COURSE OUTLINE

1. GENERAL

SCHOOL	School of Agricultural Sciences
ACADEMIC UNIT	Agriculture
LEVEL OF STUDIES	Undergraduate

COURSE CODE	AGRI_103	**SEMESTER**	1ST

COURSE TITLE	Physics-Agrometeorology

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	
Tutorials	0	
Laboratory	2	
TOTAL	**4**	**5**
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*	Background (Fundamental Principles of Physics and Agrometeorology)	
PREREQUISITE COURSES:	There are no prerequisite courses.	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek .-For Erasmus students in English	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes	
COURSE WEBSITE (URL)		

2. LEARNING OUTCOMES

Learning outcomes
The course learning outcomes, specific knowledge, skills and competences of an appropriate 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*

The crop cultivation in open space is highly influenced by physical parameters such as solar radiation, wind velocity, humidity, precipitation, frost, fog, existence of sea and its currents and geographical altitude and latitude. The cumulative effect of these physical components leads to normal and abrupt weather conditions on earth. The aim of this course is to acquiring the theoretical and practical notions of physics and agrometeology to understand the mechanisms of functioning of living organisms, environment and agricultural systems.

Upon successful completion of the course the students:

• Will understand basic phenomena and laws of Mechanics, Thermodynamics and Electricity-Magnetism that are necessary for attending the more specialized lessons of Agriculture.

• Be aware of the technical details regarding the design and execution of relevant experiments and the principles of operation of the measuring instruments used to study the phenomena under consideration.

- Will be able to know atmospheric processes that produce various climate and weather conditions, their agricultural significance, and use of agro-meteorological forecasting tools in agricultural decision making.

The course will provide the foundations of physics-agrometeology, with a strong focus on developing a skill base necessary for the construction, analysis, and interpretation of experimental data, as well as a practical understanding and use of predictive models.

At the end of this course the student will have further developed the following skills (general skills):
• Ability to identify and name utensils and instruments of a physics-agrometeology laboratory
• Ability to record and keep a proper laboratory diary
• Ability to process experimental measurements and yield results in the correct format
• Ability to find information from any book of physics and agrometeology as well as from sources on the internet

In general, upon completion of this course the student will have further developed the following general skills (from the list above):
Search, analysis and synthesis of data and information, using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Respect for the natural environment
Exercise criticism and self-criticism

3. SYLLABUS

The course involves study of:
1. Point kinematics. Kinematics in one, two and three dimensions with the help of vector calculus. Newton's Laws and their applications. Plant growth Curve
2. Dynamics of Solids. Mass-Inertia of bodies. Work and energy. Kinetic and Dynamic Energy. Power. Linear momentum. Mass Center. Rotational Motion. Torque of Force. Moment of inertia.
3. Electrostatic. Electrical Charge. Coulomb's Law. Electric Field. Electrostatic Energy, Potential. Gauss Law. Point and Continuous Charge distributions. Conservative Fields. Dynamic Energy Function. Applications: Gravity Field, Electrostatic Field.
4. Dielectric Materials and Capacitors. Electrical Conductivity. Electrical Power. Electrical Resistance. Ohm's Law. Resistor and Capacitor dc electrical circuit.
5. Magnetic Field. Magnetic Flux. Ampere's Law. Biot-Savart's Law. Magnetic Induction, Faraday. Time Changing Fields. Abduction.
6. **Fluids.** Definition and properties. Mechanical behavior of solids and fluids. The fluid state. Density, pressure and temperature. Internal energy, enthalpy, entropy, special heat capacity. Fluid Compressibility - Viscosity. Fluid Dynamics - Navier Stokes Equations.
7. Thermodynamics. Heat-Temperature. Heat Transfer. Thermodynamic Laws. Heat transfer mechanisms in greenhouse and agricultural systems.
8. Atmospheric Physics: atmospheric thermodynamics, hydrostatic equilibrium and stability, atmospheric radiation, clouds and atmospheric dynamics.
9. Meteorology: Definitions, scope and its role in agriculture. Agro-meteorological variables and its measurement: Air temperature, relative humidity (RH), Solar radiation, Soil moisture, soil temperature, precipitation, wind speed and direction, sunshine duration; evaporation and factors affecting evaporation and transpiration rates

10. Weather and climate forecasts for agriculture: Elements of agricultural weather forecast, Types of weather forecasts- Now-casting (NC), Very short-range forecast (VSRF), Short-range forecast (SRF), Medium-range forecast (MRF), Long-range forecast (LRF). Usefulness of weather forecast based on its types; weather forecasting scenario of Greece

11. Weather crop relation, Crop zonation and crop planning, Agricultural pest management (pest outbreak planning), Bioclimatic indicators (sensible temperature, discomfort, dryness, frost protection, drought management).

13. Climate change and its impacts on agriculture: climate variability, changes in atmospheric composition, observed changes and future climate scenario; impact on hydrology, crop and livestock; impacts in Greece

13. Agro-meteorological stations and measurements of these variables; significance of its in Agriculture; Required exposure for measurement. Agro-meteorological normal for main crops. Crop growth simulation modeling,

Laboratory Exercises
1. Measurements and Error Analysis
2. Sensing and Measurement Instruments,. Meteorological (Weather) Instruments
3. Measurement of distance (position), velocity and acceleration, force, torque, pressure, fluid flow
4. Measurements in electric circuits and Ohms Law
5. Faraday's Laws of Electromagnetic Induction - measurement of Electrical potential
6. Measurement of capillary Pressures and surface tension
7. Experimental Study of Rainfall-Rainfall diagram-Rain Gauge
8. Transforming Satellite Data into Weather Forecasts
9. Types of Weather Stations, Meteorological MeasurementsSurface weather observations and reports
10. Weather forecasting scenario in the field

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures in the classroom, laboratory and field.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of ICT (power point) in Teaching • Use of ICT (power point) in Laboratory Training • Use of ICT in Communication with students (Learning process support through the electronic platform e-class).
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*	<table><tr><td>*Activity*</td><td>*Semester workload*</td></tr><tr><td>Lectures</td><td>26</td></tr><tr><td>Laboratory</td><td>26</td></tr><tr><td>Writing short reports of laboratory exercises</td><td>13</td></tr><tr><td>Final Exams</td><td>3</td></tr><tr><td>Study hours and preparation for the laboratory exercises and the final examination</td><td>57</td></tr><tr><td>Course total</td><td>**125**</td></tr></table>
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*	1. The laboratories participate by 30% in the final grade. In order to be examined in theory, the student must have completed all the laboratories and have been successfully examined in them. 2. The main assessment criteria focus on understanding and correlating the knowledge that students gain from the course with other knowledge. Particular emphasis is placed on whether they have developed the ability to apply this knowledge to crop selection and to assess the impact of these changes on the environment. Emphasis is also placed on demonstrating critical ability and justifying the choices they make in each problem.

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.	3. Evaluation is dynamic. It mainly involves problem solving. is done orally or in writing or with a combination of the two, with or without pre-examination on the basic principles of the course, with or without exculpatory advances and with other test or inventive methods, depending on the composition of the dynamics and the needs of the audience. 4. The above are done in the Greek language. For foreign language students (eg Erasmus students) conducted in English

5. RECOMMENDED LITERATURE

-Προτεινόμενη Βιβλιογραφία :

1. Φυσική για τις Επιστήμες Ζωής [Κωδικός Βιβλίου στον Εύδοξο: 32997839] Έκδοση: 1η έκδ./2013 Συγγραφείς: Newman Jay ISBN: 9789605313135 Τύπος: Σύγγραμμα Διαθέτης (Εκδότης): ΔΙΑΥΛΟΣ Α.Ε. ΕΚΔΟΣΕΙΣ ΒΙΒΛΙΩΝ
https://service.eudoxus.gr/search/#a/id:32997839/0

2. Φυσική, 7η Έκδοση [Κωδικός Βιβλίου στον Εύδοξο: 59415176] Έκδοση: 7η/2018 Συγγραφείς: Giancoli C. Douglas, Κεχαγιάς Αλέξανδρος, Κωνσταντίνος Σφέτσος, Γεώργιος Τσιπολίτης (επιμέλεια) ISBN: 9789604187294 Τύπος: Σύγγραμμα Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
https://service.eudoxus.gr/search/#s/Douglas%20C%20.%20Giancoli/0

3. Φυσική [Κωδικός Βιβλίου στον Εύδοξο: 86054388] Έκδοση: 1η/2019 Συγγραφείς: Δαυΐδ Κωνσταντίνος, Μυλωνάς Νικόλαος ISBN: 9789604188376 Τύπος: Σύγγραμμα Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
https://service.eudoxus.gr/search/#s/%CE%9D%CE%B9%CE%BA%CF%8C%CE%BB%CE%B1%CE%BF%CF%82%20%20%CE%9C%CF%85%CE%BB%CF%89%CE%BD%CE%AC%CF%82%20%20&%20%20%CE%9A%CF%89%CE%BD%CF%83%CF%84%CE%B1%CE%BD%CF%84%CE%AF%CE%BD%CE%BF%CF%82%20%20%CE%94%CE%B1%CF%85%CE%AF%CE%B4/0

4. ΕΝΕΡΓΕΙΑΚΗ & ΠΕΡΙΒΑΛΛΟΝΤΙΚΗ ΦΥΣΙΚΗ [Κωδικός Βιβλίου στον Εύδοξο: 3704 Έκδοση: 1/2010] Συγγραφείς: ΑΡΓΥΡΙΟΥ ΑΘΑΝΑΣΙΟΣ - ΓΙΑΝΝΟΥΛΗ ΜΥΡΣΙΝΗ ISBN: 9789609474016 Τύπος: Σύγγραμμα Διαθέτης (Εκδότης): ΔΕΜΕΡΝΤΖΗΣ ΠΑΝΤΕΛΗΣ
https://service.eudoxus.gr/search/#a/id:3704/0

5. ΠΑΝΕΠΙΣΤΗΜΙΑΚΗ ΦΥΣΙΚΗ με Σύγχρονη Φυσική, Τόμος Α΄, Young, Hugh D.Freedman, Roger, Εκδόσεις Παπαζήση, 3η Έκδοση 2019, ISBN 978-960-02-3535-7
https://www.papazissi.gr/product/penepistimiaki-fisiki-3-1/

6. ΦΥΣΙΚΗ (ΕΠΙΤΟΜΟ) ΜΗΧΑΝΙΚΗ, ΚΥΜΑΤΙΚΗ, ΘΕΡΜΟΔΥΝΑΜΙΚΗ, ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΣΜ ΟΣ, ΟΠΤΙΚΗ. HALLIDAY DAVID, RESNICK ROBERT, WALKER JEARL. 2014. Εκδόσεις GUT ENBERG, ISBN13: 9789600116519 -

-Συναφείς επιστημονικές πηγές και περιοδικά:

7. ΑΓΡΟΜΕΤΕΩΡΟΛΟΓΙΑ . ΑΝΑΛΥΣΗ ΚΑΙ ΠΡΟΣΟΜΟΙΩΣΗ [Κωδικός Βιβλίου στον Εύδοξο: 320280] Έκδοση: 1/2016 Συγγραφείς: ΝΙΚΟΛΑΟΣ ΔΑΛΕΖΙΟΣ ISBN: 978-960-603-134-2 Τύπος: Ηλεκτρονικό Βιβλίο Διαθέτης (Εκδότης): Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα - Αποθετήριο "Κάλλιπος"
https://repository.kallipos.gr/handle/11419/3730

8. ΕΡΓΑΣΤΗΡΙΑΚΕΣ ΑΣΚΗΣΕΙΣ ΦΥΣΙΚΗΣ, Δημήτριος Χασάπης [Κωδικός Βιβλίου στον Εύδοξο: 320168]ebook, Έκδοση: 1/2016, Έκδοση: Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα - Αποθετήριο "Κάλλιπος" ISBN: 978-960-603- 022-2.
https://service.eudoxus.gr/search/#s/%CE%94%CE%B7%CE%BC%CE%AE%CF%84%CF%81%CE%B9%CE%BF%CF%82%20%CE%A7%CE%B1%CF%83%CE%AC%CF%80%CE%B7%CF%82/0

9. Plant Growth Curves: The Functional Approach to Plant Growth Analysis, Roderick Hunt Publisher: Cambridge University Press; Revised ed. edition (9 Mar. 2010) ISBN-10 0521427746: , ISBN-13 : 978-0521427746   https://www.amazon.de/-/en/Roderick-Hunt/dp/0521427746
-Εκδ. Κάλλιπος 2015

10. Agrometeorology - an overview | ScienceDirect
https://www.sciencedirect.com/topics/earth-and-planetary-sciences/agrometeorology