COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MINERAL RESOURCES ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	MRE205	SEMESTER	2
COURSE TITLE	SCIENTIFIC PROGRAMMING		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	CREDITS
Lectures	2	2
Lab exercises	2	2
Total	**4**	**4**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uowm.gr/courses/MRE123/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

After completing the course, students will be able to:

- Analyse scientific problems in specific steps and procedures for their systematic solving
- Choose appropriate data structures to store and manipulate scientific data
- Know the appropriate scientific function libraries and how to integrate and use them in their own programs
- Know how to develop software applications for solving scientific problems, using existing algorithms and developing their own
- Know how to debug their programs.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Working independently
Project planning and management
Production of free, creative and inductive thinking

(3) SYLLABUS

The course covers programming for scientific applications and focuses on design and implementation technologies for software applications.
It includes an extensive coverage of algorithm theory, specific software architectures, and various data structures.
Special emphasis is given to algorithm development using a modern computer language – Python.
Some of the thematic units included are algorithm theory, recursive algorithms, lists, stacks, queues, search trees, and data handling.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face, webinars, computer lab work using program development environments.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Use of data projector, specialised program development software, asynchronous training platform – eclass.</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>28</td></tr>
<tr><td>Lab work</td><td>28</td></tr>
<tr><td>Home exercises</td><td>32</td></tr>
<tr><td>Lectures study</td><td>32</td></tr>
<tr><td>Course total</td><td>120</td></tr>
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</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>Weekly evaluation of programming exercises (40%), final written exam of theory (50%) and final written exam of lab work (10%).
Assessment criteria are provided in the course page on the eclass platform and are available to students from the start of the semester.</td></tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

Fangohr, H., 2015, Introduction to Python for Computational Science and Engineering, University of Southampton, 167 σελ.
Καρολίδης, Δ., 2018, Μαθαίνετε Εύκολα Python, Εκδόσεις Άβακας, 575 σελ.
Lutz, M., 2009, Learning Python, 4th Edition, O'Reilly Media, 1213 σελ.
NumPy Community, NumPy User Guide, 2020
Πανέτσος, Σ., 2019, Εισαγωγή στον Προγραμματισμό με την PYTHON, Εκδόσεις Α. Τζιόλα & Υιοί, 632 σελ.
Σαμαράς, Ν., Τσιπλίδης, Κ., 2019, Το Βιβλίο της Python – Γράφοντας Κώδικα, Εκδόσεις Κριτική, 589 σελ.
Schneider, D., 2016, Εισαγωγή στον Προγραμματισμό με την PYTHON, Εκδόσεις Γκιούρδα & ΣΙΑ, 424 σελ.
VanderPlas, J., 2016, Python Data Science Handbook, O'Reilly Media, 548 σελ.
Varoquaux, G., Gouillart, E., Vahtras, O., de Buyl, P., 2019, SciPy Lecture Notes.

- Related academic journals:

Science of Computer Programming, Elsevier
Programming and Computer Software, Springer
Journal of Computer Languages, Elsevier