COURSE OUTLINE

1. GENERAL

SCHOOL	School of Agricultural Sciences		
ACADEMIC UNIT	Biosystems & Agricultural Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	BAE_808	**SEMESTER**	8th
COURSE TITLE	**AUTOMATIC CONTROL OF AGRICULTURAL PROCESSES AND MACHINERY**		

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	3	
Tutorial	2	
TOTAL	**5**	**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*	Special background
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, and in English for Erasmus students.
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*

This course is an introduction to modern state-space techniques of control system analysis and design. The basics of state feedback and observer/model-based output feedback design are presented, along with LQR, Kalman filter and LQG synthesis and an introduction to robust control.

Upon successful completion, students will have the knowledge and skills to:

- Employ state-space analysis and design techniques given the mathematical model of the process
- Use software toolboxes (such as Matlab) for control system analysis and design
- Determine the stability, controllability and observability of a system
- Compute state feedback/observer gains for given specifications
- Compute optimal state feedback/observer gains for given performance costs
- Design robust controllers for simple systems with uncertainties

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

3. SYLLABUS

Lectures:

1) Review of basic notions and methods of classical Automatic Control.
2) Introduction to the state-space description of control systems. System linearization and examples
3) System modes and stability. Free and forced response, multi-input-multi-output system transfer function.
4) System controllability and state feedback stabilization.
5) Set-point following and constant disturbance suppression.
6) Linear Quadratic Requlator.
7) System observability and state observer design.
8) Output feedback stabilization.
9) Noise in control systems and stochastic control.
10) Kalman filter.
11) LQG synthesis.
12) Systems with uncertainty and robust design.
13) Introduction to H-infinity robust design.

4. TEACHING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of Google Jamboard and Matlab in Teaching • Learning process support through an e-class platform.
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*	

Activity	*Semester workload*
Lectures	39
Tutorials	26
Studying and preparation for the final exam	60
Course total	**125**

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.*	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. 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

- Βιβλίο [22722697]: Ελεγχος Διεργασιών, Νταουντίδης Π., Μαστρογεωργόπουλος Σπ., Παπαδοπούλου Σημ. Λεπτομέρειες
- Βιβλίο [68369734]: Συστήματα Αυτομάτου Ελέγχου, 2η Έκδοση, Μαλατέστας Παντελής Λεπτομέρειες
- Βιβλίο [68369669]: Συστήματα Αυτομάτου Ελέγχου, Βελώνη Αναστασία, Κανδρής Ξενοφών-Διονύσιος Λεπτομέρειες
- Βιβλίο [59380555]: ΣΥΣΤΗΜΑΤΑ ΑΥΤΟΜΑΤΟΥ ΕΛΕΓΧΟΥ, Norman S. Nise Λεπτομέρειες
- Βιβλίο [22688051]: Συστήματα Αυτόματου Ελέγχου, Shahian B., Savant J.C. JR., Hostetter G.H., Steafani T.R. Λεπτομέρειες
- Βιβλίο [59396181]: Σύγχρονα Συστήματα Αυτομάτου Ελέγχου, 13η Έκδοση, Dorf Richard C.,Bishop Robert H. Λεπτομέρειες
- Συστήματα Αυτομάτου Ελέγχου, B.Kuo και F. Golnaraghi, Εκδόσεις Στέλλα Παρίκου και Σία Ο.Ε., 2010.
- Συστήματα Αυτομάτου Ελέγχου, K. Ogata, Εκδόσεις Φούντας, 5η έκδοση 2011.