COMPUTER-AIDED SYSTEMS DESIGN

1. GENERAL

SCHOOL	ENGINEERING		
SECTION	INFORMATICS & COMPUTER ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE		**SEMESTER OF STUDY**	BP 7th, EY 7th, 9th
COURSE TITLE	COMPUTER-AIDED SYSTEMS DESIGN		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded in distinct parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, indicate the weekly teaching hours and the total number of credits*	**WEEKLY HOURS TEACHING**	**CREDIT UNITS**
Lectures	2	
Practice Exercises	1	
Laboratory exercises	1	
Add rows if needed. The organization of teaching and the teaching methods used are described In detail at 4.	**4**	**5**

COURSE TYPE *Background, General Knowledge, Scientific Area, Development Skill*	Science Area Course, Skills Development Course,
PREREQUISITES COURSES:	Circuit Theory, Electronics, Digital Design
LANGUAGE OF INSTRUCTION and EXAMINATION:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No
ONLINE COURSE PAGE (URL)	

2. LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course are described, the *specific knowledge, skills and abilities* of *an appropriate level that students will acquire after the successful completion of the course.*

Consult Appendix A

- *Description of the Level* of *Learning Outcomes for each* course *of study according to the European Higher Education Area Qualifications Framework*
- *Descriptors of Levels 6, 7 & 8 of the European Qualifications Framework* for *Lifelong Learning and Annex B*
- *Summary Guide for writing Learning Outcomes*

The course introduces students to CAD, CAID, CAE, CAM tools and equips them with the necessary knowledge to open the horizons of their development as engineers. The course provides the basis for originality, development and application of ideas reaching even the level of full implementation es. Students will gain access to the jobs of our "digital" age, which concern the design and construction of computer systems, industrial products, and in general the applications of three-dimensional modeling in a variety of areas.

The aim of the course is to establish the necessary knowledge and develop the corresponding skills, in the field of design, solving and production of complex structures and objects, and their depiction at all intermediate stages, through computer aided design. In modern CAD-CAxx systems, the concept of design, has go beyond the simple geometric representation of objects in a plane, (paper), as was the case until recently. In addition, it is possible to attribute properties, natural

characteristics and behaviors of entire assemblies, as well as the integration of basic information of the very objects that make up them. Management of new information directly follows the desire of the designer.
The high accuracy and clarity of rendering of all the geometric characteristics of the designed object, both in terms of its physical dimensions, the properties of its construction materials, and in terms of its position in space, is just some of the supplies offered in the hands of young designers.
The general CAD concept of this course covers both mechanical and electronic drawing, at the schematic level up to the three-dimensional projection of all the components of an assembled printed board.
Finally, the presentation of new emerging technologies is covered through a series of lessons on the three-dimensional printing of physical objects, as they will have already been designed on a computer from previous series. Lectures. At the same time, it is possible to combine knowledge of different fields in new environments for handling objects from specialized other CAD tools.

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

- understand mechanical & electronic drawings and distinguish & explain schematic diagrams,
- recognize standards and comply with rules for the mapping of technical drawings in their field,
- draw two-dimensional and three-dimensional mechanical drawings with absolute precision, within a corresponding CAD program, fully describing an object or assembly,
- perceive and calculate views and intersections of objects and distinguish hand reconstruct objects from their projections,
- design schematic circuits and printed boards estimating cost and size parameters (floorspace), and compose bill of materials,
- analyze boards, activating tools for checking both electronic and design details based on corresponding rules,
- compare, evaluate and select optimal fitting locations and pipeline passage formations,
- to recognize basic characteristics of materials
- choose from a variety of materials based on their properties,
- easily handle a variety of CAD tools to create new structures from different elements,
- print two-dimensional drawings, sheet film,
- produce three-dimensional objects and assemblies.

General Skills

Taking into account the *general competencies that* the *graduate must have acquired (as listed in* the *Diploma Supplement and listed below) which of them is the subject aimed at?*

Search, *analysis* and synthesis *of data and information, using the necessary technologies*
Adapting to new situations Decision making
Autonomous work
Teamwork
Working in an international environment Working in an interdisciplinary environment
Generating new research ideas
Project planning and management
Respect for diversity and multiculturalism Respect for the natural environment
Demonstrate social, professional and ethical responsibility and sensitivity to gender issues Criticism and self-criticism
Promotion of free, creative and inductive thinking

- Autonomous & Teamwork
- Search and synthesis of data

- Work in an interdisciplinary environment
- Data analysis
- Decision-making
- Project planning and management
- Promotion of free, creative and inductive thinking

3. COURSE CONTENT

Part A: Mechanical Design (CAD computer aided design)

- Mechanical drawing, design rules
- Design standards , European & American
- Design of object views, projections, 6-seat spreads ,
- Symmetry, axes of symmetry, rules,
- Dimensioning, rules and design tools.
- theory and rules of design of sections, axes, observation arrows, markings, material appearance,
- Printing two-dimensional imaging, methodology, control of printing parameters.

Part B : 3D Modeling (CAD-CAID computer aided industrial design)

- Three-dimensional drawing of an existing object.
- Creation of simple three-dimensional structures.
- Methodology of synthesis with Boolean operations on solid bodies.
- Synthesis methodology by imitating lathe-type machine tools (rotary models).
- Synthesis methodology by imitating milling machine tools (flat models).
- Surface treatment methodology.
- Multi-object assemblies.
- Trap wiring relationships.
- Design of mechanisms and movement management .
- Geometric models of three-dimensional imaging (Edges, Symbolic, Superficial, Photorealistic).

Part C: Electronic Design (CAE computer aided engineering)

- Electronic schematic drawing.
- Electronic printed circuit board drawing.
- Multiple levels and mounting facets of fittings.
- Through hole and surface mounting technology (smt).
- Elements of electronic circuits. Identification of components.
- Selection of characteristics and packaging, according to strength .
- Selection of packaging and placement in the printed horizontally or vertically (lay vertically / horizontally),
- Selection of distances of holes, resistance terminals and other accessories (enhanced spacing)
- Component properties, rotations, movements assignment of values, duct thicknesses, characterization of levels.
- Manual laying of pipelines,
- autorouting, structure and use of autodesign rules.
- Logical and physical connections, short circuits, level passing holes, rip-up techniques.
- Electronic and design control tools (ERC / DRC)

- Creation of multiple levels of filming and masks.
- Extract gerber files and drill files.
- Creation of a three-dimensional board model and components for studying dimensions and assemblies in space.

Part D: .3D Printing (CAM computer aided manufacturing)

- Technical knowledge of printing three-dimensional objects.
- Presentation of ways to manipulate a three-dimensional model in order to lead to rapid prototyping with the technology of .3D printing.
- Presentation of basic properties of printing materials, their characteristics and capabilities.
- Chemical/physical properties.
- Options of speed, temperature, level of intersection.
- Location options in the printing area.
- Management of number and thickness of incisions, layers.
- Management of wall thickness , strengthening of details.
- Saving material, creating gaps, creating support struts.
- The future of construction.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

HOW TO DELIVER *Face-to-face, Remote education , etc.*	Face-to-face (in class)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in Teaching, Laboratory Education, Communication with students*	Use of material, namely: 1. Video projector and slides for theory and exercises, 2. interactive touch panel for the initial design stages (sketches), 3. computers (individual jobs for each student), 4. three-dimensional printers for the production of objects in space. Use of software, namely: a. software for the production of two-dimensional construction drawings; b. software for the creation of three-dimensional geometric models, c. special software for the conversion, display and interconnection of files, d. special software for the creation of files capable of printing on a three-dimensional printer, e. schematics software electronic drawings, f. software for the design of printed circuits and conversion of schematics into a printed circuit, e.g. software for the imaging of assembled printed circuits in three-dimensional form. Use of electronic means of communication, namely : i. through the e-class for the posting of announcements, lectures, theoretical notes, speeches exercises, supporting material.

	ii. communication of students through institutional e-mails.
TEACHING ORGANIZATION *The way and methods of teaching* are described *in detail*. *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliography* Study & Analysis, *Tutorial, Practice* (placement), *Clinical Practicum, Art Workshop, Interactive teaching, Educational visits, Project preparation, Writing of work / assignments, Artistic creation, etc.* *The student's study hours for each learning activity as well as* the *hours of unguided study* are listed *so that the total workload at semester level corresponds to ECTS standards*	**Activity** / **Semester Workload** Lectures: 26 Practice exercises: 13 Laboratory Education: 26 Preparation Task: 30 Independent Study: 30 **Course Total** (25 hours of load working per credit unit): **125**
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Inferential, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment,* Report */Report, Oral Exam, Public Presentation, Laboratory Work, Clinical Patient Examination, Artistic Performance,* Other */ Other* *Explicitly defined* assessment *criteria* are indicated and *if and where they are accessible to students.*	• The total score (100%) results from: • A. Written theory exams (60%) including: a. One progress during the semester on the mechanical drawing of objects : (design patterns, object projections, sections, materials, line thicknesses, dimensioning) (30%) and b. One final examination on printed circuit board electronic design: (schematics, component books, printed design rules, minimum distances, duct thicknesses, power supplies, interface plugs) (30%) Or c. One final examination with all the above-described syllabus. Part of the written examination will consist of a test multiple choice and short answer questions. • B. Active participation in the classroom during the teaching of theory (10%) • C. Laboratory Exercises (30%) i.e.: a. Delivery of first cycle work (10%) b. Delivery of second cycle study (10%) c. Final laboratory examination (10%)

5. RECOMMENDED-BIBLIOGRAPHY

- Suggested Bibliography :

1. KUNWOO LEE: BASIC PRINCIPLES OF CAD/CAM/CAE SYSTEMS, 2009. KLEIDNUMBER PUBLICATIONS LTD
2. N. BILALIS, M. MARAVELAKIS: CAD/CAM SYSTEMS &3D MODELING, 2014. CRITICAL PUBLICATIONS

3. GIBSON IAN, ROSES DAVID, STUKER BRENT: PROSTHETIC MANUFACTURING TECHNOLOGIES, 2017. REVIEW PUBLICATIONS
4. ANTONIADIS ARISTOMENIS: ENGINEERING DESIGN, 2013. A. TZIOLA & SONS S.A. PUBLICATIONS.

- Related Scientific Journals :

1. COMPUTER AIDED DESIGN – ELSEVIER SCI LRD
2. COMPUTER AIDED GEOMETRIC DESIGN – ELSEVIER SCIENCEBV.

Online bibliography updated annually Laboratory exercises
Teaching notes