# COURSE OUTLINE

## (1) GENERAL

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|---|---|---|---|
| SCHOOL | SCHOOL OF SCIENCES | | |
| ACADEMIC UNIT | BIOLOGY | | |
| LEVEL OF STUDIES | UNDERGRADUATE | | |
| COURSE CODE | BIO_HE20 | **SEMESTER** | 6/8 |
| COURSE TITLE | PHOTOSYNTHESIS | | |

| INDEPENDENT TEACHING ACTIVITIES<br>*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 | 3 |
| | | |
| | | |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |

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| COURSE TYPE<br>*general background, special background, specialised general knowledge, skills development* | Elective |
| PREREQUISITE COURSES: | There are no prerequisite courses. The student is strongly recommended to have a basic knowledge of Plant Physiology and Biochemistry. |
| LANGUAGE OF INSTRUCTION and EXAMINATIONS: | GREEK |
| IS THE COURSE OFFERED TO ERASMUS STUDENTS | NO |
| COURSE WEBSITE (URL) | https://eclass.upatras.gr/courses/BIO217/ |

## (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*

At the end of the course the student is expected to have acquired a basic knowledge of photosynthesis in different organisms, from photosynthetic bacteria to higher plants, and the underlying regulatory and protective mechanisms.
In addition, the student will be able to combine the knowledge acquired during this and previous courses and have a spherical aspect of photosynthesis.

**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?*

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|---|---|
| *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…* |
| | *…….* |

- Retrieve, analyze and synthesize data and information, with the use of necessary technologies
- Work autonomously
- Advance free, creative and causative thinking

Respect natural environment

## (3) SYLLABUS

1. Introduction: importance of photosynthesis.
2. Other assimilative (apart from $CO_2$ assimilation) pathways in the chloroplast and their physiological role: reduction and assimilation of nitrite and sulfate. Reduction of oxaloacetate and oxidized glutathione.
3. Permeability of chloroplastic membranes, export of biomolecules from the chloroplast.
4. Internal regulation of photosynthesis. Photoregulation of chloroplastic enzymes, co-ordination and detuning of photochemical and biochemical reactions. Starch and sucrose synthesis.
5. Photoinhibition of photosynthesis and photoprotective mechanisms. Avoidance and dissipation of excitation-energy, non-photochemical quenching. Scavenging of toxic species of the “light reactions”. The role of photorespiration.
6. Bacterial photosynthesis. Oxygenic and anoxygenic photosynthesis: cyanobacteria, purple and green sulfur and non-sulfur bacteria, heliobacteria. Halobacteria. $CO_2$ assimilative cycles. Ecological significance of the photosynthetic bacteria.
   Evolution of photosynthesis.

## (4) TEACHING and LEARNING METHODS - EVALUATION

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|---|---|
| **DELIVERY**<br>*Face-to-face, Distance learning, etc.* | Lectures in classroom |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY**<br>*Use of ICT in teaching, laboratory education, communication with students* | Lectures using contemporary methods and attempts of improving critical reasoning through dialogue. Complementary usage of the e-class (open class) platform . |
| **TEACHING METHODS**<br>*The manner and methods of teaching are described in detail.*<br>*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.*<br><br>*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* | *Activity* / *Semester workload*<br>Lectures: 26<br>Autonomous study: 49<br>Course total: *75* |
| **STUDENT PERFORMANCE EVALUATION**<br>*Description of the evaluation procedure*<br><br>*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*<br><br>*Specifically-defined evaluation criteria are given, and if and where they are accessible to students.* | Compulsory written exams at the end of the semester. |

## (5) ATTACHED BIBLIOGRAPHY

*- Suggested bibliography:* Photosynthesis, Lecture notes, Y. Manetas, Y. Petropoulou.

Plant Physiology, George Aivalakis, George Karabourniotis, George Liakopoulos, Embryo Press, 2016 (in greek)
Plant Physiology and Development, Lincoln Taiz, Eduardo Zeiger, Ian Max Møller and Angus Murphy, Utopia Publishing, Athens, 2017 (in greek).

*- Related academic journals:*