COURSE OUTLINE

1. GENERAL

SCHOOL	School of Sciences		
DEPARTMENT	Department of Computer Science		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	615SKOC	**SEMESTER**	6th
COURSE TITLE	Introduction to Robotics		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures	2	5
Tutorial Exercices	1	
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	Mathematics II
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	No
COURSE URL:	http://195.130.93.18/pachidis/HomePage/cur_courses_en.htm

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to introduce the student to the scientific area of robotics by presenting its historical evolution by studying mature technologies and describing modern trends in a wide range of practical applications. Specifically, the lesson aims to help the students comprehend basic robotic operators. The purpose of the lesson is to help students understand the mathematical model of two degrees of freedom robotic manipulators. It also refers to introductory concepts of the three-degree-of-freedom robotic manipulator mathematical model.

The course material aims to describe: direct & inverse kinematic analysis, its kinematic velocity and acceleration, static analysis and dynamic analysis. Particular emphasis is placed on the study of singularity points as well as the applications of homogeneous transformation matrices.

The course material also aims to introduce students to the computational requirements of the algorithms used and their programming.

Reference is made to sensors, the processing of information from sensors, control technologies, and various forms of human-machine communication.

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

- Understand the basic components of robotic systems and their interconnection.
- Know the direct and inverse kinematic analysis of two- and three-degree of freedom robots.
- Describe basic equations of velocity/acceleration kinematics, static and dynamic analysis of robotic manipulators.
- Can describe translations/rotations with homogeneous transformation matrices.
- Appreciate the value of using electronic sensors in robots and computers.
- Analyze basic computational models of human-machines interaction.
- Collaborate with his colleagues to create and present an elementary system for human-machines interaction.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
Decision making	*Sustainability*
Autonomous work	*Demonstration of social, professional and moral responsibility and*
Teamwork	*sensitivity to gender issues*
Working in an international environment	*Critical thinking*
Working in an interdisciplinary environment	*Promoting free, creative and inductive reasoning*
Production of new research ideas	

- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Production of new research ideas

3. COURSE CONTENT

1. Robot and robotics applications classification. Components of robotic systems. Robotic areas analysis.
2. Two degrees of freedom robotic manipulator: direct/inverse kinematic analysis, singularity points, velocity/acceleration kinematics.
3. Balance equations of force/moments. Dynamic analysis. Energy calculation. Three degrees of freedom robotic manipulator.
4. Robot kinematic description. Coordinate Systems and symbols
5. Homogeneous transformation matrices. translations/rotations. Mounting a gripper. Description of rotation. Denavit-Hartenberg algorithm.
6. Technological evolution of the need for human-machines interaction
7. The "human factor": sensors, actuators, the brain and its functions, the spoken language
8. Study of Interaction elements such as control layouts, transfer functions, spatial correlations, function models, senses, interaction errors
9. Modeling of interaction mainly with descriptive and predictive models

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD

Face to face, Distance learning, etc.

Face to face

USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)

Use of ICT in Teaching, in Laboratory Education, in Communication with students

- Use of ICT in Teaching
- Electronic communication (e-mail) according to the needs.
- Webpage

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail.
Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.

Activity	*Workload/semester*
Lectures	52
Tutorial Exercices	13
Bibliographic research & analysis (teamwork)	18
Individual training work	20
Project	20
Written exams	2
Course total	125

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,

I. Individual work - study (30%) involving solving practical problems

Ii. Final written exam (70%) involving problem solving

Evaluation criteria are as follows:

• Problem analysis ability

Clinical examination of a patient, Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	• Ability to design solutions • Ability to implement solutions Oral final exam (100%), for those with dyslexia

5. SUGGESTED BIBLIOGRAPHY

- Δ.Μ. Εμίρης, Δ.Ε. Κουλουριώτης, Ρομποτική, ΣΕΛΚΑ-4Μ, Αθήνα, 2004
- Α.Τ. Μικρόπουλος, Εκπαιδευτικό Λογισμικό: Θέματα Σχεδίασης και Αξιολόγησης Λογισμικού Υπερμέσων, Κλειδάριθμος, 2009
- Scott MacKenzie, Human-Computer Interaction: An Empirical Research Perspective, Morgan Kaufmann, 2013
- IEEE Robotics & Automation Magazine
- IEEE Transactions on Robotics
- IEEE Transactions on Systems, Man, and Cybernetics: Systems
- IEEE Transactions on Affective Computing
- IEEE Transactions on Autonomous Mental Development
- IEEE Transactions on Human-Machine Systems
- Computers in Human Behavior
- Interacting with Computers
- International Journal of Human-Computer Studies
- Robotics
- Robotics and Autonomous Systems
- Robotics and Computer-Integrated Manufacturing