



# **COURSE OUTLINES GRADUATE STUDIES PROGRAM**

**MPhil in  
"Computer Science and Informatics"**

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# 1st SEMESTER

## MPHIL01 - Data science

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL01	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Data science		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Report on lab assignments		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Data Structures, Databases, Data Mining, Probability, Statistics, Algorithms		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/MPHIL101/">https://eclass.hua.gr/courses/MPHIL101/</a>		

### (2) LEARNING RESULTS

#### Learning Results

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.

Consult Appendix A.

- Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area
- Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B
- Comprehensive Guide to Writing Learning Outcomes

The objective of the subject is to introduce students to the concepts of data science and help them acquire and validate the basic knowledge required to conduct further research in the subject areas, through study and participation in the activities assigned to them.

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

- analyze a data-related problem and formulate/design/implement a technical solution

- understand the theoretical background of open problems in the subject area and identify research opportunities beyond the existing research level
- use software, models, and libraries to develop standard solution implementations and evaluate them.

### General Skills

Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Adaptation in new conditions  
 Decision Making  
 Independent work  
 Employment at an international level  
 Formulation of new research ideas  
 Project design and management  
 Promoting reasoning and self improvement  
 Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

Data Mining, Big Data Algorithms, Statistical Thinking

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings									
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	<ul style="list-style-type: none"> <li>- Data mining and machine learning libraries and models</li> <li>- Statistical tools</li> <li>- Communication via OpenClass and email</li> </ul>									
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Report on lab assignments</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>		Activity	Workload in Semester	Report on lab assignments	125	Individual study	125	Course total	250
Activity	Workload in Semester									
Report on lab assignments	125									
Individual study	125									
Course total	250									

## STUDENT EVALUATION

*Description of the evaluation process  
Assessment Language, Assessment Methods, Formative or Deductive,  
Multiple Choice Test, Short Answer Questions, Essay Development  
Questions, Problem Solving, Written Assignment, Report / Report,  
Oral Examination, Public Presentation, Laboratory Work, Clinical  
Patient Examination, Artistic Interpretation, Other / Others  
Explicitly defined evaluation criteria are mentioned and if and where  
they are accessible by students.*

Individual work that includes:

- Individual research and study
- Technical report
- Overview

## (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:

### 1) Probability and Statistics for data analysis

Fundamental theory in probability and statistics, which is necessary for basic research and data analysis tasks.

### 2) Multivariate Statistical Analysis

Fundamental Multivariate Statistical Analysis Methods applied in Data Science, including linear regression, logistic regression, clustering analysis, principal component analysis, factor analysis.

### 3) Statistics for Big data

Statistics in the era of big data. Statistical Network Analysis. Implementation using R and Python.

### 4) Recommender systems: Balancing between personalization and privacy

<https://www.sciencedirect.com/science/article/pii/S2095809917303855>

<https://ieeexplore.ieee.org/abstract/document/9599369>

### 5) Recommender systems: Context-aware RS

[https://www.sciencedirect.com/science/article/pii/S0950705117305075?casa\\_token=v1MC4Cj3BioAAAAA:caErwu7xuKitQ6EFn8hFhe6UBlVXqybX2BWXa9ZUt1HPLTi0ON2ERUh1WbNkWwcEI-pGs1gghqs](https://www.sciencedirect.com/science/article/pii/S0950705117305075?casa_token=v1MC4Cj3BioAAAAA:caErwu7xuKitQ6EFn8hFhe6UBlVXqybX2BWXa9ZUt1HPLTi0ON2ERUh1WbNkWwcEI-pGs1gghqs)

### 6) Recommender systems: RS in smart cities and IoT

[https://www.sciencedirect.com/science/article/pii/S0306437920300478?casa\\_token=3K350B3L6twAAAAA:ngKUTo2gTqHTkjzbe\\_LqkyvOvTqx01eb4jZm22RFa2RwFiamMPRizJd8ClvRMj\\_VTkX64-0v07Q](https://www.sciencedirect.com/science/article/pii/S0306437920300478?casa_token=3K350B3L6twAAAAA:ngKUTo2gTqHTkjzbe_LqkyvOvTqx01eb4jZm22RFa2RwFiamMPRizJd8ClvRMj_VTkX64-0v07Q)

### 7) Federated Learning with non-iid data

[https://www.sciencedirect.com/science/article/pii/S0925231221013254?casa\\_token=SORoQusaMfQAAAAA:dUv4eHX9ZGutCJk5xBlvSc9CQ-jn1zm-m57kWJa1uuJ\\_krl2a2pLynRBOEuJpsRrho4u0hG-8h4](https://www.sciencedirect.com/science/article/pii/S0925231221013254?casa_token=SORoQusaMfQAAAAA:dUv4eHX9ZGutCJk5xBlvSc9CQ-jn1zm-m57kWJa1uuJ_krl2a2pLynRBOEuJpsRrho4u0hG-8h4)

### 8) Reinforcement learning in multi-agent environments: Multi armed bandits

<https://www.nowpublishers.com/article/Details/MAL-068>

<https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9431107>

<https://dl.acm.org/doi/abs/10.1145/3173574.3173682>

### 9) Large language models and their use in Text-mining tasks: Vector similarity search for Greek document collections

<https://github.com/RedisAI/vecsims-demo>

<https://lablab.ai/t/efficient-vector-similarity-search-with-redis-a-step-by-step-tutorial>

### 10) Large language models and their use in Text-mining tasks: Development of a chatbot over a Greek document collection

<https://www.athenarc.gr/en/theano-covid19-chatbot>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7256567/>

11) Scan (X-ray) image analysis for fine-grained visual recognition

<https://www.sciencedirect.com/science/article/abs/pii/S0925231222014138>

<https://ieeexplore.ieee.org/document/9956127>

<https://www.sciencedirect.com/science/article/abs/pii/S0031320321004416>

<https://ieeexplore.ieee.org/document/9722843>

<https://www.sciencedirect.com/science/article/abs/pii/S0950705121010686>

12) Graph neural network architectures for video captioning

[https://openaccess.thecvf.com/content\\_CVPR\\_2020/html/Pan\\_Spatio-Temporal\\_Graph\\_for\\_Video\\_Captioning\\_With\\_Knowledge\\_Distillation\\_CVPR\\_2020\\_paper.html](https://openaccess.thecvf.com/content_CVPR_2020/html/Pan_Spatio-Temporal_Graph_for_Video_Captioning_With_Knowledge_Distillation_CVPR_2020_paper.html)

[https://openaccess.thecvf.com/content\\_CVPR\\_2020/html/Zhang\\_Object\\_Relational\\_Graph\\_With\\_Teacher-Recommended\\_Learning\\_for\\_Video\\_Captioning\\_CVPR\\_2020\\_paper.html](https://openaccess.thecvf.com/content_CVPR_2020/html/Zhang_Object_Relational_Graph_With_Teacher-Recommended_Learning_for_Video_Captioning_CVPR_2020_paper.html)

<https://ieeexplore.ieee.org/abstract/document/9709204>

<https://ieeexplore.ieee.org/abstract/document/9762283>

13) Scene classification using graph neural networks in the context of autonomous driving

[http://openaccess.thecvf.com/content\\_ECCV\\_2018/html/Jianwei\\_Yang\\_Graph\\_R-CNN\\_for\\_ECCV\\_2018\\_paper.html](http://openaccess.thecvf.com/content_ECCV_2018/html/Jianwei_Yang_Graph_R-CNN_for_ECCV_2018_paper.html)

<https://www.nuscenes.org/>

- Relevant Scientific Journals:

Journals

- Data Mining and Knowledge Discovery

- Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery

- Big Data Mining and Analytics

- Journal of AI and Data Mining

- Machine Learning and Data Mining in Pattern Recognition (MLDM)

Conferences

- ACM SIGKDD International Conference on Knowledge Discovery & Data Mining

- ACM International Conference on Web Search and Data Mining

- IEEE International Conference on Data Mining

- Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)

## MPHIL02 - Computational Intelligence and Cognitive Computing

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL02	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Computational Intelligence and Cognitive Computing		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	The course requires a strong, undergraduate-level background in linear algebra, univariate and multivariate calculus, probability theory, as well as knowledge of basic knowledge of numerical analysis and optimization methods. Furthermore, this course requires good knowledge of computer programming (especially Python), for the implementation of research projects and experiments.		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/MPHIL103/">https://eclass.hua.gr/courses/MPHIL103/</a>		

### (2) LEARNING RESULTS

#### Learning Results

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.

Consult Appendix A.

- Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area
- Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B
- Comprehensive Guide to Writing Learning Outcomes

Upon successfully completing this unit the students will be in a position to

- Know how to study and fully comprehend articles that are published in the current scientific literature
- Get accustomed with all stages followed during modern research production, including study of the bibliography, research of innovative solution, design and implementation of experiments, as well as the writing of scientific publications

- Be in a position to identify research opportunities and open problems in the areas of Artificial Intelligence and Machine Learning as well as to identify the first steps towards possible solutions.

**General Skills**

*Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?*

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Adaptation in new conditions  
 Decision Making  
 Independent work  
 Employment at an international level  
 Formulation of new research ideas  
 Project design and management  
 Promoting reasoning and self improvement  
 Promoting free, creative and deductive reasoning

**(3) COURSE CONTENT**

In the context of this course, students will perform in-depth study of modern methods that are related to one or more of the following areas of Artificial Intelligence:

- Machine learning
- Representation learning for images, sound, text and signals
- Reinforcement learning and autonomous agents
- Knowledge representation and reasoning

**(4) TEACHING and LEARNING METHODS - EVALUATION**

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings	
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	<ul style="list-style-type: none"> <li>- Machine learning and/or knowledge representation libraries and models</li> <li>- Libraries for auto-differentiation which support hardware acceleration</li> <li>- Communication via eClass and email</li> </ul>	
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise,</i>		
	<b>Activity</b>	<b>Workload in Semester</b>
	Project	125



<i>Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc.</i> <i>The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	Individual study	125
	Course total	250
<p align="center"><b>STUDENT EVALUATION</b></p> <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others</i> <i>Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	Individual work that includes: - Individual research and study - Technical report - Overview	

## (5) SUGGESTED BIBLIOGRAPHY

### - Suggested Bibliography:

- Astn Zhang, Zachary C. Lipton, Mu Li and Alexander J. Smola, "Dive into Deep Learning", <https://d2l.ai/>
- Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2016 <https://www.deeplearningbook.org/>
- Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson, 4th Edition (2020)
- Timothy Chou, "Precision: Principles, Practices and Solutions for the Internet of Things", 2016
- Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. Mathematics for machine learning. Cambridge University Press, 2020.
- R. Sutton & G. Barto. Reinforcement learning, 2020

### - Relevant Scientific Journals:

International scientific journals

IEEE Transactions on Pattern Analysis and Machine Intelligence

IEEE Transactions on Neural Networks and Learning Systems

Engineering Applications of Artificial Intelligence

Expert Systems with Applications

Journal of Machine Learning Research

Journal of Artificial Intelligence Research

Neural Computing and Applications

International Journal of Computer Vision

### Proceedings of international scientific conferences:

Neural Information Processing Systems

International Conference on Learning Representations

AAAI Conference on Artificial Intelligence

Computer Vision and Pattern Recognition

International Conference on Computer Vision

International Joint Conference on Artificial Intelligence

## MPHIL03 - Embedded systems and Robotics

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL03	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Embedded systems and Robotics		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Signal processing, image analysis, machine learning, algorithms, probability, statistics		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/MPHIL104/">https://eclass.hua.gr/courses/MPHIL104/</a>		

### (2) LEARNING RESULTS

#### Learning Results

*The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.*

*Consult Appendix A.*

- *Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Comprehensive Guide to Writing Learning Outcomes*

The aim of this subject is to introduce the students to some of the fundamental concepts found in the fields of the so-called 4th industrial revolution (Industry 4.0) and digital transformation (Digital transformation). In particular, the course will focus on the study, analysis and application of modern cutting-edge methods and technologies related to the scientific subjects of machine vision, human-computer interaction and embedded systems.

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

- analyze the requirements of a relevant application (e.g. in the fields of industry, process automation,

maintenance, etc.) and implement a relevant technical solution  
 - study the relevant literature and the different solutions/products available on the market and carry out a comparative evaluation of them  
 - to utilize software, models, libraries and development environments for the implementation and evaluation of technical solutions that will be designed.

**General Skills**

*Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?*

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Decision making  
 Individual work  
 Project design and management  
 Promoting reasoning and self-improvement  
 Promoting free, creative and deductive reasoning

**(3) COURSE CONTENT**

Machine vision, human computer interaction, embedded systems

**(4) TEACHING and LEARNING METHODS - EVALUATION**

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings	
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	Machine/deep learning and digital signal processing libraries and models - Statistical tools - Communication via OpenClass and email	
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<b>STUDENT EVALUATION</b> <i>Description of the evaluation process</i>	
	<b>Activity</b>	<b>Workload in Semester</b>
	Project	125
Individual study	125	
Course total	250	
Individual work that includes: - Individual research and study		

*Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others*  
Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.

- Technical report  
- Overview

## (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:

Large-scale multi-agent human-robot collaborative learning

\* <https://ieeexplore.ieee.org/abstract/document/9431107>

Machine vision applications

\* <https://ieeexplore.ieee.org/abstract/document/9537584>

\* <https://ieeexplore.ieee.org/abstract/document/10011760>

\* <https://ieeexplore.ieee.org/abstract/document/9439463>

\* <http://armbench.s3-website-us-east-1.amazonaws.com/>

\* <https://ieeexplore.ieee.org/document/10062210>

Synthesis and optimization of RISC-V System-on-Chips

\* A. Amid et al., "Chipyard: Integrated Design, Simulation, and Implementation Framework for Custom SoCs," in IEEE Micro, vol. 40, no. 4, pp. 10-21, 1 July-Aug. 2020

\* S. Karandikar et al., "FireSim: FPGA-Accelerated Cycle-Exact Scale-Out System Simulation in the Public Cloud," 2018 ACM/IEEE 45th Annual International Symposium on Computer Architecture (ISCA), Los Angeles, CA, USA, 2018

- Relevant Scientific Journals:

IEEE Transactions on Robotics, Machine Vision and Applications (Elsevier), Design Automation for Embedded Systems (Springer)

## MPHIL04 - Computing Infrastructures, Services and Systems

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL04	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Computing Infrastructures, Services and Systems		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Good skills in Programming Fair understanding of the principle of Distributed, Operating and Network systems		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://mphil.dit.hua.gr/en/studies/">https://mphil.dit.hua.gr/en/studies/</a>		

### (2) LEARNING RESULTS

#### Learning Results

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.

Consult Appendix A.

- Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area
- Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B
- Comprehensive Guide to Writing Learning Outcomes

Advance the students' knowledge on Computing Infrastructures, Services and Systems.  
Specialise on cutting edge technologies on relevant research fields.  
Develop problem-solving skills while tackling research-oriented challenges.  
Deliver research publications, software repositories or technical reports

## General Skills

Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies

Adaptation in new conditions

Decision Making

Independent work

Formulation of new research ideas

Promoting free, creative and deductive reasoning

## (3) COURSE CONTENT

Cloud Infrastructures, Cloud Services, Intranets, Fog Edge and Cloud Computing, dynamic resource management, autonomous systems

## (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings									
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	email, messengers, online meetings software, software repositories, software libraries, software and models for managing content (e.g. latex)									
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #e6f2ff;">Activity</th> <th style="background-color: #e6f2ff;">Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>		Activity	Workload in Semester	Project	125	Individual study	125	Course total	250
Activity	Workload in Semester									
Project	125									
Individual study	125									
Course total	250									
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	project-based									

## (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:

<https://link.springer.com/article/10.1007/s13174-010-0007-6> (cloud computing)

<https://www.sciencedirect.com/science/article/pii/S1383762118306349> (edge computing)

<https://ieeexplore.ieee.org/abstract/document/8016573> (mobile edge computing)

<https://www.sciencedirect.com/science/article/pii/S0167739X13000241> (IoT)

<https://ieeexplore.ieee.org/abstract/document/6567202> (big data)

<https://www.sciencedirect.com/science/article/pii/S0306437914001288> (big data & cloud computing)

<https://ieeexplore.ieee.org/abstract/document/8763885> (deep learning and edge computing)

google scholar search using keywords:

"cloud computing"

"edge computing"

"IoT"

"middleware"

"service-oriented systems"

"software systems"

"computing systems"

"microservices"

"serverless computing"

"blockchains"

etc

- Relevant Scientific Journals:

Future Generation Computer Systems

Journal of Software and Systems

IEEE Transactions on Parallel and Distributed Systems

IEEE Transactions on Cloud Computing

IEEE IoT

## MPHIL05 - System security and Cryptography

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL05	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	System security and Cryptography		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Course in Information Systems Security Course in Cryptography		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/DIT285/">https://eclass.hua.gr/courses/DIT285/</a>		

### (2) LEARNING RESULTS

#### Learning Results

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.

Consult Appendix A.

- Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area
- Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B
- Comprehensive Guide to Writing Learning Outcomes

- Familiarity with identity management standards
- Experimental development of authentication systems
- Design and implementation of applications with homomorphic and multi-party computation encryption libraries
- European legislative framework for qualified services

#### General Skills

Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?



- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Independent work  
 Formulation of new research ideas  
 Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

It involves research dealing with the subject of systems security and cryptography in the fields of:

- 1) of authentication technologies
- 2) identity management technologies
- 3) qualified services
- 4) homomorphic cryptography
- 5) multi-party computation

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings	
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	eclass	
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<b>Activity</b>	<b>Workload in Semester</b>
	Project	125
	Individual study	125
	Course total	250
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	Research Project	

## (5) SUGGESTED BIBLIOGRAPHY

### - Suggested Bibliography:

Security Engineering: A Guide to Building Dependable Distributed Systems, 3rd Edition

Ross Anderson

Computer Security, by Dieter Gollmann

Computer System Security: Basic Concepts and Solved Exercises , Gildas Avoine and Philippe Oechslin

### - Relevant Scientific Journals:

journal of information security and applications (elsevier)

journal of cryptology (springer)

## MPHIL06 - Technology Management

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL06	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Technology Management		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Information Systems (IS) Organizational Science Social Sciences Methodologies Analysis, Design and Evaluation of IS		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/MPHIL107/">https://eclass.hua.gr/courses/MPHIL107/</a>		

### (2) LEARNING RESULTS

#### Learning Results

*The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.*

*Consult Appendix A.*

- *Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Comprehensive Guide to Writing Learning Outcomes*

The course introduces the students to

- research methodologies in the field of Information Systems, Business digitization and Technology Transfer in general
- research questions development and conducting research with valid research methods such as case studies, survey research, design science research etc.

Ultimately, the students will acquire the following knowledge and skills:

- Conducting literature review in a systematic manner
- Identification of research gaps and new research questions
- Research models development
- Conducting research with credible research methods
- Paper writing for peer-reviewed academic journals and conferences

### General Skills

*Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?*

- |  |   |
|--|---|
| ● <i>Search, analysis and synthesis of data and information, also using the necessary technologies</i> | ● <i>Project planning and management</i>  |
| ● <i>Adapting to new situations</i>  | ● <i>Respect for diversity and multiculturalism</i>   |
| ● <i>Decision making</i>   | ● <i>Respect for the natural environment</i>  |
| ● <i>Autonomous work</i>   | ● <i>Demonstrating social, professional and ethical responsibility and sensitivity to gender issues</i> |
| ● <i>Teamwork</i>  | ● <i>Exercising criticism and self-criticism</i>  |
| ● <i>Working in an international environment</i>   | ● <i>Promoting free, creative and inductive thinking</i>  |
| ● <i>Working in an interdisciplinary environment</i>   | ● <i>...</i>  |
| ● <i>Generating new research ideas</i>   | ● <i>Other</i>  |

Search, analysis and synthesis of data and information with the use of the assorted technologies

Adaptation in new conditions

Decision Making

Independent work

Work at an interdisciplinary framework

Formulation of new research ideas

Project design and management

Promoting reasoning and self improvement

Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

Research on the following indicative research topics:

- Assessment of Technology Impact on Organizations
- Factors that affect Technology adoption by Organizations
- Relationship of Digital Maturity of Organizations with their Performance/ Success
- Business Analytics in Organizations - Applications, Challenges, Benefits
- Innovation in Organizations: Assessment, Innovation development
- Relationship of Digital Maturity of Organizations with their Innovation level
- Feasibility of Innovative/ State of the art Technologies

- Financial Management of Cloud services
- Innovation models/ types
- Sustainability in organizations (New approaches, New business models)
- New Technology Diffusion Models
- FinTech

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings									
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	e-class document editors, presentation tools online sources for papers literature review tools statistics tools business process management tools other tools based on the research field									
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>		Activity	Workload in Semester	Project	125	Individual study	125	Course total	250
Activity	Workload in Semester									
Project	125									
Individual study	125									
Course total	250									
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	<ul style="list-style-type: none"> <li>- Assignment (Literature review report, Research/ Technical report)</li> <li>- Writing paper for peer-reviewed academic journals and conferences</li> </ul>									

#### (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:  
Papers from peer-reviewed academic journals and conferences
- Relevant Scientific Journals:  
Technological Forecasting and Social Change  
Information Systems Research  
Journal of Business Research  
International Journal of Production Economics

## MPHIL07 - System Engineering

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL07	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	System Engineering		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	System Engineering System Analysis Object Oriented Programming Web applications programming Service oriented architectures		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/modules/course_info/index.php?course=MPHIL108">https://eclass.hua.gr/modules/course_info/index.php?course=MPHIL108</a>		

### (2) LEARNING RESULTS

#### Learning Results

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.

Consult Appendix A.

- Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area
- Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B
- Comprehensive Guide to Writing Learning Outcomes

The course introduces the students to

- methodologies and frameworks for system analysis, design and development
- languages and tools for system analysis and modeling
- system architecture design

- research questions development and conducting research with valid research methods.

Ultimately, the students will acquire the following knowledge and skills:

- Conducting literature review in a systematic manner
- Identification of research gaps and new research questions
- System modeling with established languages and tools
- Paper writing for peer-reviewed academic journals and conferences

### General Skills

*Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?*

- |  |   |
|--|---|
| ● <i>Search, analysis and synthesis of data and information, also using the necessary technologies</i> | ● <i>Project planning and management</i>  |
| ● <i>Adapting to new situations</i>  | ● <i>Respect for diversity and multiculturalism</i>   |
| ● <i>Decision making</i>   | ● <i>Respect for the natural environment</i>  |
| ● <i>Autonomous work</i>   | ● <i>Demonstrating social, professional and ethical responsibility and sensitivity to gender issues</i> |
| ● <i>Teamwork</i>  | ● <i>Exercising criticism and self-criticism</i>  |
| ● <i>Working in an international environment</i>   | ● <i>Promoting free, creative and inductive thinking</i>  |
| ● <i>Working in an interdisciplinary environment</i>   | ● <i>...</i>  |
| ● <i>Generating new research ideas</i>   | ● <i>Other</i>  |

Search, analysis and synthesis of data and information with the use of the assorted technologies

Adaptation in new conditions

Decision Making

Independent work

Work at an interdisciplinary framework

Formulation of new research ideas

Project design and management

Promoting reasoning and self improvement

Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

Research on the following indicative research topics:

- System engineering frameworks
- System modeling languages
- System architectures e.g. event-based
- Distributed architectures and systems
- System design considering new requirements e.g. ethics, privacy protection
- Exploring technologies suitable for specific applications

- Process modeling with CMMN language (application and evaluation of CMMN)
- Green system design
- Quality and Efficiency of Systems and Architectures
- Methodologies and tools for system testing

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings									
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	e-class document editors, presentation tools online sources for papers literature review tools statistics tools system modeling/ design tools integrated development environments									
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>		Activity	Workload in Semester	Project	125	Individual study	125	Course total	250
Activity	Workload in Semester									
Project	125									
Individual study	125									
Course total	250									
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	<ul style="list-style-type: none"> <li>- Assignment (Literature review report, Research/ Technical report)</li> <li>- Design/ Development of application/system</li> <li>- Writing paper for peer-reviewed academic journals and conferences</li> </ul>									

#### (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:  
Papers from peer-reviewed academic journals and conferences
- Relevant Scientific Journals:  
IEEE Transactions on Systems, Man, and Cybernetics: Systems  
IEEE Software  
Journal of Systems and Software  
Software and Systems Modeling



## MPHIL08 - Communication and Network Technologies

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL08	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Communication and Network Technologies		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b>	General background		
<i>general background, special background, specialization, general knowledge, skill development</i>			
<b>PREREQUISITE COURSES:</b>	Basic Notions of Network and Communication technologies & Python		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/modules/course_info/index.php?course=MPHIL106">https://eclass.hua.gr/modules/course_info/index.php?course=MPHIL106</a>		

### (2) LEARNING RESULTS

<p><b>Learning Results</b></p> <p><i>The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course. Consult Appendix A.</i></p> <ul style="list-style-type: none"> <li>● <i>Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area</i></li> <li>● <i>Descriptive Indicators for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Annex B</i></li> <li>● <i>Comprehensive Guide to Writing Learning Outcomes</i></li> </ul> <p>- Familiarity with various design and simulation tools          - Experimental development and study of systems          - Design of protocols and applications          - Digital twins</p> <p><b>General Skills</b></p> <p><i>Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?</i></p>
---

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Independent work  
 Formulation of new research ideas  
 Promoting reasoning and self improvement

### (3) COURSE CONTENT

This thematic unit involves research dealing with the subject of communication systems and networks in the fields of:

- 1) the technologies of communication systems (optical, satellite, wireless, etc.)
- 2) the physical layer (PHY)
- 3) layer 2 (Data link layer) and MAC layer
- 4) network layer (including IP and TCP)
- 5) network applications
- 6) management and design of network systems

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings	
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	Eclass	
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc.</i> <i>The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>		
	<b>Activity</b>	<b>Workload in Semester</b>
	Project	125
	Individual study	125
	Course total	250
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report/Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other /Others</i>	Theses	

## **(5) SUGGESTED BIBLIOGRAPHY**

### **- Suggested Bibliography:**

Computer Networks, Tanenbaum, 5th edition, Pearson Education India

Satellite Communication System and its applications: Civilian and Military wireless communication applications, Prajapati, LAP LAMBERT Academic Publishing

Optical Networks: A Practical Perspective, Ramasmawi, 3rd Edition 3rd Edition, Morgan Kaufmann

### **- Relevant Scientific Journals:**

IEEE Journal on Selected Areas in Communications

IEEE Communications Magazine

IEEE Network

IEEE Internet of Things Journal

IEEE Transactions on Cognitive Communications and Networking

## MPHIL09 - Programming Languages/Software Systems

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL09	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Programming Languages/Software Systems		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Programming, Data Structures, Algorithms		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/MPHIL102/">https://eclass.hua.gr/courses/MPHIL102/</a>		

### (2) LEARNING RESULTS

#### Learning Results

*The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.*

*Consult Appendix A.*

- *Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Comprehensive Guide to Writing Learning Outcomes*

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

- understand the underlying theory of programming languages and software systems,
- know how to study and fully comprehend research articles,
- familiarise themselves with the steps of research process,
- use tools and libraries to develop research prototypes and experimental evaluations.

#### General Skills

*Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?*

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Adaptation in new conditions  
 Decision Making  
 Independent work  
 Employment at an international level  
 Formulation of new research ideas  
 Project design and management  
 Promoting reasoning and self improvement  
 Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

- Foundations of programming languages: semantics, type theory, domain theory, category theory.
- Programming language design and implementation.
- Program analysis and formal verification: static and dynamic analysis, model checking.
- Program synthesis

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings								
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	- Communication via OpenClass and email								
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>	Activity	Workload in Semester	Project	125	Individual study	125	Course total	250
Activity	Workload in Semester								
Project	125								
Individual study	125								
Course total	250								
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others</i>	Individual work that includes: <ul style="list-style-type: none"> <li>- Individual research and study</li> <li>- Technical report</li> <li>- Overview</li> </ul>								

## **(5) SUGGESTED BIBLIOGRAPHY**

### **- Suggested Bibliography:**

- R. D. Tennent, *Semantics of Programming Languages*, Prentice Hall, ISBN: 978-0-13-805599-8, 1991.
- Benjamin Pierce, *Types and programming languages*, MIT Press, ISBN: 978-0-262-16209-8, 2002.
- Samson Abramsky, *Domain Theory*, In *Handbook of Logic in Computer Science*. Vol. III. Oxford University Press, ISBN 0-19-853762-X, 1994.
- Benjamin Pierce, *Basic Category Theory for Computer Scientists*, MIT Press, ISBN: 978-0-262-66071-6, 1991.
- Flemming and Hanne, *Principles of Program Analysis*, Springer Berlin, ISBN: 978-3-662-03811-6, 2015.
- *Handbook of Model Checking*, Springer International Publishing, ISBN: 978-3-319-10574-1, 2018.
- Relevant Scientific Journals:

#### **Journals**

- ACM TOPLAS (Transactions on Programming Languages and Systems)
- JFP (Journal of Functional Programming)
- TPLP (Theory and Practice of Logic Programming)

#### **Conferences**

- POPL (Symposium on Principles of Programming Languages)
- PLDI (Programming Language Design and Implementation)
- ICFP (International Conference on Functional Programming)
- ICLP (International Conference on Logic Programming)

## MPHIL10 - Algorithms and Optimization

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL10	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Algorithms and Optimization		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	Combinatorics, Graph Theory, Algorithms, Programming		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/courses/MPHIL105/">https://eclass.hua.gr/courses/MPHIL105/</a>		

### (2) LEARNING RESULTS

#### Learning Results

*The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.*

*Consult Appendix A.*

- *Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Comprehensive Guide to Writing Learning Outcomes*

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

- understand theoretical and practical aspects of algorithms, computation and optimisation,
- know how to study and fully comprehend research articles,
- familiarise themselves with the steps of research process.

#### General Skills

*Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?*

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Independent work  
Promoting free, creative and deductive thought

### (3) COURSE CONTENT

- Theoretical Computer Science
- Theory of Computing
- Algorithms: Design and Analysis of Algorithms, Data Structures, Algorithm Engineering
- Optimization: Linear and Integer Programming, Convex Optimization, Non-Linear Optimization

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings									
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	eclass platform									
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>		Activity	Workload in Semester	Project	125	Individual study	125	Course total	250
Activity	Workload in Semester									
Project	125									
Individual study	125									
Course total	250									
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	Project									

### (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:



- Stephen Boyd and Lieven Vandenberghe, *Convex Optimization*, Cambridge University Press.
- W. Cook, W. Cunningham, W. Pulleyblank and A. Schrijver, *Combinatorial Optimization*.
- C. Papadimitriou and K. Steiglitz, *Combinatorial Optimization: Algorithms and Complexity*, Prentice-Hall, 1982.
- Alan Frieze and M. Karonski, "Introduction to Random Graphs", Cambridge University Press, 2015.
  
- Relevant Scientific Journals:
- Symposium on Discrete Algorithms (SODA)
- ACM Transactions on Algorithms

## MPHIL11 - Internet of Things

### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHIL11	<b>SEMESTER OF STUDIES</b>	1st
<b>COURSE TITLE</b>	Internet of Things		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Project		125	
Individual study		125	
<b>TOTAL</b>		250	10
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>			
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	<a href="https://eclass.hua.gr/modules/course_info/?course=MPHIL109">https://eclass.hua.gr/modules/course_info/?course=MPHIL109</a>		

### (2) LEARNING RESULTS

#### Learning Results

*The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.*

*Consult Appendix A.*

- *Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Comprehensive Guide to Writing Learning Outcomes*

The course aims to integrate the IoT domain with a multitude of architectures that have to do both with its application in a wide range of areas of interest (Transportation, Smart Cities, Industry 4.0) as well as with the exploitation of new trends and developments in the operational part and the context of the Computing Continuum (device/edge/cloud) and the use of Artificial Intelligence. Also included are ways to interconnect and integrate subsystems to create unified workflows and synergies to achieve the end goals of each application.

At the end of the course, students will be able to understand the complex interactions that are

necessary to create added value services on top and across diverse systems as well as exploit key functionalities in order to deliver such applications.

### General Skills

Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?

- Search, analysis and synthesis of data and information, also using the necessary technologies
- Adapting to new situations
- Decision making
- Autonomous work
- Teamwork
- Working in an international environment
- Working in an interdisciplinary environment
- Generating new research ideas
- Project planning and management
- Respect for diversity and multiculturalism
- Respect for the natural environment
- Demonstrating social, professional and ethical responsibility and sensitivity to gender issues
- Exercising criticism and self-criticism
- Promoting free, creative and inductive thinking
- ...
- Other

Search, analysis and synthesis of data and information with the use of the assorted technologies

Adaptation in new conditions

Decision Making

Independent work

Formulation of new research ideas

Project design and management

Respecting the natural environment

Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

IoT in Transportation:

Research on IoT applications for traffic management, vehicle-to-vehicle communication, and autonomous vehicles.

Edge Computing in IoT:

Research on edge computing architectures for optimizing data processing in IoT environments.

Research on distributed Continuum application workflows (edge/cloud/device) and tradeoffs

Research on supporting services, platforms and frameworks for the IoT

IoT in Smart Cities

Research on IoT applications for traffic management, waste management, and energy conservation in smart cities.

Sustainability and environmental impact of IoT implementations in urban areas.

IoT and AI Integration:

Investigating the synergy between IoT and artificial intelligence for predictive maintenance and data analytics.

Developing AI algorithms for real-time decision-making in IoT systems.

IoT and Industry 4.0:

Examining IoT's role in the fourth industrial revolution, including smart factories and supply chain

optimization.

IoT-enabled automation and robotics in manufacturing

Evaluating use of AI (safety, performance improvement, regulatory requirements etc) in Industry 4.0

Standardization and Interoperability:

Studying the challenges and solutions for IoT device interoperability and standardization.

#### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings									
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	Eclass, Google Meet Open Data Sources and Smart Cities APIs Software tools per case (e.g. Node-RED for workflows, Spark for data processing, Minio for data storage etc.)									
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Project</td> <td>125</td> </tr> <tr> <td>Individual study</td> <td>125</td> </tr> <tr> <td>Course total</td> <td>250</td> </tr> </tbody> </table>		Activity	Workload in Semester	Project	125	Individual study	125	Course total	250
Activity	Workload in Semester									
Project	125									
Individual study	125									
Course total	250									
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.</i>	Written Assignment									

#### (5) SUGGESTED BIBLIOGRAPHY

- Suggested Bibliography:

Research Papers per topic

- Relevant Scientific Journals:

IEEE Internet of Things

IEEE Transactions on Industrial Informatics

Elsevier Future Generation Computer Systems

## 2nd - 3rd SEMESTER

### MPHILD - Diploma Thesis

#### (1) GENERAL

<b>SCHOOL</b>	Digital Technology		
<b>DEPARTMENT</b>	Informatics and Telematics		
<b>STUDY LEVEL</b>	Postgraduate		
<b>COURSE CODE</b>	MPHILD	<b>SEMESTER OF STUDIES</b>	2nd - 3rd
<b>COURSE TITLE</b>	Diploma Thesis		
<b>TEACHING ACTIVITIES</b>		<b>COURSE LOAD (HOURS OF WORK)</b>	<b>ECTS CREDITS</b>
<i>in case the credits are awarded in separate parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and total credits</i>			
Final Thesis Report		500	
Individual study		1000	
<b>TOTAL</b>		1500	60
<b>COURSE TYPE</b> <i>general background, special background, specialization, general knowledge, skill development</i>	General background		
<b>PREREQUISITE COURSES:</b>	-		
<b>STUDY and EXAMS LANGUAGE:</b>	English/Greek		
<b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>	No		
<b>COURSE WEB PAGE (URL)</b>	-		

#### (2) LEARNING RESULTS

##### Learning Results

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that the students will acquire after the successful completion of the course.

Consult Appendix A.

- Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area
- Descriptive Indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B
- Comprehensive Guide to Writing Learning Outcomes

The aim of the thesis is to enable students to gain experience in conducting scientific research and documenting the results in a structured way.

Upon successful completion of the thesis, the student will be able to:

- analyze a data-related problem and formulate/design/implement a technical solution

- understand the theoretical background of open problems in the area of interest of the work and identify research opportunities beyond the existing research level
- use software, models, libraries to develop standard solution implementations and evaluate them.

### General Skills

Taking into account the general competencies that the graduate must have acquired (as listed in the Diploma Appendix and listed below), which one(s) is the course aimed at?

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>● Search, analysis and synthesis of data and information, also using the necessary technologies</li> <li>● Adapting to new situations</li> <li>● Decision making</li> <li>● Autonomous work</li> <li>● Teamwork</li> <li>● Working in an international environment</li> <li>● Working in an interdisciplinary environment</li> <li>● Generating new research ideas</li> </ul> | <ul style="list-style-type: none"> <li>● Project planning and management</li> <li>● Respect for diversity and multiculturalism</li> <li>● Respect for the natural environment</li> <li>● Demonstrating social, professional and ethical responsibility and sensitivity to gender issues</li> <li>● Exercising criticism and self-criticism</li> <li>● Promoting free, creative and inductive thinking</li> <li>● ...</li> <li>● Other</li> </ul> |
|--|--|

Search, analysis and synthesis of data and information with the use of the assorted technologies  
 Adaptation in new conditions  
 Decision Making  
 Independent work  
 Employment at an international level  
 Formulation of new research ideas  
 Project design and management  
 Promoting reasoning and self improvement  
 Promoting free, creative and deductive reasoning

### (3) COURSE CONTENT

Depending on the subject of the diploma thesis

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>COURSE DELIVERY METHOD</b> <i>Face to face, Distant learning, etc.</i>	Distant and face to face meetings								
<b>USE OF ICT</b> <i>Use of ICT in Teaching, Lab education, Communication with the students</i>	- Tools for saving the code and text of the thesis - Communication via OpenClass and email								
<b>TEACHING MANAGEMENT</b> <i>The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature Study &amp; Analysis, Tutorial, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Teaching, Educational Visits, Study Preparation (Project), Writing Paper / Assignments, Artistic Creation, etc. etc. The student's study hours for each learning activity as well as unguided study hours according to ECTS principles are listed.</i>	<table border="1"> <thead> <tr> <th>Activity</th> <th>Workload in Semester</th> </tr> </thead> <tbody> <tr> <td>Final Thesis Report</td> <td>500</td> </tr> <tr> <td>Individual study</td> <td>1000</td> </tr> <tr> <td>Course total</td> <td>1500</td> </tr> </tbody> </table>	Activity	Workload in Semester	Final Thesis Report	500	Individual study	1000	Course total	1500
Activity	Workload in Semester								
Final Thesis Report	500								
Individual study	1000								
Course total	1500								
<b>STUDENT EVALUATION</b> <i>Description of the evaluation process</i>	Individual work that includes: - Individual research and study								

*Assessment Language, Assessment Methods, Formative or Deductive, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Interpretation, Other / Others*  
*Explicitly defined evaluation criteria are mentioned and if and where they are accessible by students.*

- Technical report to be submitted for evaluation at a peer-reviewed conference or journal
- Detailed presentation and support

## **(5) SUGGESTED BIBLIOGRAPHY**

Depending on the subject of the diploma thesis