDEPENDENT TEACHING ACTIVITIES**

<table>
<thead>
<tr>
<th>Teaching and examples</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching and examples</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

**COURSE TYPE**

- 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/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, | 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 | (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. |
| USE OF INFORMATION AND COMMUNICATION TECHNOLOGY | Use of ICT in teaching |
| Description of teaching techniques, practices and methods: Lectures, seminars, laboratory |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Algorithm and system development in class</td>
<td>26</td>
</tr>
<tr>
<td>Independent study</td>
<td>30</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Team project for specific case study</th>
<th>43</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

**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:
   - Handbook of Natural Language Processing (Chapman & Hall/CRC: Machine Learning & Pattern Recognition) 2nd Edition by Nitin Indurkhya (Editor), Fred J. Dameru (Editor)

2. Related scientific journals:
BIOINFORMATICS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
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<td>Bioinformatics</td>
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INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
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<tr>
<td></td>
<td>5</td>
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</table>

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: Greek

LANGUAGE OF EXAMINATION/ASSESSMENT:

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 protein 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
- Project planning and management
- Adapting to new situations
- Respect for diversity and multiculturalism
- Decision-making
- Social, professional and ethical responsibility and sensitivity to gender issues
- Individual/Independent work
- Critical thinking
- Group/Team work
- Development of free, creative and inductive thinking
- Working in an international environment
- 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
- 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, amino 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**
- In-class lecturing
- Face-to-face, in-class lecturing, distance teaching and distance learning etc.

**USE OF INFORMATION AND COMMUNICATION TECHNOLOGY**
- 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.
- Use of ICT in teaching, Laboratory Education, 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>30</td>
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<tr>
<td>Project assignment to teams of students asking for the study of molecular sequences</td>
<td>45</td>
</tr>
<tr>
<td>Individual study</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total (25 workload units per credit unit)</strong></td>
<td>125</td>
</tr>
</tbody>
</table>

**STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS**
- Programming assignment delivered at the end of the semester (100% 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:*

DIDACTICS OF INFORMATICS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<tr>
<td>SEMESTER</td>
<td>6th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Didactics of Informatics</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
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<tbody>
<tr>
<td>4</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

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<th>COURSE TYPE</th>
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<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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<table>
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<th>PREREQUISITE COURSES:</th>
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<table>
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<th>COURSE WEBSITE (URL)</th>
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<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMD142/">https://gunet2.cs.unipi.gr/courses/TMD142/</a></td>
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</table>

(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 and 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, Adapting to new situations, Decision-making, Individual/Independent work, Group/Team work, Working in an international environment, Working in an interdisciplinary environment

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, 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
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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Use of ICT, use of simulation and visualization software</th>
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<tbody>
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<td>Face-to-face, in-class lecturing</td>
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<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
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<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
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<tbody>
<tr>
<td>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>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<td>Lectures</td>
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<td>Teaching simulations</td>
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<td>Educational scenario development</td>
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<td>Self-study</td>
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<td>Learning object development</td>
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<td>Design of teaching approach</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
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</table>
### 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%)

### 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**

- Related scientific journals:
  - **ICTE Journal ([https://periodicals.osu.eu/ictejournal](https://periodicals.osu.eu/ictejournal))**
SECURITY GOVERNANCE

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
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<tbody>
<tr>
<td>DEPARTMENT</td>
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COURSE TITLE: Security Governance

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<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
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<td>5</td>
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<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Scientific expertise</th>
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<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
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</table>

PREREQUISITE COURSES: Greek

LANGUAGE OF INSTRUCTION: Greek

LANGUAGE OF EXAMINATION/ASSESSMENT: Yes

THE COURSE IS OFFERED TO ERASMUS STUDENTS: Yes


(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:

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- Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications’ Framework.
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**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, | 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 | (Other...citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ...... |

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 applications.
- 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Use of ICT in teaching, Laboratory Education, Communication with students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Use of specialised software tools to identify vulnerabilities</td>
</tr>
<tr>
<td></td>
<td>Use of presentations and interactive board during lectures</td>
</tr>
<tr>
<td></td>
<td>Use of computer for development</td>
</tr>
<tr>
<td></td>
<td>Use of computers in the lab for development of programs and debugging</td>
</tr>
<tr>
<td></td>
<td>Web page update, news updates and offer of additional content (presentations, notes, code snippets)</td>
</tr>
<tr>
<td></td>
<td>Use institutional platform to submit grades</td>
</tr>
<tr>
<td></td>
<td>Use email and GUNET for communicating with the students</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
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<td>Lectures</td>
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<tr>
<td>Lab practice</td>
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<tr>
<td>Project</td>
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</tr>
<tr>
<td>Study hours</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
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</table>
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*Detailed description of the evaluation procedures:*

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

### laboratory work

### SUGGESTED BIBLIOGRAPHY:

- 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
- 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

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<tr>
<td>COURSE UNIT CODE</td>
<td>6th</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Intelligent Interaction with Social Networks</td>
</tr>
</tbody>
</table>

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

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<tr>
<th>LEARNING ACTIVITIES</th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Lectures - Laboratories</td>
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</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
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<tbody>
<tr>
<td>Scientific expertise, Skills Development</td>
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PREREQUISITE COURSES:

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
</tr>
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<tbody>
<tr>
<td>Greek</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
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</thead>
<tbody>
<tr>
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</tr>
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<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
</tr>
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<tbody>
<tr>
<td><a href="https://gunet.cs.unipi.gr/courses/TMF155/">https://gunet.cs.unipi.gr/courses/TMF155/</a></td>
</tr>
</tbody>
</table>

(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.)

(3) COURSE CONTENT

This course focuses on presenting a unified algorithmic framework for addressing the problems that emerge within the context of 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing, laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Lectures are supported by the use of ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of ICT in teaching, Laboratory Education, Communication with students</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>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.</strong></td>
<td></td>
</tr>
<tr>
<td>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></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory Practice</td>
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<tr>
<td>Studying</td>
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<tr>
<td>Group Exercises</td>
<td>43</td>
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<td><strong>Total</strong></td>
<td><strong>125</strong></td>
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</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detailed description of the evaluation procedures:</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</strong></td>
<td></td>
</tr>
</tbody>
</table>
(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

SOFTWARE DESIGN PATTERNS

COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>INFORMATION TECHNOLOGIES AND COMMUNICATIONS</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>COURSE LEVEL</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>ΠΛΠΡΑΝΑΛ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>SOFTWARE DESIGN PATTERNS</td>
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<table>
<thead>
<tr>
<th>TEACHING ACTIVITIES</th>
<th>TEACHING HOURS PER WEEK</th>
<th>ECTS</th>
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<tbody>
<tr>
<td>INSTRUCTION – LAB EXERCISES</td>
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<td>5</td>
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<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>SPECIALTY TRACK (EY), Developing Skills (ΑΔ)</th>
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<tbody>
<tr>
<td></td>
<td>SOFTWARE ENGINEERING AND INTELLIGENT SYSTEMS TRACK</td>
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</tbody>
</table>

EXPECTED PRIOR KNOWLEDGE/PREREQUISITES AND PREPARATION:

<table>
<thead>
<tr>
<th>TEACHING AND EXAMINATIONS LANGUAGE:</th>
<th>Greek</th>
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</table>

THE COURSE IS OFFERED TO ERASMUS STUDENTS: Yes

| COURSE WEB PAGE (URL) | http://gunet2.cs.unipi.gr/courses/TMC135/ |

(2) 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

### Course Content

#### General Skills

1. Standalone-Autonomous 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.

- Necessity of Classes
- Associations between classes and UML
- Polymorphism & Principle of Integration
- Principle of Low Coupling & Advanced Software Design Principles
- Principle of Unique Competence & Open-Closed Design Principle
- Liskov Substitution Principle & Principle of Inversion of Dependencies
- Principle of Separation of Interconnections
- Apply principles to Software Design Standards
- Adapter & Composite & Bridge
- 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

- In Class and in Laboratory (Face to Face)

#### USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Use ICT in Teaching.  
Support the learning process through the course’s website (eclass gunet). Notes and educational material, etc.

#### COURSE DESIGN

<table>
<thead>
<tr>
<th>Δραστηριότητα</th>
<th>Φόρτος Εργασίας Εξαμήνου</th>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory Exercises</td>
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<tr>
<td>Project-Case Study</td>
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<tr>
<td>Independent Study</td>
<td>26</td>
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</tbody>
</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.

#### STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS

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

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 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:


PARALLEL COMPUTING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<tr>
<td>COURSE TITLE</td>
<td>Parallel Computing</td>
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</table>

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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
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</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Scientific expertise, Skills Development</th>
</tr>
</thead>
</table>

PREREQUISITE COURSES:

The course requires knowledge from the following courses:

- "Introduction to Programming"
- "Data Structures"
- "Algorithms"
- "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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Independent study</td>
<td>26</td>
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<tr>
<td>Team projects</td>
<td>47</td>
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</table>

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. Final exam:
   Written, different levels of difficulty, which may include Multiple Choice Test, Short Answer Questions, Troubleshooting
3. Laboratory exercises:
(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 work requires the application of parallel programming techniques, optimization, performance analysis and application of performance metrics

### 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 Κλειδάρθμος, 2012.

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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<td>COURSE UNIT CODE</td>
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<tr>
<td>COURSE TITLE</td>
<td>ENGLISH 6</td>
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</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>4</td>
<td>3</td>
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</table>

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:

English

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

**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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Teaching in class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Practice focusing on the analysis and terminology to groups of students</td>
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<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Teaching support by:</th>
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<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td>Presentation with power-point</td>
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<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>Teaching</td>
<td>3 hours per week x 13 = 39</td>
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<tr>
<td></td>
<td>Work in groups</td>
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<td></td>
<td>Study</td>
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<td></td>
<td>Total</td>
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<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th>Written final exams containing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures</td>
<td>- text comprehension</td>
</tr>
<tr>
<td></td>
<td>- terminology, multiple choice exercises</td>
</tr>
<tr>
<td></td>
<td>- translation from English to Greek and vice versa</td>
</tr>
</tbody>
</table>
**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

<table>
<thead>
<tr>
<th>(5) SUGGESTED BIBLIOGRAPHY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading and Writing English for Advanced Students of Economics and Business Management by Sivridou F., Ananiadou E., εκδόσεις Φαίδιμος</td>
</tr>
<tr>
<td>- el.glosbe.com, <a href="http://www.linguee.com">www.linguee.com</a>, dictionary.cambridge.org, <a href="http://www.collinsdictionary.com">www.collinsdictionary.com</a>, BBC Economy, CNN, Deutsche Welle</td>
</tr>
<tr>
<td>Online lectures: Yale University, Khan academy</td>
</tr>
</tbody>
</table>
FRENCH VI

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΓΑΛ06</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>French VI</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific expertise, Skills Development</td>
</tr>
</tbody>
</table>

PREREQUISITE COURSES: None

LANGUAGE OF INSTRUCTION: French

LANGUAGE OF EXAMINATION/ASSESSMENT: YES

THE COURSE IS OFFERED TO ERASMUS STUDENTS: YES


(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:
• Have an exceptional knowledge of the French language in written and oral form.
• Compose specialized text.
- Translate text of general and specialized content to and from French.
- Comprehend scientific articles.
- Collect information from such sources and incorporate it in the scientific paper they are expected to present.
- Know basic functions and capabilities of software for machine translation.
- Be able to translate text concerning the scientific field of Informatics.

### 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 | (Other...citizenship, spiritual freedom, social awareness, altruism etc.) |

- Adapting to new situations
- Introduction of innovative ways of thinking
- Working in an international environment
- Working in an interdisciplinary environment
- Access to proceedings of international conferences
- Respect for diversity and multiculturalism
- Environmental awareness
- Social, professional and ethical responsibility and sensitivity to gender issues

### (3) COURSE CONTENT

Vocabulary specialized in Informatics.

Translation of specialized texts to and from French.
Human or Machine Translation of texts referring to finding a parking spot, mobile services architecture over the internet, technology of incorporated computational systems, network-based information systems, intelligent human-computer communication technologies, decision support systems, etc.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>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>
</tr>
<tr>
<td>Activity/Method</td>
<td>Semester workload</td>
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<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Total</td>
<td>75</td>
</tr>
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</table>

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.

Written examinations in the middle and at the end of the semester.
Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.

(5) **SUGGESTED BIBLIOGRAPHY:**

- Suggested bibliography:

  Teacher notes
7th SEMESTER

DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEMS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>PLPSYS01-1</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>DISTRIBUTED AND MULTIPROCESSING COMPUTER SYSTEM</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures + Laboratory Exercises</td>
<td>4</td>
</tr>
</tbody>
</table>

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/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.
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
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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26 x 2 = 52</td>
</tr>
<tr>
<td>Autonomous study</td>
<td>23</td>
</tr>
<tr>
<td>Student projects</td>
<td>35</td>
</tr>
<tr>
<td>Essay writing</td>
<td>15</td>
</tr>
</tbody>
</table>

**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:

MOBILE AND WIRELESS COMMUNICATIONS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>PLKAE01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Mobile and Wireless Communications</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>6</td>
<td>5</td>
</tr>
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</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Specialization of general knowledge</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
<th>GREEK (&amp; ENGLISH)</th>
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</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>GREEK</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
<th><a href="https://gunet2.cs.unipi.gr/courses/TMC114/">https://gunet2.cs.unipi.gr/courses/TMC114/</a></th>
</tr>
</thead>
</table>

(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:
   1. 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. He is familiar with wireless multi-access and resource allocation techniques, as well as radio transmission and management techniques.

5. It discusses mobility management issues and

6. It changes the impact of the above on the performance of the communications system, the

7. Understands resource allocation techniques in multi-user systems and their impact on network capacity and network performance

8. He is familiar with signalling, mobility management and Mobile IP protocol.

9. It recognises the basic principles of Ad-hoc Bluetooth, networks and Bluetooth.

10. Understands the basic principles of Wireless Local Networks (WLAN) – 802.11.

11. Configures and operates wireless local networks

12. It simulates wireless networks and mobile and wireless communications networks

13. Analyses the results of the simulation

14. It evaluates its findings and provides 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, | 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 | …….citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | ……. |

- 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 of Cellular Systems,
- Resource Allocation – Multiple Access, Transmission and Management of Radio Channels, Signaling and ΡαδιοδιαύλωνArchitectures 2G, 3G, 4GG, 5G.
- Mobility Management, LTE and 5G Network Basics,
- Wireless Local Networks (WLAN) – 802.11, Mobile IP,

Ad hoc networks - Wireless Personal Networks, Small-scale Wireless Networks.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Weekly lectures in class and in the workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
<tr>
<td>Use electronic slides in lectures.</td>
</tr>
<tr>
<td>Use of computers and network infrastructures during laboratory exercises.</td>
</tr>
<tr>
<td>Maintenance of a course website with announcements and provision of teaching material.</td>
</tr>
<tr>
<td>Posting scores through Pan’s online course management platform. Piraeus.</td>
</tr>
<tr>
<td>Use email to communicate with students.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>
</tr>
<tr>
<td>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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Teaching - Workshops</td>
<td>74</td>
</tr>
<tr>
<td>Preparation of a study (project)</td>
<td>51</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
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</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Exercises - Written Examinations</td>
</tr>
<tr>
<td>Detailed description of the evaluation procedures:</td>
</tr>
</tbody>
</table>
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, Theologian 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
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<td>COURSE UNIT CODE</td>
<td>ΠΛΠΛΗ47</td>
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<tr>
<td>COURSE TITLE</td>
<td>Information System Security</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>INDEPENDENT TEACHING ACTIVITIES</td>
<td>WEEKLY TEACHING HOURS</td>
</tr>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
<tr>
<td>Lab exercises</td>
<td>2</td>
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<tr>
<td>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4</td>
<td>5</td>
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<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Scientific expertise</th>
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<tbody>
<tr>
<td>PREREQUISITE COURSES:</td>
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<tr>
<td>LANGUAGE OF INSTRUCTION:</td>
<td>Greek Greek</td>
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<tr>
<td>LANGUAGE OF EXAMINATION/ASSESSMENT:</td>
<td></td>
</tr>
<tr>
<td>THE COURSE IS OFFERED TO ERASMUS STUDENTS</td>
<td>Yes</td>
</tr>
<tr>
<td>COURSE WEBSITE (URL)</td>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMD108/">https://gunet2.cs.unipi.gr/courses/TMD108/</a></td>
</tr>
</tbody>
</table>

(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:

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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.
- 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.
3. Cryptographic systems.
4. Public Key Infrastructure.
5. Access control and Privacy.
7. Secure electronic and mobile services.
8. Introduction to network security.
### (4) TEACHING METHODS—ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</strong></td>
<td><strong>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 &quot;virtual machines&quot; 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.</strong></td>
</tr>
<tr>
<td><strong>COURSE DESIGN</strong></td>
<td><strong>Activity/Method</strong></td>
</tr>
<tr>
<td><strong>Description of teaching techniques, practices and methods:</strong> 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>Lectures</td>
</tr>
<tr>
<td></td>
<td>Laboratory practice</td>
</tr>
<tr>
<td></td>
<td>Fieldwork project</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
### 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.

*Relevant scientific journals:*

Computers and Security, Elsevier
International Journal of Information Security, Springer
DATA SCIENCE TOPICS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΗΘΕΔ01</td>
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<tr>
<td>SEMESTER</td>
<td>7</td>
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<tr>
<td>COURSE TITLE</td>
<td>DATA SCIENCE TOPICS</td>
</tr>
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</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, Laboratory hours</td>
<td>4</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

COURSE TYPE: 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, | 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 | (Other......citizenship, spiritual freedom, social awareness, altruism etc.) |

(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 Science-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.

Use of ICT in teaching, laboratory education, communication with students

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory practice</td>
<td>15</td>
</tr>
<tr>
<td>team-work</td>
<td>50</td>
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<tr>
<td>independent (self) study</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
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</table>

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.
SUGGESTED BIBLIOGRAPHY:

- Suggested bibliography:


- 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL DEPARTMENT</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES INFORMATICS</th>
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</thead>
<tbody>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>7</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>SYSTEMS’ SIMULATION</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>13 weeks x 4 hours/week</td>
<td>5</td>
</tr>
<tr>
<td>Laboratories</td>
<td>4 weeks x 2 hours/week</td>
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</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge, Scientific expertise, General Knowledge, Skills Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREREQUISITE COURSES:</td>
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</tr>
<tr>
<td>LANGUAGE OF INSTRUCTION:</td>
<td>Greek</td>
</tr>
<tr>
<td>LANGUAGE OF EXAMINATION/ASSESSMENT:</td>
<td></td>
</tr>
<tr>
<td>THE COURSE IS OFFERED TO ERASMUS STUDENTS</td>
<td>Yes</td>
</tr>
<tr>
<td>COURSE WEBSITE (URL)</td>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMC104/">https://gunet2.cs.unipi.gr/courses/TMC104/</a></td>
</tr>
</tbody>
</table>

(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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
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</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>
</tr>
</tbody>
</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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures/Labs</td>
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<tr>
<td>Team assignment in System Dynamics</td>
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<tr>
<td>Independent study</td>
<td>45</td>
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<td></td>
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<td></td>
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<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
</tr>
</tbody>
</table>

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.
VIRTUAL REALITY

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
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<td>UNDERGRADUATE</td>
</tr>
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<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>SEMESTER</td>
<td>7</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>VIRTUAL REALITY</td>
</tr>
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</table>

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 and examples | 4 | 5 |

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
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<th>COURSE TYPE</th>
</tr>
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<tbody>
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<table>
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<table>
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<tr>
<td>Greek</td>
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<table>
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<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
<tbody>
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<table>
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<tr>
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</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMD117/">https://gunet2.cs.unipi.gr/courses/TMD117/</a></td>
</tr>
</tbody>
</table>

(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, | 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 | (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.
5. The Unity3D environment.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Face-to-face</td>
</tr>
</tbody>
</table>
**USE OF INFORMATION AND COMMUNICATION TECHNOLOGY**

*Use of ICT in teaching, Laboratory Education, 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.

**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

**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/](https://unity.com/)

2. Related scientific journals:
IMAGE ANALYSIS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΗΕΙΚ01</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>7</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>IMAGE ANALYSIS</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
<tr>
<td>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4</td>
<td></td>
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</table>

COURSE TYPE

Scientific expertise

PREREQUISITE COURSES:

Greek

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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>30</td>
</tr>
<tr>
<td>Team assignment to develop an image analysis project</td>
<td>45</td>
</tr>
<tr>
<td>Independent study</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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


-Related scientific journals:

IEEE Transactions on Image Processing
CURRENT TOPICS OF SOFTWARE ENGINEERING – SOFTWARE FOR MOBILE DEVICES

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
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<tr>
<td>COURSE TITLE</td>
<td>Current Topics in Software Engineering – Software for Mobile Devices</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures – Laboratory Exercises</td>
<td>4+2</td>
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</tbody>
</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

COURSE TYPE

SPECIALTY TRACK (EY)

Background knowledge, Scientific expertise, General Knowledge, Skills Development

Skills Development

PREREQUISITE COURSES:

Greek

LANGUAGE OF INSTRUCTION:

Greek

LANGUAGE OF EXAMINATION/ASSESSMENT:

Yes

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

In Class and in Laboratory

# USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

Use ICT in Teaching and in Laboratories. Support the learning process through the course’s website (eclass gunet). Notes and educational material, etc.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<tr>
<td>Laboratory Exercises</td>
<td>26</td>
</tr>
<tr>
<td>Project Case-Study</td>
<td>21</td>
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<tr>
<td>Independent Study</td>
<td>26</td>
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<td></td>
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<tr>
<td>Total Course</td>
<td>125</td>
</tr>
<tr>
<td>(25 hours per ECTS point)</td>
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</table>

# 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.

# 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:

INFORMATION RETRIEVAL AND SEARCHING ON THE WORLD WIDE WEB

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATION TECHNOLOGIES</th>
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<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
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</tr>
<tr>
<td>COURSE TITLE</td>
<td>Information retrieval and Search in World Wide Web</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
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<tbody>
<tr>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Scientific expertise</th>
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<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
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</table>

<table>
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<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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<tbody>
<tr>
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<table>
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<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
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<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMD105/">https://gunet2.cs.unipi.gr/courses/TMD105/</a></td>
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</tbody>
</table>

(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.

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?

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

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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Use of ICT teaching</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use of ICT in teaching, Laboratory Education, Communication with students</th>
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</thead>
</table>

<table>
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<tr>
<th>COURSE DESIGN</th>
<th>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.</th>
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<td>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>
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</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Projects</td>
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<tr>
<td>Study</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
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<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th>Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed description of the evaluation procedures:</td>
<td>Problem Solving</td>
</tr>
<tr>
<td>Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short-answer questions, open-ended</td>
<td>Problem Solving</td>
</tr>
</tbody>
</table>
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:

Η ΜΕΘΟΔΟΣ PAGERANK ΤΗΣ GOOGLE ΚΑΙ ΑΛΛΑ ΣΥΣΤΗΜΑΤΑ ΚΑΤΑΤΑΞΗΣ ΙΣΤΟΣΕΛΙΔΩΝ, LANGVILLE AMY, MEYER CARL, ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ

ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΑΝΑΚΤΗΣΗ ΠΛΗΡΟΦΟΡΙΩΝ, CHRISTOPHER D. MANNING, PRABHAKAR RAGHAVAN, HINRICH SCHUTZE, ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ

- Related scientific journals: Information Retrieval Journal, Springer
TUTORING PROGRAMS EVALUATION

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
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<td>COURSE TITLE</td>
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<td>SEMESTER</td>
<td>7th</td>
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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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

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:
Greek

LANGUAGE OF EXAMINATION/ASSESSMENT:

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, 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, (Other.......citizenship, spiritual freedom, social awareness, altruism etc.)
Introduction of innovative research, ......

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
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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Face-to-face, in-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT, teaching simulations, demonstration of simulation and visualization software</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of</td>
</tr>
<tr>
<td></td>
<td>Activity/Method</td>
</tr>
<tr>
<td>Lectures</td>
<td>30</td>
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<tr>
<td>Teaching simulations</td>
<td>15</td>
</tr>
<tr>
<td>Teaching demonstrations</td>
<td>6</td>
</tr>
<tr>
<td>Visiting a school of Piraeus in order to attend a real life teaching</td>
<td>6</td>
</tr>
</tbody>
</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.

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<tr>
<th>Activity</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Self-study</td>
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<tr>
<td>Teaching preparation</td>
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</tr>
<tr>
<td>Preparing evaluation reports</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

**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%)

**SUGGESTED BIBLIOGRAPHY:**

- Suggested bibliography:
  - Giannis Salvaras, Evaluation of programs, Grigori publ., 2013
  - [https://www.adip.gr/](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 Ministry of Education, 2011
NEXT GENERATION VEHICULAR NETWORKS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<td>LEVEL OF STUDY</td>
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<tr>
<td>COURSE TITLE</td>
<td>Next Generation Vehicular Networks</td>
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</tbody>
</table>

**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

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<tbody>
<tr>
<td>Background knowledge, Scientific expertise, General Knowledge, Skills Development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPECIALIZATION OF GENERAL KNOWLEDGE</th>
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</thead>
<tbody>
<tr>
<td>Specialization of general knowledge</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
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<tbody>
<tr>
<td>No</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
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<tbody>
<tr>
<td>GREEK (&amp; ENGLISH)</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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<tbody>
<tr>
<td>GREEK</td>
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<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE WEBSITE (URL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="https://gunet2.cs.unipi.gr/courses/TMC114/">https://gunet2.cs.unipi.gr/courses/TMC114/</a></td>
</tr>
</tbody>
</table>

(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. It develops and develops V2X systems and applications.
3. It evaluates the performance of these applications.
4. Clarifies key VANET technologies.
5. It knows modern techniques/methodologies in 5G οχηματικές vehicle communications and networking (VCN).
6. It discusses vehicle channel issues.
7. It recognises communication techniques between vehicles in the next generation of intelligent transport systems.
8. It 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 and providing 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,
- 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 networking (VCN).

Students learn to design and develop V2X systems and applications and evaluate their performance.

Concepts related to:
- 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 ADHOC MAC, collaborative networks, enhanced node collaboration, collaborative relay broadcasting, communication issues between vehicles in the next generation of intelligent transports systems, congestion control for ad hoc vehicle networks for safety.

Complementarity between υχηματικών vehicle and LTE networks, traffic signal control systems and car-to-car communications, multi-level interconnection in V2V communication networks, transmission of security messages on V2I υχηματικά communication networks, ad hoc vehicle networks for smart cities.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Weekly lectures in class and in the workshop</th>
</tr>
</thead>
</table>

| USE OF INFORMATION AND COMMUNICATION TECHNOLOGY | • 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. |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching - Workshops</td>
<td>74</td>
</tr>
<tr>
<td>Preparation of a study (project)</td>
<td>51</td>
</tr>
</tbody>
</table>

| 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.

<table>
<thead>
<tr>
<th>Laboratory Exercises -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Examinations</td>
</tr>
</tbody>
</table>

The final grade results 70% from the final examination, 30% from the laboratory exercises.

### 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.
KNOWLEDGE MANAGEMENT

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
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<tr>
<td>COURSE TITLE</td>
<td>KNOWLEDGE MANAGEMENT</td>
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</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

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.

(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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>in class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>The learning process in supported through the electronic platform e-class.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of ICT in teaching, Laboratory Education, Communication with students</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of teaching techniques, practices and methods:</strong> 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></td>
<td></td>
</tr>
<tr>
<td>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></td>
<td></td>
</tr>
<tr>
<td><strong>Lectures</strong></td>
<td>40</td>
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</tr>
<tr>
<td><strong>Group assignment in case study</strong></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>Study and analysis of bibliography</strong></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>Independent study</strong></td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>125</td>
<td></td>
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</tbody>
</table>
**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. |

---

**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


Journal of Knowledge Management

https://www.emeraldinsight.com/journal/jkm*
SMART CITIES AND INTERNET OF THINGS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΕΠΔΙΠΡ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Smart Cities and Internet of Things</td>
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INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
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<th></th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

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 (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 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>COURSE DESIGN</th>
</tr>
</thead>
</table>
| *Face-to-face, in-class lecturing, distance teaching and distance learning etc.* | *Use of the ICT electronic platform e-class.* | *Description of teaching techniques, practices and methods:*
| *In-class lecturing* | *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.* |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>20 x 2 = 40</td>
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<tr>
<td>Group discussions</td>
<td>6 x 2 = 12</td>
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<tr>
<td>Self-study</td>
<td>38</td>
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<tr>
<td>Essay writing</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
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</table>

**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:

- Selection of scientific articles
E-LEARNING AND SOCIAL NETWORKS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
<td>7th</td>
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<tr>
<td>COURSE TITLE</td>
<td>E-Learning and Social Networks.</td>
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INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures - Laboratories</td>
<td>4</td>
<td>5</td>
</tr>
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</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

COURSE TYPE

Scientific expertise, Skills Development

PREREQUISITE COURSES:

Greek

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?*

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

- 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 Environments.
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

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.

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:

- Kevin Pitts and Renu Kumar, “Issues in Digital Technology in Education, Publisher: Wikibooks 2011, 2018 (e-book)

Related scientific journals:

- Computers & Education
- IEEE on Education
- IEEE Transactions on Learning Technologies
- International Journal of Educational Research
INFORMATION SYSTEMS IN SHIPPING
COMPUTER GAME DEVELOPMENT TECHNOLOGIES

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΑΔΑΗΠ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>COMPUTER GAME DEVELOPMENT TECHNOLOGIES</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching and examples</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

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/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

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

#### Course Content


#### Teaching Methods—Assessment

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Algorithm and system development in class</td>
<td>26</td>
</tr>
<tr>
<td>Independent study</td>
<td>20</td>
</tr>
<tr>
<td>Team project for specific case</td>
<td>53</td>
</tr>
</tbody>
</table>
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

**SUGGESTED BIBLIOGRAPHY:**

1. **Suggested bibliography:**
   - [https://unity.com/](https://unity.com/)

2. **Related scientific journals:**
## SERVICE ORIENTED PROGRAMMING

### COURSE OUTLINE

#### (1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>COURSE LEVEL</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>ΠΛΥΠΛ001</td>
</tr>
<tr>
<td>COURSE SEMESTER</td>
<td>7</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>SERVICE ORIENTED SOFTWARE</td>
</tr>
</tbody>
</table>

#### INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>INSTRUCTION – LAB EXERCISES</th>
<th>4+2</th>
<th>ECTS</th>
</tr>
</thead>
</table>

#### COURSE TYPE

- SPECIALTY TRACK (EY), Developing Skills (Δ)
- 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
**TEACHING AND LEARNING METHODS - ASSESSMENT**

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td>Use ICT in Teaching. Support the learning process through the course’s website (eClass Gunet). Notes and educational material, etc.</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Δραστηριότητα</th>
<th>Φόρτος Εργασίας Εξαμήνου</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>52</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>26</td>
</tr>
<tr>
<td>Project-Case Study</td>
<td>21</td>
</tr>
<tr>
<td>Independent Study</td>
<td>26</td>
</tr>
</tbody>
</table>

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 KLEIDARTHIMOS 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
  
  - JRuby Rails Web Application Development Deepak Vohra
### 8th SEMESTER

**NETWORK SECURITY**

#### COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACTS/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΑΣΦΔ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Network Security</td>
</tr>
</tbody>
</table>

**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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>3</td>
</tr>
<tr>
<td>Lab exercises</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

*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:**

| Greek | Greek |

**LANGUAGE OF EXAMINATION/ASSESSMENT:**

| https://gunet2.cs.unipi.gr/courses/TMA102/ |

**THE COURSE IS OFFERED TO ERASMUS STUDENTS:**

| Yes |

#### (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.

**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?

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

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.

**(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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</strong></td>
<td><strong>Face-to-face, in-class lecturing</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use of ICT in teaching, Laboratory Education, Communication with students</strong></td>
<td><strong>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 &quot;virtual machines&quot; 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.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of teaching techniques, practices and methods:</strong> 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><strong>Activity/Method</strong></td>
</tr>
<tr>
<td><strong>The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</strong></td>
<td>Lectures</td>
</tr>
<tr>
<td>Laboratory practice</td>
<td>30</td>
</tr>
<tr>
<td>Fieldwork project</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detailed description of the evaluation procedures:</strong></td>
<td><strong>Fieldwork project: 50%, Laboratory Exercises: 50%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>The evaluation criteria are available to the students through the course web page.</strong></td>
</tr>
<tr>
<td>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.</td>
<td>Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</td>
</tr>
</tbody>
</table>

### (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.

Relevant scientific journals:
- Computers and Security, Elsevier
- IEEE Transactions on Dependable and Secure Computing
- Computer Networks, Elsevier
- IEEE Transactions on Information Forensics and Security
E-BUSINESS AND INNOVATION

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΗΕΠΚ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>E-BUSINESS AND INNOVATION</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

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:

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
- Adapting to new situations
- Decision-making
- Individual/Independent work
- Group/Team work
- Project planning and management
- Working in an international environment
- Working in an interdisciplinary environment
- Introduction of innovative research
- 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

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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use of the ICT electronic platform e-class.</th>
</tr>
</thead>
</table>
| Use of ICT in teaching, Laboratory Education, Communication with students | 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. |

<table>
<thead>
<tr>
<th>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.</th>
<th>The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity/Method</td>
<td>Semester workload</td>
</tr>
<tr>
<td>Lectures</td>
<td>20 x 2 = 40</td>
</tr>
<tr>
<td>Group discussions</td>
<td>6 x 2 = 12</td>
</tr>
<tr>
<td>Self-study</td>
<td>38</td>
</tr>
<tr>
<td>Essay writing</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

| 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.

SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography:

- Selection of scientific articles
INTERNET-BASED INFORMATION SYSTEMS

COURSE OUTLINE

(1) General information

| FACULTY/SCHOOL DEPARTMENT | INFORMATION AND COMMUNICATIONS TECHNOLOGIES
| LEVEL OF STUDY | UNDERGRADUATE
| COURSE UNIT CODE | ΠΛΣΥΔ01
| COURSE TITLE | Internet Based Information Systems

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures and Laboratories</td>
<td>4 + 2</td>
</tr>
</tbody>
</table>

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:

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 and the networked economy
- Have a knowledge of the applications of net-centric information systems in the e-business and 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, | 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 | - Project planning and management |
| - Teamwork | - Respect for diversity and multiculturalism |
| - Promoting free, creative and inductive thinking | - Promoting free, creative and inductive thinking |
### Course Units

1. **Network Computing**
   - Internet and Web Technologies
   - Browsing and information discovery, browser and server software
   - Communication media
   - Electronic Collaboration, tele-collaboration tools
   - ICT infrastructure

2. **Electronic commerce and business**
   - 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 appliances
     - 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 and URL)
   - Document types in the Web
   - Web architecture and infrastructure
   - The HTTP protocol
     - Links
     - Messages
   - Web servers
     - Apache web server
     - Web server clustering
   - The client-server model
   - Security in the client-server model
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 (Communicatrition)
   - Ηλεκτρονική συνεργασία (Collaboration), 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
<table>
<thead>
<tr>
<th>Θέμα</th>
<th>Περιγραφή</th>
</tr>
</thead>
</table>
| 4. Κατανεμημένα Συστήματα Βασισμένα σε Κείμενο                           | • Τι είναι τα κατανεμημένα συστήματα  
  • Ο παγκόσμιος ιστός  
  • Οργάνωση  
  • Χώροι ονομάτων (URI, URN και URL)  
  • Τύποι εγγράφων στον παγκόσμιο ιστό  
  • Αρχιτεκτονική και υποδομή του παγκόσμιου ιστού  
  • Πρωτόκολλο HTTP  
  • Συνδέσεις  
  • Μηνύματα  
  • Εξυπηρετητές ιστού  
  • Εξυπηρετητής Apache  
  • Αναπαραγωγή και Συστατικόφυλετήση 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  
  • Γλώσσες σήμανσης HTML και HTML5  
  • Κανόνες μορφοποίησης (CSS)  
  • JavaScript και βιβλιοθήκες jQuery και jQuery Mobile  
  • Η γλώσσα eXtensible Markup Language (XML)  
  • Document Type Definition (DTD)  
  • Σχήμα XML (XML Schema)  
  • Extensible Stylesheet Language (XSL)  
  • To πρότυπο ανταλλαγής δεδομένων JSON  
  • Ασύγχρονη επικοινωνία (AJAX)  
  • Άλλες τεχνολογίες  
  • Python  
  • JavaScript βιβλιοθήκες Underscore.js, MooTools και Node.js  
  • Java Applets  
| 6. Διαδικτυακός Προγραμματισμός με Java: Servlets και JSP          | • Η γλώσσα προγραμματισμού Java  
  • Java Servlets  
  • Παραδείγματα  
  • 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  
  • Το πλαίσιο Struts  
  • 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Lectures in the amphitheatre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use of video project and laptops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
<tr>
<td>Electronic books/articles</td>
<td></td>
</tr>
<tr>
<td>Web searching</td>
<td></td>
</tr>
<tr>
<td>Java NetBeans</td>
<td></td>
</tr>
<tr>
<td>Apache web server</td>
<td></td>
</tr>
<tr>
<td>Application server Glassfish</td>
<td></td>
</tr>
<tr>
<td>MySQL</td>
<td></td>
</tr>
<tr>
<td>Use of the eclass</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COURSE DESIGN</th>
<th>Description of teaching techniques, practices and methods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching,</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>45 hours</td>
</tr>
<tr>
<td>Lab exercises</td>
<td>20</td>
</tr>
<tr>
<td>Project report</td>
<td>35</td>
</tr>
<tr>
<td>Independent study</td>
<td>25</td>
</tr>
</tbody>
</table>
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.

<p>| | |</p>
<table>
<thead>
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<tbody>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

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### 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:**
### 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>PLDIP01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>IT PROJECT MANAGEMENT</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

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: Greek

LANGUAGE OF EXAMINATION/ASSESSMENT: 

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 appropriate 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>in class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td></td>
</tr>
<tr>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
<td></td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td></td>
</tr>
<tr>
<td>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></td>
</tr>
<tr>
<td>The learning process in supported through the electronic platform e-class.</td>
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</table>

<table>
<thead>
<tr>
<th>Activity/Method</th>
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<td>Lectures</td>
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<tr>
<td>Field exercise</td>
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<tr>
<td>Study and analysis of bibliography</td>
<td>5</td>
</tr>
<tr>
<td>Independent study</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>COURSE LEVEL</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>ΠΑΕΚΛ01</td>
</tr>
<tr>
<td>COURSE SEMESTER</td>
<td>8</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>EDUCATIONAL SOFTWARE</td>
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</table>

<table>
<thead>
<tr>
<th>TEACHING ACTIVITIES</th>
<th>TEACHING HOURS PER WEEK</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSTRUCTION – LAB EXERCISE</td>
<td>4+2</td>
<td>5</td>
</tr>
</tbody>
</table>

COURSE TYPE

SPECIALTY TRACK (EY)

SOFTWARE ENGINEERING AND INTELLIGENT SYSTEMS TRACK

EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:

TEACHING AND EXAMINATIONS LANGUAGE:

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

<table>
<thead>
<tr>
<th>TEACHING METHOD</th>
<th>In Class and in Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES</td>
<td>Use ICT in Teaching and in Laboratories. Support the learning process through the course’s website (eclass gunet). Notes and educational material, etc.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Δραστηριότητα</th>
<th>Φόρτος Εργασίας Εξαμήνου</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>60</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>24</td>
</tr>
<tr>
<td>Project-Case Study</td>
<td>41</td>
</tr>
<tr>
<td><strong>ASSESSMENT OF STUDENTS</strong></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Description of the assessment process</strong></td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td><strong>Presentation of Software Implementation Work in a Laboratory Environment with Computer &amp; Oral Examinations (100%)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Presentation language: Greek</strong></td>
<td></td>
</tr>
<tr>
<td><strong>The assessment method is communicated to the students at the beginning of the semester through the systems of the department (eclass)</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **Total Course (25 hours per ECTS point)** | **125** |

(5) **LITERATURE AND STUDY MATERIALS / READING LIST**

**Suggested Literature:**


SPEECH AND AUDIO PROCESSING

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>ΠΛΕΠΣΦΗ01</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Speech and Audio Processing</td>
</tr>
</tbody>
</table>

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*

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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</tr>
<tr>
<td>Laboratory exercises</td>
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<td>Total</td>
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</table>

Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Background knowledge, Scientific expertise, General Knowledge, Skills Development</th>
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<tbody>
<tr>
<td></td>
<td>Scientific expertise, Skills development</td>
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</table>

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, 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In-class lecturing, laboratory training</th>
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</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>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.</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td></td>
</tr>
<tr>
<td>Activity/Method</td>
<td>Semester workload</td>
</tr>
<tr>
<td>Lectures</td>
<td>15</td>
</tr>
<tr>
<td>Laboratory exercises</td>
<td>15</td>
</tr>
<tr>
<td>Project assignment to teams of students asking for the design and implementation of a speech/audio processing system</td>
<td>45</td>
</tr>
<tr>
<td>Individual study</td>
<td>50</td>
</tr>
<tr>
<td>Total (25 workload units per credit unit)</td>
<td>125</td>
</tr>
</tbody>
</table>
### 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:


## INTELLIGENT AGENTS

### COURSE OUTLINE

**(1) General information**

<table>
<thead>
<tr>
<th><strong>FACULTY/SCHOOL</strong></th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEPARTMENT</strong></td>
<td>INFORMATICS</td>
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<tr>
<td><strong>LEVEL OF STUDY</strong></td>
<td>UNDERGRADUATE</td>
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<td><strong>SEMIESTER</strong></td>
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<td><strong>COURSE TITLE</strong></td>
<td>INTELLIGENT AGENTS</td>
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</table>

**INDEPENDENT TEACHING ACTIVITIES**

<table>
<thead>
<tr>
<th></th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching and examples</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

*Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4*

**COURSE TYPE**

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?

<table>
<thead>
<tr>
<th>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</th>
<th>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.)……</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Search for, analysis and synthesis of data and information by the use of appropriate technologies</td>
<td>Project planning and management</td>
</tr>
<tr>
<td>2. Adapting to new situations</td>
<td>Respect for diversity and multiculturalism</td>
</tr>
<tr>
<td>3. Respect for diversity (regarding behaviors and human communication)</td>
<td>Environmental awareness</td>
</tr>
<tr>
<td>4. Group/Team work</td>
<td>Social, professional and ethical responsibility and sensitivity to gender issues</td>
</tr>
<tr>
<td>5. Critical thinking</td>
<td>Critical thinking</td>
</tr>
<tr>
<td>6. Decision making</td>
<td>Development of free, creative and inductive thinking</td>
</tr>
<tr>
<td>7. Introduction of innovative research</td>
<td>(Other……citizenship, spiritual freedom, social awareness, altruism etc.)……</td>
</tr>
<tr>
<td>8. Development of free, creative and inductive thinking</td>
<td></td>
</tr>
</tbody>
</table>

(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.

**USE OF INFORMATION AND COMMUNICATION TECHNOLOGY**
- 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.

<table>
<thead>
<tr>
<th><strong>Activity/Method</strong></th>
<th><strong>Semester workload</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>26</td>
</tr>
<tr>
<td>Algorithm and system development in class</td>
<td>26</td>
</tr>
<tr>
<td>Independent study</td>
<td>40</td>
</tr>
<tr>
<td>Team project for specific case study</td>
<td>33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
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</table>

**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:

3. Suggested bibliography:
   Russell Stuart, Norvig Peter, Τεχνητή νοημοσύνη : Μια σύγχρονη προσέγγιση, Publisher: Κλειδάριθμος, ISBN: 9789602098738, 2004

4. Related scientific journals:
ERP/CRM

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
<td>PLSYS02</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>ERP/CRM SYSTEMS</td>
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**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*

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
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*Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4*

<table>
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<td>Major concentration</td>
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<table>
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<tr>
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<tbody>
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<td>Greek</td>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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<tbody>
<tr>
<td>THE COURSE IS OFFERED TO ERASMUS STUDENTS: Yes</td>
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<td>COURSE WEBSITE (URL) <a href="https://gunet2.cs.unipi.gr/courses/TMA109/">https://gunet2.cs.unipi.gr/courses/TMA109/</a></td>
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</tbody>
</table>

(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, | 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 | (Other........citizenship, spiritual freedom, social awareness, altruism etc.) |
| Introduction of innovative research | .......... |

- Search, analysis and composition of data and information with the use of appropriate 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

<table>
<thead>
<tr>
<th>Modes of Delivery</th>
<th>in class lecturing</th>
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<tbody>
<tr>
<td><strong>Use of Information and Communication Technology</strong></td>
<td>The learning process is supported through the electronic platform e-class.</td>
</tr>
<tr>
<td><strong>Course Design</strong></td>
<td>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>
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<table>
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<th>Activity/Method</th>
<th>Semester Workload</th>
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<tr>
<td>Lectures</td>
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<tr>
<td>Group assignment in case study</td>
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<tr>
<td>Study and analysis of bibliography</td>
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</tr>
<tr>
<td>Independent study</td>
<td>30</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
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</table>
### 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.

---

### 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

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
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<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE UNIT CODE</td>
<td>PLTHEDDE01</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>WEEKLY TEACHNG HOURS</th>
<th>CREDITS</th>
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<td></td>
<td>6</td>
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<tr>
<td></td>
<td>5</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Specialization of general knowledge</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>PREREQUISITE COURSES:</th>
<th>No</th>
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<table>
<thead>
<tr>
<th>LANGUAGE OF INSTRUCTION:</th>
<th>GREEK (&amp; ENGLISH)</th>
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<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
<th>GREEK</th>
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THE COURSE IS OFFERED TO ERASMUS STUDENTS

Yes

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<th>COURSE WEBSITE (URL)</th>
<th><a href="https://gunet2.cs.unipi.gr/courses/TMC144/">https://gunet2.cs.unipi.gr/courses/TMC144/</a></th>
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</table>

(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. It automates 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 modern telecommunications markets.
7. Designs and operates systems.
8. Evaluates the operation of systems.
9. It treats system errors and failures.
10. Learns to use advanced management tools.
11. It analyses, studies, evaluates and proposes broad solutions for a series of systems and network management scenarios.

**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.
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
- 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 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.

3. Virtualization (NFV) virtualization network functions, software-defined networks (SDNs), Virtualization techniques, overlay networks, wireless virtualization, SDN and NFV in 5G will be analyzed.

(4) TEACHING METHODS--ASSESSMENT

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>Weekly lectures in class and in the workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td>
<td>Use of ICT in teaching, Laboratory Education, Communication with students</td>
</tr>
<tr>
<td>COURSE DESIGN</td>
<td>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>
</tr>
<tr>
<td></td>
<td>The study hours for each learning activity as well as the hours of self-</td>
</tr>
<tr>
<td></td>
<td>Activity/Method</td>
</tr>
<tr>
<td></td>
<td>Teaching - Workshops</td>
</tr>
<tr>
<td></td>
<td>Preparation of astudy (pro-ject)</td>
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<tr>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>
**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.
- Mobile and Personal Communications Networks, Theologian M., Publications A. Giola & Sons O.E.
TOTAL QUALITY MANAGEMENT

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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</thead>
<tbody>
<tr>
<td>DEPARTMENT</td>
<td>INFORMATICS</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
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<tr>
<td>COURSE TITLE</td>
<td>Quality Assurance Systems</td>
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<table>
<thead>
<tr>
<th>INDEPENDENT TEACHING ACTIVITIES</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
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<tbody>
<tr>
<td>Lectures and Tutorials</td>
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<td>5</td>
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Add rows if necessary. The organization of teaching and the teaching methods used are described in detail under section 4.

<table>
<thead>
<tr>
<th>COURSE TYPE</th>
<th>Scientific expertise</th>
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<tbody>
<tr>
<td>Background knowledge,</td>
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<tr>
<td>Scientific expertise,</td>
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<tr>
<td>General Knowledge,</td>
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<td>Skills Development</td>
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<table>
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<th>PREREQUISITE COURSES:</th>
<th>Probabilities and Statistics</th>
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<table>
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<th>LANGUAGE OF INSTRUCTION:</th>
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<table>
<thead>
<tr>
<th>LANGUAGE OF EXAMINATION/ASSESSMENT:</th>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>THE COURSE IS OFFERED TO ERASMUS STUDENTS</th>
<th>Yes</th>
</tr>
</thead>
</table>

| COURSE WEBSITE (URL) | https://gunet2.cs.unipi.gr/courses/TMD135/ |

(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:

- Describe key concepts of quality, quality control, quality assurance and total quality management.
- Recognize the total quality management models.
- Report the certification bodies of quality assurance systems.
- Determine which standard corresponds to each business activity.
- Report the most important ISO standards for IT products and services.
- Determine the process of developing and implementing a quality assurance system.
- Describe the requirements and steps for certifying a quality assurance system.
- Employ tools to prevent, monitor and analyze the causes of low quality.
- Use statistical quality control techniques.
- Detect quality problems in business processes.
- Calculate the cost of management actions to improve quality as well as the cost of poor quality.
- Utilize the appropriate tools to improve quality.
- Create questionnaires and apply methodologies for measuring customer satisfaction.
- Analyze the data resulting from the surveys.
- Suggest appropriate actions for improving the quality.

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.
- Production of new research ideas.
- Promoting free, creative and inductive thinking.
- Decision making.

(B) COURSE CONTENT

Topics
1. Quality - Total Quality Management
   - What is Quality, definition, significance and fundamental concepts
   - Historical development of Quality
   - Introduction to Total Quality Management
   - Total Quality Management Methods and Models
• Theories and Models of Deming, Juran, Crosby, Ishikawa, Taguchi etc.
• Quality Awards - Model of Business Excellence

2. Quality Assurance Systems
• Standards - Certification of Quality Assurance Systems
  o Certification organizations (ISO, CEN, ELOT etc.)
  o Principles – Requirements of Standards
  o Categories and Evolution of Standards
  o Other European and International Standards
• Quality Assurance Systems in the field of Information Technologies
• Applications - Case Studies

3. Quality Control
• Basic Tools and Methods for Quality Control
• Statistical Quality Control
• Control Tools
  o Histogram
  o Control Sheet
  o Pareto Chart
  o Cause – Effect Diagram
  o Flow Chart
  o Scatter plot
  o Control Chart
• Other Quality Control Tools
• Quality Control using Fuzzy Logic
• Integration of Artificial Intelligence techniques in Quality Control

4. Improving Quality
• Capability and Capacity Analysis & Evaluation
• Failure modes and effects analysis (FMEA)
• Quality Planning-Design
• Quality Cost
• Six Sigma (6σ) and Lean Six Sigma (L6σ)

5. Measurement and Analysis of Customer Satisfaction
• Tools for Measuring Customer Satisfaction
• KANO, SERVQUAL, Multicriteria Satisfaction Analysis (MUSA)
• Applications - Case Studies
• Development of Questionnaires

(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

- Notes on board
- Use of computer and video projector
- Educational videos
- Electronic books / articles
- Use of Internet
- Word processing and Presentation Software
- Survey Software and Questionnaire Tools (Google Forms, Typeform)
- Statistical Software (SPSS, Minitab, Matlab)
- 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.

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures and Tutorials</td>
<td>45</td>
</tr>
<tr>
<td>Assignments</td>
<td>40</td>
</tr>
<tr>
<td>Individual Study</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>125</td>
</tr>
</tbody>
</table>

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,

I. Written examination (100% of the grade) that includes:
- Multiple Choice Questions (10%)
- Short-answer Questions (10%)
- Open-ended Questions (30%)
- Problem Solving (50%)

Alternatively, the examination can be carried through two assignments.

II. Two assignments (100% of the grade).
Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.

The individual assignment (50% of the grade) includes personalized exercises related to statistical quality control and quality improvement (use of student unique ID for data differentiation). Also, the personalized exercises related to specific standards and the procedures that an organization/business must follow to comply with them.

The students should use the following software:

- Word processing Software
- Optimization Software (Matlab)
- Spreadsheet Software (Microsoft Excel)
- Statistical Software (SPSS, Minitab, Matlab)

The group assignment (50% of the grade) concerns a customer satisfaction survey. Each group develops electronic questionnaires on the chosen topic. Also, an assessment and analysis of customer satisfaction are conducted using the MUSA method, which is a multi-criteria analysis method.

- Word processing Software
- Survey Software and Questionnaire Tools (Google Forms, Typeform)
- Spreadsheet Software (Microsoft Excel)
- Optimization Software (Matlab)

(5) SUGGESTED BIBLIOGRAPHY:

- Αυλωνίτης, Σ.Α. (2012), «Στοιχεία ελέγχου και διασφάλισης ποιότητας», Εκδόσεις Ίων.
- Γρηγορούδης, Β., Σίσκος, Γ. (2000), «Ποιότητα Υπηρεσιών και Μέτρηση Ικανοποίησης του Πελάτη», Εκδόσεις Νέων Τεχνολογιών.
- Δερβιτσιώτης, Κ. (2005), «Διοίκηση Ολικής Ποιότητας», Εκδόσεις Νομική Βιβλιοθήκη.
- Ταγαράς, Γ. (2001), «Στατιστικός Έλεγχος Ποιότητας». Εκδόσεις ΖΗΤΗ.

- Journals:
  - Total Quality Management and Business Excellence
  - Quality Engineering
  - Quality and Reliability Engineering International
  - The Quality Assurance Journal
  - European Journal of Operational Research
  - Journal of Quality Management
  - Journal of Process Control
BLOCKCHAIN TECHNOLOGIES AND APPLICATIONS

COURSE OUTLINE

(1) General information

<table>
<thead>
<tr>
<th>FACULTY/SCHOOL</th>
<th>INFORMATION AND COMMUNICATIONS TECHNOLOGIES</th>
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<tbody>
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<td>DEPARTMENT</td>
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<tr>
<td>LEVEL OF STUDY</td>
<td>UNDERGRADUATE</td>
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<tr>
<td>COURSE UNIT CODE</td>
<td>PLEPDIPRO1</td>
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<tr>
<td>COURSE TITLE</td>
<td>Blockchain technology and applications</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures and laboratory exercises</td>
<td>4</td>
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</table>

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:**

**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**
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- 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, | 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 | (Other....citizenship, spiritual freedom, social awareness, altruism etc.) |

- Individual/Independent work
- Group/Team work
- Project planning and management

**(B) 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

<table>
<thead>
<tr>
<th>MODES OF DELIVERY</th>
<th>In-class lecturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</th>
<th>Use of the ICT electronic platform e-class.</th>
</tr>
</thead>
</table>
| Use of ICT in teaching, Laboratory Education, Communication with students | 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. |

<table>
<thead>
<tr>
<th>Activity/Method</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>$20 \times 2 = 40$</td>
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<tr>
<td>Group discussions</td>
<td>$6 \times 2 = 12$</td>
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<tr>
<td>Self-study</td>
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<td>Essay writing</td>
<td>35</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>125</strong></td>
</tr>
</tbody>
</table>

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

(5) **SUGGESTED BIBLIOGRAPHY:**

-Suggested bibliography:
