ΠΑΝΕΠΙΣΤΗΜΙΟ
ΔΥΤΙΚΗΣ ΑΤΤΙΚΗΣ
UNIVERSITY OF WEST ATTICA

SCHOOL OF ENGINEERING

DEPARTMENT OF INDUSTRIAL DESIGN
AND
PRODUCTION ENGINEERING

CURRICULUM

Code	Cat.	SEMESTER	Hours	ECTS
		1st SEMESTER		
1001	**Y-1**	Linear Algebra	4	5
1002	**Y-1**	General Physics	4	5
1003	**Y-1**	Computer Programming	4	5
1004	**Y-1**	Mechanical Drawing	4	5
1005	**Y-1**	Design Theory and Methodology	4	5
1006	**Y-1**	Electrical Circuits	4	5
		2nd SEMESTER		
2001	**Y-2**	Numerical Analysis	4	5
2002	**Y-2**	Technical Engineering-Statics	4	5
2003	**Y-2**	Algorithms and Data Structures	4	5
2004	**Y-2**	Differential and Integral Calculus I	4	5
2005	**Y-2**	Measurement and Sensor Technology	4	5
2006	**Y-2**	Business Finance	4	5
		3rd SEMESTER		
3001	**Y-3**	Differential and Integral Calculus II	4	5
3002	**Y-3**	CAD/CAM	4	5
3003	**Y-3**	Production Technology I	4	5
3004	**Y-3**	Strength of Materials	4	5
3005	**Y-3**	Electronics	4	5
3006	**Y-3**	System and Signal Analysis	4	5
		4th SEMESTER		
4001	**Y-4**	Machine Elements	4	5
4002	**Y-4**	Statistics and Probabilities for Engineers	4	5
4003	**Y-4**	Supply Chain Management	4	5
4004	**Y-4**	Data collection and Analysis	4	5
4005	**Y-4**	Differential Equations	4	5
4006	**Y-4**	Ergonomic Analysis and Design	4	5
		5th SEMESTER		
5001	**Y-5**	Design of Industrial Actuation Systems	4	5
5002	**Y-5**	Optimization Methods	4	5
5003	**Y-5**	Production Technology II	4	5
5004	**Y-5**	Automatic Control Systems I	4	5
5005	**Y-5**	Occupational Safety Management	4	5
5006	**Y-5**	Thermodynamics	4	5
		6th SEMESTER		
6001	**Y-6**	Industrial Design I	4	5
6002	**Y-6**	Quality Control and Total Quality Management	4	5
6003	**Y-6**	Decision Support Systems	4	5
6004	**Y-6**	Microcontroller-based System Design	4	5
6005	**Y-6**	Fluid Mechanics	4	5
6006	**Y-6**	Internet Technology in the Digital Industry	4	5

7th SEMESTER (3Y+3EY)				
7001	**Y-7**	Mechatronics	4	5
7002	**Y-7**	Information Production Systems	4	5
7003	**Y-7**	Artificial Intelligence	4	5
7004	**EY-7**	Entrepreneurship And Innovation Management	4	5
7005	**EY-7**	Environment – Management of Byproducts	4	5
7006	**EY-7**	Power Electronics – Smart Grid	4	5
7007	**EY-7**	Electromechanical Installations Design	4	5
7008	**EY-7**	Industrial Design II	4	5
7009	**EY-7**	Business Intelligence and Big Data Analysis	4	5
7010	**EY-7**	Art, Technology and Culture	4	5
7011	**EY-7**	English Terminology I	4	5
8th SEMESTER (3Y+3EY)				
8001	**Y-8**	Additive Manufacturing Processes - 3d Printing	4	5
8002	**Y-8**	Industrial Automation - PLC	4	5
8003	**Y-8**	Production Systems	4	5
8004	**EY-8**	Automatic Control Systems II	4	5
8005	**EY-8**	Non-destructive testing	4	5
8006	**EY-8**	Internet of Things	4	5
8007	**EY-8**	Innovative Design and Sustainablity	4	5
8008	**EY-8**	Intelligent Systems	4	5
8009	**EY-8**	Renewable Sources of Energy	4	5
8010	**EY-8**	Design and Development of Nano Devices	4	5
8011	**EY-8**	English Terminology II	4	5
9th SEMESTER (1Y+5EY)				
9001	**Y-9**	Robotics	4	5
9002	**EY-9**	Self-Driving Vehicle Design	4	5
9003	**EY-9**	Cloud Computing	4	5
9004	**EY-9**	SMART MATERIALS	4	5
9005	**EY-9**	Marketing	4	5
9006	**EY-9**	Methodology of research projects	4	5
9007	**EY-9**	Cyberphysical Systems	4	5
9008	**EY-9**	Transportation Systems Management	4	5
9009	**EY-9**	Project Management	4	5
9010	**EY-9**	Data Security and Protection	4	5
9011	**EY-9**	Design of Interactive Systems	4	5
10th SEMESTER				
10001	**Y**	Thesis		30
10002	**E**	Internship		10

1st Semester

Linear Algebra

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering			
ACADEMIC UNIT	Industrial Design and Production Engineering			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	**1001**	**SEMESTER**	**1**	
COURSE TITLE	Linear Algebra			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHIN GHOURS**	**CREDITS**
Lectures			3	3
Exercises / Tutorials			1	2
			4	**5**
COURSE TYPE	General background			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE337/			

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course, the student will be able to: • acquire the required theoretical background and ability to decide on the application of an appropriate method, • develop the ability to use basic techniques of Linear Algebra related to the study and solution of linear systems, inverse calculation, determinant calculation and their applications, finding eigenvalues, eigenvectors, minimum polynomial.
General Competences
• Production of free, creative and inductive thinking • Working independently • Team work • Decision-making • Search for, analysis and synthesis of data and information, with the use of modern scientific tools for solving problems in specialized applications • Working in an interdisciplinary environment The above General Competences correspond to Level 6 of the European Qualifications Framework.

(3) SYLLABUS

Matrix algebra. Inverse matrix. Square matrix. Inverse matrix. Diagonal matrix. Symmetric/ antisymmetric matrix. Rectangular matrix. Composite matrix. Similarity of matrices. Trace of matrix.

Systems of linear equations. Gauss-Jordan elimination. Reduced scaled matrix form. LU factorization. Matrix rank. Inverse calculation with Gauss-Jordan elimination.

Matrix determinant. Definition. Properties. Cramer Theorem. Adjoint matrix. Cramer systems.

Vector spaces. Vector spaces. The $\mathbb{R}^2$ space. Linear case. Linear dependency. Base and dimension of vector space. Subtractions and subspaces sections. Linear sum of subspaces. Dimension theorem. Basic matrix sub-spaces (column space, row space, zero space and left zero space). Vector spaces with inner product. Cartesian bases.

Typical matrix amounts. Eigenvalues. Eigenvectors. Polynomial matrices. Diagonalization of matrices. Cayley-Hamilton Theorem. Minimum polynomial.

Analytic geometry. Vector calculus (inner, outer, mixed vector product and applications). Line to space. Level. Sphere.

Use of Matlab for applications. Managing matrices and vectors in Matlab. Numerical (direct and iterative) methods for solving linear systems. Calculate vector norm and matrix norm. QR matrix factorization, special matrix factorization (SVD) and projections. Matrices and minimal squares. Regression. Matrix index status estimation. Iterative methods for calculating matrix eigenvalues.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td colspan="2">Communication with students through the platform with emails & announcements on the course’s website (e-class).

Powerpoint display with projector and laptop.

Demonstration of modern mathematical software (Matlab, Mathematica, Wolfram Alpha) on the taught subjects.

Announcement of course notes in electronic form on the course’s website (e-class).

Referral to websites with related applications (Desmos, Maxima, Geogebra).

Utilization of the computer laboratory of the Department.

Possibility of examinations through the tool of Exercises in e-class.</td></tr>
<tr><td>TEACHING METHODS</td><td>Activity</td><td>Semester workload</td></tr>
<tr><td></td><td>Lectures</td><td>39</td></tr>
<tr><td></td><td>Exercises</td><td>46</td></tr>
<tr><td></td><td>Individual study</td><td>65</td></tr>
<tr><td></td><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>

STUDENT PERFORMANCE EVALUATION	**Language of assessment:** Greek (English for ERASMUS students upon request). Students are assessed through a written examination, which includes short-answer questions and problem solving. There is a possibility for an intermediate examination in the middle of the semester. Ability to deliver work (20%). Students with learning difficulties are examined in accordance with article 37 of the Internal Regulations of the UNIWA. The evaluation criteria have been presented to the students before the final examination and the individual grade of the subjects is written in them. Students can see their writing and their individual grades in the topics, as well as receive clarifications about them after pointing out any mistakes.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Νικόλαος Χαλιδιάς, Εφαρμοσμένα Μαθηματικά για Οικονομολόγους και Μηχανικούς, Broken Hill Publishers, 2021.
- A.O.Morris, Μια Εισαγωγή στη Γραμμική Άλγεβρα, ΕΠΙΣΤΗΜΟΝΙΚΕΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΚΕΣ ΕΚΔΟΣΕΙΣ Α.Γ.ΠΝΕΥΜΑΤΙΚΟΣ, 1980.
- Γεωργίου Δημήτριος, Κούγιας Ιωάννης, Μεγαρίτης Αθανάσιος, Γραμμική Άλγεβρα, 2η Έκδοση, Εκδόσεις Τζιόλα, 2017.
- Θανάσης Χρυσάκης, Γραμμική Άλγεβρα και Αναλυτική Γεωμετρία, Εκδόσεις Τσότρας, 2013.
- Strang Gilbert, Γραμμική Άλγεβρα και Εφαρμογές, ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 2009.
- Βάρσος Δημήτρης, Δεριζιώτης Δημήτρης, Εμμανουήλ Γιάννης, Μαλιάκας Μιχάλης, Μελάς Αντώνης, Ταλέλλη Ολυμπία, Μια Εισαγωγή στη Γραμμική Άλγεβρα, "σοφία" Ανώνυμη Εκδοτική & Εμπορική Εταιρεία, 2012.
- Δονάτος Γεώργιος Σ., Αδάμ Μαρία Χ., Γραμμική Άλγεβρα, Γ. ΔΑΡΔΑΝΟΣ - Κ. ΔΑΡΔΑΝΟΣ Ο.Ε., 2008.

General Physics

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**1002**	**SEMESTER**	**1**
COURSE TITLE	General Physics		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHIN GHOURS	CREDITS
Lectures	3	4
Laboratory	1	1
	4	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE185/

(2) LEARNING OUTCOMES

Learning outcomes

The course belongs to Level 6 of the European Qualifications Framework. Therefore, upon completion of the course students will have:

- Thorough knowledge and critical understanding of the basic principles and laws of Physics (in issues of engineering, waves and thermodynamics) and will have acquired a knowledge base that is necessary for attending Technology courses and in general monitoring the evolution of modern technology.
- Knowledge and skills in handling simple relations of differential and integral calculus to calculate physical quantities (position, velocity, acceleration, energy, power, torque, heat, etc.) to predict the behavior of physical quantities, to compare and draw conclusions.
- Knowledge and skills in using the methods and the most basic techniques of Experimental Physics.
- Ability to operate measuring devices to take measurements, process them, evaluate them and correlate physical quantities.

In detail, students will be able to:

- Calculate physical quantities (position, velocity, acceleration, energy, power, torque, etc.).
- Predict the behavior of physical quantities, and select the appropriate parameters to achieve the desired behavior.
- Operate instruments and experimental devices for measuring physical quantities.
- To take measurements autonomously, to process them, to correlate physical quantities as well as to calculate or estimate errors. To decide if their measurements are within the framework of experimental uncertainties or if there is a systematic error in part or the whole experimental setup.

General Competences

- 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 interdisciplinary environment
- Production of new research ideas
- Production of free, creative and inductive thinking

(3) SYLLABUS

The course also includes a laboratory part, where they are designed, solved issues of:

- Introduction - System of Units, Accuracy - Significant Digits, Reference Systems, Elements of Differential and Integral Calculus.
- Vectors - Motion in one and two dimensions, Relative motion, Galilean Transformations.
- Material point dynamics, Newton's laws.
- Momentum, Work, Power, Energy, Conservation of Energy.
- Kinematics and Dynamics of Rotational Motion, Torque, Rotation, Moment of Inertia, examples - applications, correspondences of physical quantities between Translational and Rotary Motion, Rolling, work-energy theorem for rotational motion applications. Connection of natural quantities with sensor technology.
- Equilibrium and Elasticity - Young Measure.
- Fields of forces - gravitational field, satellites, Kepler Laws.
- Oscillations - differential equations of oscillating systems, correspondences between mechanical and electrical systems.
- Mechanical Waves, differential wave equation, Sound, Wave superposition, wave properties applications. Introduction to electromagnetic waves. Applications.
- Temperature, Heat Dissipation, Thermal properties of matter, correspondences between mechanical, electrical, magnetic and thermal systems. Laws of Thermodynamics, applications.

A series of laboratory exercises on Mechanics - Heat.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face and distance learning.	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY	ICT is used in both parts of the course, theoretical and laboratory, both for teaching and for communicating with students.	
TEACHING METHODS	***Activity***	***Semester workload***
	Theoretical part with Lectures	39
	Laboratorial part with	33

	Exercises and practical applications	
	Individual study	78
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment:** Greek The assessment of students is done with written exams at the end of the semester that include theory questions in various forms (e.g., multiple choice, short answer, filling in the gap, etc.) as well as exercises that require detailed problem solving. Final written exam: 80% Laboratory work/exercises: 20% The assessment criteria are announced to the students at the beginning of the semester and are posted on the course's website in eClass.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

(1) Κωνσταντινίδης Σ., Ντρίβας Ν. & Πρελορέντζος Λ.: «Φυσική Ι: Μηχανική & Σύγχρονη Φυσική», Πανεπιστημιακές Εκδόσεις «Αράκυνθος», Αθήνα 2007 (Εύδοξος: 1358).

(2) H.D. YOUNG: «Πανεπιστημιακή Φυσική» Α Τόμος, Εκδόσεις ΠΑΠΑΖΗΣΗ (Εύδοξος: 68387875).

(3) R.Serway : «Φυσική για Επιστήμονες και Μηχανικούς» Α΄ΤΟΜΟΣ) (Εύδοξος: 22750100).

(4) Halliday-Resnick-Walker: «Φυσική » Α Τόμος, Εκδόσεις Gutenberg (Εύδοξος: 33074351).

- **Related academic journals**:

(5) Solid-State Physics, Elsevier

(6) Applied Physics A

(7) Applied Physics B

(8) Institute of Physics

Computer Programming

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**1003**	**SEMESTER**	**1**
COURSE TITLE:	Computer Programming		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING**	**ECTS CREDITS**

	HOURS	
Theory (Lectures)	3	3
Laboratory	1	2
	4	**5**

COURSE TYPE:	General knowledge
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE101/

(2) LEARNING OUTCOMES

Learning Outcomes

Upon completion of the course students will have:

1. Knowledge of the basic principles and concepts of informatics
2. Basic programming knowledge in Python
3. Basic knowledge of software applications

In detail, students will be able to:

1. Understand problems related to computer science
2. Design and solve computer problems.
3. Implement algorithms in Python language

General Competences

1. Search, analysis and synthesis of data and information, using the necessary technologies
2. Adaptation to new situations
3. Decision making
4. Production of new research ideas
5. 5. Promoting free, creative and inductive thinking

(3) SYLLABUS

The course aims to introduce the world of computers. Hardware and software issues are examined, specifically the course includes the following:

- System software: Operating system basics, information system functions, memory and file management
- Application software: introduction to numerical systems, software management, open source and commercial software, software distribution models, software licensing operation.
- Hardware evaluation: description of CPU operation, machine cycle, memory system evaluation.
- Networking: introduction to network architecture, network components, internet connection.
- Introduction to algorithms
- Introduction to databases: description, advantages of database implementation software

- Introduction to programming in Python: the concept of variable, basic data types, operators, control structures, functions, visibility and range of variables, parameter passing, retrospective, tables, complex data types, dynamic memory, pointers, dynamic data structures , data files, basic Python components, libraries.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face
• Lectures
• Practice exercises
• Laboratories
• Assignments & Presentations</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in theoretical teaching and use of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>36</td></tr>
<tr><td>Non-guided personal study</td><td>75</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
• Written examination with short answer questions (Concluding)
• Written exams with multiple choice questions (Concluding)
• Written assignment (Formative)
• Laboratory/project work (Formative)

The final grade of the course consists of:
• Final written examination in the entire theoretical content (80%),
• Elaboration of laboratory-based work (20%).

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Python's book ,Nikolaos Samaras, Tsiplidis Konstantinos, Publications: Kritiki*
- *Hardware, Software and Computer Communications – 4th Edition Ioannis Vogiatzis, Era Antonopoulou.*
- *introduction to information technology, Alan Evans, Kendall Martin, Mary Anne Poatsy, Publications: Kritiki*
- *Discovering Computers: Tools, Applications, Devices and the Implications of Technology Vermaat Misty, Sebok susan, Freund Steven, Campbell Jennifer, Frydenberg Mark BROKEN HILL PUBLISHERS LTD*
- *Basic Principles in Informatics O'Leary Timothy J., O'Leary Linda I., O'Leary Daniel A. BROKEN HILL PUBLISHERS LTD*

Mechanical Drawing

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**1004**	**SEMESTER**	**1**
COURSE TITLE:	Mechanical Drawing		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	1	1.5
Laboratory Practice/Project	3	3.5
	4	**5**

COURSE TYPE:	General Background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE120/

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion of the course students will be able to: • Know and understand the basic concepts of Spatial Geometry and geometric representation methods. • Distinguish projection systems, clearly interpret and explain their usefulness and differences between them. • Apply the appropriate methodology for the representation of elements of three-dimensional space at the level, with emphasis on Mechanical applications. • Analyze the elements of space and understand their volumetric structure, so that they can

combine and correlate these elements with simple geometric Euclidean solids.
• Organize in full the representations of the three-dimensional space on the level, using the design language of the engineers.
• Compose and compare the individual elements of the space by reading their design representation.
• Be able to collaborate with their classmates to create and present, both individually and as a group, a case study from its initial stages to its final evaluation.

Upon successful completion of the course students will have:
• Thorough knowledge and critical understanding of the subject matter of the concepts and rules of the Mechanical Design.
• Knowledge and skills for the identification of a component of a mechanical nature, how to represent and design it using the design rules.
• Knowledge and skills of standardization of components (DIN, ISO, ANSI, ΕΛΟΤ. etc.), recognition of possibilities of shaping and processing of the materials of the components.
In detail, students will be able to:
• Know the rules of design and gain insight into their technical thinking.
• Understand the technical peculiarities of the design method that governs the content of the designs.
• Apply design rules flexibly to turn their thoughts into designs and make necessary corrections and modifications.
• Evaluate any kind of technical design and judge its construction costing, so that it can be kept at competitive levels.
• Analyze in a drawing the technical particularities of the component-mechanism and differentiate it due to interchangeability of equipment.
• Compose components, designing them to complete a task or build a mechanism.

General Competences

The course aims to contribute to:

- The analysis and processing of project information
- The autonomous work
- Teamwork
- Production of new research ideas
- Project design and management
- Promotion of free, creative and inductive thinking

(3) SYLLABUS

1. Introduction-General Instructions of the Course, Description of main mechanical components
2. Types of lines, Lettering and numbering, First contact with the technical design, understanding its rules and its purpose
3. Multiview drawing-Orthographic projection, Auxiliary views
4. Cross sections (Full sections, multilevel, half, part, off-set)
5. Dimensioning and its rules (according to content and type of project)
6. Threads design and its rules (Threads connection applications, Screws) Representations of springs, gears, bearings
7. Intersection of cylinders, spheres, cones
8. Understanding a given design (without perspective object)
9. Construction design (Surface Quality Symbols) according to DIN140 & Machining quality symbols (roughness) according to DIN-ISO1302, lathe parts, plate forming, cast pressed objects, tolerances-fittings-registration of form tolerances, Use of standard element tables (roll bearings, sealing elements, etc.) Welding symbols and

their registration
10. Design of Assembled Mechanisms (Parts general layout, Numbering of parts) Numbering and classification of designs - List of component and parts.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In the classroom and in working groups with physical presence of students. In more detail: THEORY •Lectures using PowerPoint slides and by solving applications problems. • Presentation and analysis of semester assignments. PRACTICE EXERCISES IN A LABORATORY-BASED ENVIRONMENT • Solve applications on site. Design of mechanical components and pieces by students.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in theoretical teaching and lecturing (slides of Power-point). • Use of the courses' e-Class platform (Outline, Predicted Chart, Implemented Chart, Information for semester work, Lecture material - Notes and presentations). • Providing additional material on the courses e-Class and support of the learning process by providing notes with selected additional exercises and illustrated examples on the courses Ms-Teams platform.
TEACHING METHODS	***Method description / Activity*** | ***Semester Workload*** Lectures | 13 Application/Excercises | 52 Non-guided personal study and Project-based assignments | 30 Semester projects | 55 **Course Total (30h/ECTS)** | **150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Description** Written exams, project evaluation **Student assessment methods** • Examination on paper with the design of a requested object of Mechanical nature • Mechanical design projects during the semester For the successful completion of the course the

	students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work, as well as in the elaboration of the project (theoretical study). The final grade of the course consists of: • Final written examination in the entire course content (60%), • Elaboration of design semester projects (40%) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Engineering Drawing and Graphic Technology, T.E.French, C.J. Vierck, R.J.Foster Mc Graw-Hill Intern. Editions, NY 14 Edition 1994 ISBN-13:978-0070534926
2. Engineering Drawing, P.S.Gill KATSON Books S.K. Kataria & Sons 2013 ISBN-13:978-9350143155
3. Mechanical Drawing; Outline of Course Engineering, Frank Lowell Sagwan Press 2018 ISBN-13:978-1377101262
4. Technical Drawing Handbook, Litchfield D. R., (1998), Flinders Press
5. Manual of Engineering Drawing: British and International Standards, Fifth edition, Simmons Colin H., Maguire Dennis E., Phelps Neil, (2020), Butterworth-Heinemann Publications

Design Theory And Methodology

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
DEPARTMENT:	Industrial Design and Production Engineering		
LEVEL OF STUDY:	Undergraduate		
COURSE UNIT CODE:	**1005**	**SEMESTER OF STUDY**	**1**
COURSE TITLE:	**Design Theory And Methodology**		
COURSEWORK BREAKDOWN		**TEACHING WEEKLY HOURS**	**ECTS Credits**
Various teaching methods		(2 THEORY +2 LABORATORY)	
		4	**5**
COURSE UNIT TYPE:	Scientific area course / specialization / skill development		
PREREQUISITES:	No		
LANGUAGE OF INSTRUCTION/EXAMS:	Greek		
COURSE DELIVERED TO ERASMUS STUDENTS	Yes		
COURSE WEB PAGE (URL)	https://eclass.uniwa.gr/courses/IDPE326/		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will be able to: 1. Understand the meaning of design and know its historical development. 2. Understand the different versions of Design and different perspectives. 3. Understand, distinguish and argue regarding the ontological and epistemological dimension of Design. 4. Understand different ways of looking at the four dimensions of Design: functionality, aesthetics, expression / symbolism, mediation. 5. Understand design methodologies and design tools at an abstract generalized level (analysis, synthesis). 7. Manage design theories and methodologies using the generalized approach. 8. Understand drawing tools and be able to distinguish similarities, differences and correlations of tools. 9. Easily, quickly, and efficiently adapt to a variety of design approaches / techniques or tools called upon to support. 10. Gain initial experiential experiences regarding design practice.
General Skills
• Search, analyze and synthesize data and information, using design tools • Adaptation to new situations: Evaluation • Decision Making: Synthesis of techniques for the solution of medium-sized complex projects. • Autonomous work: Knowledge of development tools and use • Teamwork: Ability to dialogue and collaborate to develop a new product and draft design specifications • Working in an international environment: Ability to look for solutions within the international community and ask for help. Communication skills in international languages, respect for diversity • Production of new research ideas: • Project design and management: Design of new projects with respect for the natural environment with ecological awareness and demonstration of social, professional and moral responsibility and sensitivity to gender issues • Exercise criticism and self-criticism • Promoting free, creative and inductive thinking • Aesthetic and functional analysis of products • Drafting design specifications • Creative capture of problematic situations • Morphological analysis and optimization of complex systems • Holistic picture of the product and systems development cycle • Support for collaboration between design / engineering teams • qualitative and quantitative Evaluation of the derivatives of the design process

(3) SYLLABUS

The course is a basic introduction to issues of design theory and methodology. The educational goal is to familiarize students with the design and their awareness of its range and extensions. The course will focus on key concepts in the context of design methodology, while focusing on

the development phase of the idea.

The contents of the course include:

1. What is design
2. Design methods
3. What are the key features (functionality, aesthetics, expression / symbolism, mediation) of the design that must be considered and the interaction between them
4. Product development processes and design methodology - a general overview.
5. Requirements specifications - guidelines and methods.
6. Function analysis - definitions and methods.
7. Production of ideas - methods and representations.
8. Synthesis of product concepts - methods and mentalities.
9. Evaluation and decision making - methods and mentalities.
10. Improving product concepts.
11. Discussion on possible advantages and disadvantages of design methodology in practical use.

(4) TEACHING METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING ORGANISATION</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>72</td></tr>
<tr><td>Laboratory work</td><td>36</td></tr>
<tr><td>Personal study</td><td>42</td></tr>
<tr><td>Total Contact Hours and Training (30h/ECTS)</td><td>150 (5 ECTS)</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>ASSESSMENT METHODS</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation

Student assessment methods
• Written examination
• Laboratory/project work
For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work.
The final grade of the course consists of:
• Final written examination in the entire course content (60%),</td></tr>
</table>

	• Elaboration of laboratory-based projects/work (40%). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) RESOURCES

- Recommended Bibliography:

1.Parsons, G. (2015). "The philosophy of desig"n. Hobken, NJ: Wiley-Blackwell.

2.Cross, N. (2006). "Designerly ways of knowing". London: Springer.

3.Banathy, B. (1996). "Designing social systems in a changing world". New York: Plenum Press.

4.Norman, D. (1988). "The psychology of everyday things". New York: Basic Books.

5.Papanek, V. (1972). "Design for the real world". New York: Pantheon Books.

6.Simon, H. (1968). "The sciences of the artificial". Cambridge, Mass.: MIT Press.

- Relevant Scientific Journals:

Electrical Circuits

COURSE OUTLINE

(1) **GENERAL**

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**1006**	**SEMESTER**	**1**
COURSE TITLE:	Electrical Circuits		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	3
Tutorial/Project		0.5	1
Laboratory		0.5	1
		4	**5**
COURSE TYPE:	General knowledge		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE188/		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, students will have: 1) Knowledge and critical understanding of the basic theory of electrical circuits, fundamental for future relevant courses 2) Knowledge and skills in solving circuits with resistors, power calculation, as well as power balance 3) Knowledge and skills required for circuit wiring tasks, usage of power supplies and usage of multimeters (measurement of currents and voltages). Upon completion of the course, students will be able to: 1) Solve direct current circuits by applying the laws of Kirchhoff, perform loop method analysis, solve using mesh current and source transformation methods 2) Predict the behavior of electrical quantities in some circuits and be able to select the values of the components they need be used to achieve desired circuit behavior 3) Find the equivalent Thevenin-Norton circuit and calculate the maximum power transfer to the load 4) Operate power supplies, multimeters and perform measurements
General Competences
• Ability to search, analyze and synthesize data and information, using the necessary internet technologies and bibliographic research and networking. • Ability to make decisions, relevant to problems occurring during theory of lab exercises • Ability to work independently, through the preparation of individually performed tasks and exercises. • Ability for team work, through the elaboration of team works and exercises.

(3) SYLLABUS

1. Background knowledge of Electricity including: electric charge, Coulomb's law, electric field, field strength, voltage potential.
2. Electrical current, electrical circuits, voltage. Kirchhoff’s laws
3. Resistors, Ohm's law, independent and dependent voltage and current sources. Active circuit components
4. Real voltage and current sources and equivalence transformations
5. Resistors, capacitors and coils wiring, open/short circuits, voltage/current divider circuits, voltage supply wiring
6. Systematic methods for circuit solving: loop method and mesh meth in passive and active circuits.
7. Linear circuit theorems: superposition principle, transformation of resistors in star-delta wiring.
8. Thevenin and Norton theorems, maximum power transfer theorem.
9. Magnetic field. Electricity generation and transmission
10. Introduction to alternating current (AC)

Lab Exercises
The laboratory part of the course includes the execution of exercises, designed in order for students to familiarize with the basic principles of linear circuits, and measurement techniques.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face-to-face

<table>
<tr><td></td><td></td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>Use of ICT in teaching, laboratory education, communication with students.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Practice Exercise Lectures</td><td>13</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Non-guided personal study</td><td>85</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek
Description
Written exams, laboratory evaluation and project evaluation
Student assessment methods
• Final written examination (70%)
• Lab exercises (30%)
• (Optional) written essays (projects) or mid-term examination (20% deducted from final written examination)
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

1. Χαριτάντη Γ: Ηλεκτρικά κυκλώματα, Εκδόσεις Εκδόσεις Αράκυνθος, 2014
2. Sadiku-Alexander, Εισαγωγή στα Ηλεκτρικά Κυκλώματα, Εκδόσεις Τζιόλα, 2013, ISBN 9604182625
3. Χατζαράκης Γεώργιος : Ηλεκτρικά κυκλώματα, Εκδόσεις Τζιόλα 2015

2nd SEMESTER

Numerical Analysis

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering			
ACADEMIC UNIT	Industrial Design and Production Engineering			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	**2001**	**SEMESTER**	**2**	
COURSE TITLE	Numerical Analysis			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHIN GHOURS**	**CREDITS**
Lectures			3	3
Laboratory			1	2
			4	**5**
COURSE TYPE	General background			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE280/			

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course, the student will be able to: • acquire the required theoretical background and ability to be able to choose the appropriate approximation method for the numerical solution of the problem they face • acquire the required theoretical background and ability to be able to analyze the convergence order of the approximation method they apply • be aware of the basic methods of arithmetic integration and arithmetic derivation that are necessary in numerical solutions • know the most efficient ways to solve linear and non-linear systems to which the discretization of most engineering applications leads • acquire the ability to deal with problems involving the approach and interpolation of data with partial polynomial functions • understand and analyze the capable and necessary conditions, as well as the corresponding error, under which the arithmetic methods give the required results • acquire the ability to implement course methods and algorithms in the Matlab software computing environment • colllect information on the existence of computer numerical libraries and other related tools.
General Competences

- Working independently
- Team work
- Working in an interdisciplinary environment

(3) SYLLABUS

Basic concepts. Movable and fixed decimal operations. Rounding errors and their effect on calculations. Algorithm stability. Troubleshooting.

Constant points of functions. Banach's constant point theorem. Numerical methods for locating constant points. Behavior, convergence and complexity.

Newton's method and the intersecting method.

Solving linear systems. Direct methods (Gauss, factorization). LU factorization. Repetitive methods (Gauss Seidel and Jacobi). Vector and matrix norms. Vector method for calculating eigenvalues. Matrix status indicator.

Polynomial interpolation. Taylor, Lagrange, Newton, Hermite Polynomials. Interpolation with splines.

Solving non-linear equations. The method of bifurcation. Regula-Falsi method. Constant point iterative methods. Numerical methods of nonlinear systems. Newton method. Intersection method. Schroder method. Behavior, convergence and complexity.

Numerical derivation and integration. Newton, trapezoidal and Simpson methods. Simpson complex rule. Errors.

Finite difference methods.

Applications using Matlab software. Examples of 1st and 2nd order differential equations (ordinary and partial) in Matlab. Transformations (Fourier, Laplace).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY	Communication with students through the platform with emails & announcements on the course's website (e-class). Powerpoint display with projector and laptop. Demonstration of modern mathematical software (Matlab, Mathematica, Wolfram Alpha) on the taught subjects. Announcement of course notes in electronic form on the course's website (e-class). Referral to websites with related applications (Desmos, Maxima, Geogebra). Utilization of the computer laboratory of the Department. Possibility of examinations through the tool of Exercises in e-class.	
TEACHING METHODS	***Activity***	***Semester workload***
	Lectures	39
	Laboratory	26

	Computing exercises	35
	Individual study	50
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of assessment:** Greek (English for ERASMUS students upon request). Students are assessed through a written examination, which includes short-answer questions and problem solving. There is a possibility for an intermediate examination in the middle of the semester. Delivery of assignments and written/oral examination in the Laboratory (40%). Students with learning difficulties are examined in accordance with article 37 of the Internal Regulations of the UNIWA. The evaluation criteria have been presented to the students before the final examination and the individual grade of the subjects is written in them. Students can see their writing and their individual grades in the topics, as well as receive clarifications about them after pointing out any mistakes.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Εισαγωγή στην Αριθμητική Ανάλυση, Ακρίβης Γ.Δ., Δουγαλής, Β.Α.
- Αριθμητική ανάλυση, Γ.Σ. Σοφιανός & Ε. Θ. Τυχόπουλος, Εκδόσεις Σταμούλης, 2005.
- Αριθμητική Ανάλυση-Εισαγωγή, Μιχαήλ Ν. Βραχάτης, Εκδόσεις Κλειδάριθμος 2011.
- Αριθμητικές μέθοδοι και προγράμματα για μαθηματικούς υπολογισμούς, G.E. Forsythe, M.A. Malcolm & C.B. Moler, μετάφραση από τους Γ.Δ. Ακριβή & Β.Α. Δούγαλη, Πανεπιστημιακές Εκδόσεις Κρήτης, 1997.
- Introduction to numerical analysis, F.B. Hildebrand, Dover, 1956.
- Theory and applications of numerical analysis, G.M. Philips & PJ Taylor, 2nd ed., 1996.

- Related academic journals:

SIAM Journal on numerical analysis

Technical Engineering-Statics

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**2002**	**SEMESTER**	**2**	
COURSE TITLE:	Technical Engineering-Statics			
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY**		**ECTS**

	TEACHING HOURS	CREDITS
Theory (Lectures) and Esxercises	2	2.5
Laboratory	2	2,5
	4	**5**

COURSE TYPE:	General background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE211/

(2) LEARNING OUTCOMES

Learning Outcomes
The student makes a first contact with the concept of carrier and construction, the concept of statics, balance and learns the ways of support and their properties. Analyzes mainly flat bodies, such as grids, beams and frames. Determines the intensive sizes inside them and designs them on the beams and frames. Upon successful completion of the course, students will be able to: • Determine the reactions of isostatic vectors. • Apply equilibrium equations. • To analyze the forces in sections. • To study flat grids with the methods of balancing nodes and sections. • Determine the intensive quantities in beams and frames. To draw the diagrams of axial forces N, shear forces Q and bending moments M. • To know the properties of intensive quantities. • Calculate the geometric characteristics of sections (center of gravity and moments of inertia). Upon successful completion of the course students will have: 1. Thorough knowledge and critical understanding of the subject matter and concepts of Statics. 2. Knowledge and skills for recognizing, describing and evaluating the static state of bodies, by selecting the appropriate mathematical formulas and equations. 3. Knowledge and skills of perception and solution of technical problems of static balance of bodies, frames and constructions of mechanical nature as well as machines - mechanisms. In detail the student will be able to: 1. Describe, identify and evaluate the type and nature of structures and mechanical structures. 2. Know the basic equations that govern each case. 3. Formulate solutions of static equilibrium problems based on the equations that apply depending on the case. 4. Evaluate and accept or critically reject the results of research and problem solving.
General Competences
The course aims to contribute to the acquisition of the following general skills: 1. Ability to search, analyze and synthesize data and information, using the necessary technologies of internet and bibliographic research and networking. 2. Ability to make decisions, through the elaboration of solutions and through the elaboration

of options for the elaboration of the assigned tasks and exercises.
3. Ability for autonomous work, through the elaboration of individually performed tasks and exercises.
4. Ability for group work, through the elaboration of group tasks and exercises.
5. Ability to plan and manage tasks, through the undertaking and elaboration of integrated projects.

The course also aims at the following general skills:
• Understanding of vectors and operations between them with application in Engineering-Statics.
• Knowledge of equilibrium equations and support conditions of bodies.
• Analysis of flat grids with the methods of equilibrium of nodes and sections.
• Determination of intensive sizes in beams and frames.
• Design of N, Q, M diagrams.
• Calculation of geometric characteristic cross sections (centers of gravity and moments of inertia).

(3) SYLLABUS

(1) General principles of Statics. Official foundation.
(2) Vector algebra. About the vector character of power.
(3) Combining forces of material and solid body. Analysis and synthesis of forces at the level and in space.
(4) Power and torque. Moment of force in terms of point and axis. Pair of forces. Action reaction. Parallel power transfer. Reduction of system of forces. Main axis. Balance of material point and solid body. Forces in space and at the level (analytical methods).
(5) Types of supports (rolling, hinge, ankle).
(6) Isostatic vectors, overstatic vectors.
(7) Central and general Power Systems.
(8) Free Body Diagrams, balance of forces and moments in bodies on a level and in space. Complex bodies. Calculation of reactions.
(9) Modular beam.
(10) Grids, graphic and computational methods for solving networks at the level and in space. Analytical method of nodes. The method of Ritter incisions. Complex networks.
(11) Frames and machines-mechanisms.
(12) Center of forces, lines, surface, weight, moments of inertia of cross sections, Steiner theorem, algebraic transformations. Weight Centers. Weight Centers of material points, lines, surfaces and volumes. Composite body center of gravity calculation.
(13) Internal forces. Cross-sectional loads. Ideal sections, mathematical relations between internal loads. Diagrams N, Q, M and their properties.
(14) Bipolar beam and its diagrams for different types of loads.
(15) Compacted beam.
(16) Prominent beam.
(17) Bipolar beam.
(18) Diagrams N, Q, M. Construction of diagrams N, Q, M beam by the method of the substitute beam and the method of integrals.
(19) Modular beam.
(20) Frames.
(21) Curved vectors - Mixed vectors.
(22) Flexible load bearing objects. Cables with concentrated loads and with continuous charging. Parabolic cable.
(23) Friction, friction rule, applications of the friction rule in mechanical applications (Screw - Belts). Rolling friction.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In the classroom and in working groups with physical presence of students. In more detail:
• Tutorial delivery with the use of projection and by solving applications on the blackboard.
• Presentation and analysis of exercises and topics of semester assignments.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching and lecturing (slides of Power-point).
• Use of the courses e-Class platform (Outline, Predicted Chart, Implemented Chart, Information for semester work, Lecture material - Notes and presentations).
• Providing additional material on the courses e-Class and support of the learning process by providing notes with selected additional exercises and illustrated examples on the courses Ms-Teams platform.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>15</td></tr>
<tr><td>Tutorials and Exercises</td><td>15</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>10</td></tr>
<tr><td>Project-based assignments/laboratory based exercises</td><td>30</td></tr>
<tr><td>Non-guided personal study</td><td>45</td></tr>
<tr><td>Semester project</td><td>35</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, project evaluation

Student assessment methods
• Written examination with short answer questions (Concluding)
• Written exams with multiple choice questions (Concluding)
• Written assignment (Formative)
• Laboratory/project work (Formative)
For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work, as well as in the elaboration and public presentation of the project (theoretical study). The final grade of the course consists of:</td></tr>
</table>

	• Final written examination in the entire course content (70%), • Semester project (15%) • Project-based assignments (15%), • Elaboration of laboratory-based projects/work (20%). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Engineering Mechanics: Statics, Hibbeler Russell, 14th Edition, 2016
- Vector Mechanics for Engineers: Statics, Beer F., Johnston E., Mazurek D., 11th Edition, McGraw Hill, 2020
- Engineering Mechanics-Statics, J.L.Meriam, L.G.Kraige, Wiley, 5th Edition, 2003, ISBN: 0-471-26607-8
- Vector Mechanics for Engineers-Statics, 10th Edition,, F.P.Beer, E.R.Jonston, D.F.Mazurek,, McGraw-Hill
- Statics and Strength of Materials, 2nd Edition, Fa-Hwa Cheng, McGraw-Hill Education
- Engineering Mechanics, Statics, 5th edition, Anthony M Bedford, Wallace Fowler, Yusof Ahmad, Pearson Education Singapore

Algorithms and Data Structures

COURSE OUTLINE

(6) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**2003**	**SEMESTER**	**2**
COURSE TITLE:	Algorithms and Data Structures		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	3
Laboratory		1	2
		4	**5**
COURSE TYPE:	General knowledge		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO	Yes		

ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE111/

(7) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will have: 1. Familiarity with the concepts of algorithms 2. Algorithm analysis skills 3. Knowledge of basic and secondary data structures In detail, students will be able to: 1. Analyze and design algorithms. 2. Implement data structures in C ++ 3. Select the appropriate data structures for each algorithm 4. Implement the basic algorithms in C ++
General Competences
6. Search, analysis and synthesis of data and information, using the necessary technologies 7. Adaptation to new situations 8. Decision making 9. Production of new research ideas 10. 5. Promoting free, creative and inductive thinking

(8) SYLLABUS

The course Algorithms and Data Structures deals with the basic concepts of algorithms and data structures.
Algorithms:

- Brute Force
- Divide and Conquer
- Greedy Algorithm
- Algorithm analysis

Data structures:

- Tables, Lists, Stacks, Queues,
- Static-Dynamic Trees
- Binary Trees

(9) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Laboratories • Assignments & Presentations
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in theoretical teaching and use of ICTs in lecturing

<table>
<tr><td></td><td>

- Use of ICTs in laboratory-based training
- Use of ICTs for the communication with students via the e-class platform
- Specialised software tools for experimentation
- Support of the educational process via the e-class platform

</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>36</td></tr>
<tr><td>Non-guided personal study</td><td>75</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>

Language of Assessment
Greek
Description
Written exams, laboratory evaluation and project evaluation
Student assessment methods

- Written examination with short answer questions (Concluding)
- Written exams with multiple choice questions (Concluding)
- Written assignment (Formative)
- Laboratory/project work (Formative)

The final grade of the course consists of:

- Final written examination in the entire theoretical content (80%),
- Elaboration of laboratory-based work (20%).

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

</td></tr>
</table>

(10) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Algorithms, Edmonds Jeff, Publications: Kritiki*
- *Quantitative Methods and Applications, Ch.Fountas, Ch.Drosos, Publications: Varvarigou*
- *C: From Theory to Application, Tselikis, Tselikas, Publications: G.Tselikis*
- *Introduction to Algorithm Analysis and Design, AnanyLevitin, Jiola Publications*
- *Introduction to Object-Oriented Programming, Sgouropoulou, Troussas,*

Differential and Integral Calculus I

COURSE OUTLINE

GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**2004**	**SEMESTER**	**2**
COURSE TITLE	Differential and Integral Calculus I		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	3
Laboratory	1	2
	4	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE232/

(1) **LEARNING OUTCOMES**

Learning outcomes
Upon successful completion of this course, the student will be able to acquire: • the required theoretical background and ability to be able to use the differential calculus of a variable in Probability, Statistics and Engineering problems that they will be called upon to face in the later years of their studies • the ability to deal with problems involving sets, supremum sets, infimum sets, real number series (convergence, monotony, recursive series), function limits, function continuity, function derivative, functions terms, Taylor theorem, convex and concave functions • the ability to apply function calculus results of a real variable to engineering/scientific problems.
General Competences
• Production of free, creative and inductive thinking • Working independently • Team work • Decision-making • Search for, analysis and synthesis of data and information, with the use of modern scientific tools for solving problems in specialized applications • Working in an interdisciplinary environment The above General Competences correspond to Level 6 of the European Qualifications Framework.

(2) **SYLLABUS**

The set of real numbers.

Series of real numbers. Convergence. Cauchy Series. Upper and lower series limit.

Real functions of a real variable. Elementary functions (exponential, logarithmic, trigonometric, hyperbolic, inverse trigonometric, inverse hyperbolic). Basic concepts of differential calculus (limits, lateral limits, continuity, uniform continuity, derivative). Differential calculus theorems (Rolle theorem, mean value theorems, de l'Hospital rule, Taylor formula). Differential calculus applications (local extremes, inflection points, asymptotic curve, graph study, Newton method).

Indefinite Integrals. Integration by factors. Completion by replacement. Special integration methods (integration with reductive formulas, integration of explicit functions, analysis in simple fractions, binomial integrals, reduction to integrals of explicit functions by substitution).

Definite integrals. Riemann sums. Fundamental theorem of integral calculus. Variable change. Applications in Physics, Geometry and Engineering (calculation of flat area, curve arc length, solid volume by rotation, surface area by rotation, center of gravity/mass, moment of inertia, force work, etc.). Taylor and MacLaurin power series function development.

Applications using Matlab software. Introduction to the Matlab environment (workspace and command window, command history, documentation system). Numerical and alphanumeric data (character, string). Matlab data types and accuracy. Create, import and manage data. Mathematical and logical operators and expressions. Data visualization (graphs, diagrams and graphics). Creating scripts and functions (Matlab Editor, m-files). Implementation of programs with loops, conditional statements, nested loops and user-defined functions.

Basic arithmetic functions. Definition and handling of variables. Output format. Symbolic variables. Symbolic mathematical calculations in Matlab. Basic functions for engineers in Matlab (trigonometric, hyperbolic, etc.). Solving numerical equations. Roots of polynomials. Complex numbers. Complex functions. Symbolic calculations with complex numbers. Functions. Introduction to arithmetic derivation and arithmetic integration in Matlab.

(3) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY	Communication with students through the platform with emails & announcements on the course's website (e-class). Powerpoint display with projector and laptop. Demonstration of modern mathematical software (Matlab, Mathematica, Wolfram Alpha) on the taught subjects. Announcement of course notes in electronic form on the course's website (e-class). Referral to websites with related applications (Desmos, Maxima, Geogebra). Utilization of the computer laboratory of the Department. Possibility of examinations through the tool of Exercises in

	e-class.
TEACHING METHODS	

Activity	*Semester workload*
Lectures	39
Laboratory	26
Computing exercises	30
Individual study	55
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of assessment:** Greek (English for ERASMUS students upon request). Students are assessed through a written examination, which includes short-answer questions and problem solving. There is a possibility for an intermediate examination in the middle of the semester. Delivery of assignments and written/oral examination in the Laboratory (40%). Students with learning difficulties are examined in accordance with article 37 of the Internal Regulations of the UNIWA. The evaluation criteria have been presented to the students before the final examination and the individual grade of the subjects is written in them. Students can see their writing and their individual grades in the topics, as well as receive clarifications about them after pointing out any mistakes.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Νικόλαος Χαλιδιάς, Εφαρμοσμένα Μαθηματικά για Οικονομολόγους και Μηχανικούς, Broken Hill Publishers, 2021.
- Spivak Michael, Διαφορικός και Ολοκληρωτικός Λογισμός, ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 2η Έκδοση, 2010.
- Finney R.L., Weir M.D., Giordano F.R., Απειροστικός Λογισμός Τόμος Ι, ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ, 2009.
- Παντελίδης Γεώργιος Ν., Ανάλυση, Τόμος Ι, Εκδόσεις Ζήτη, 3η έκδ. βελτ./2008.
- Γεωργίου Δημήτρης, Ηλιάδης Σταύρος, Μεγαρίτης Αθανάσιος, Πραγματική Ανάλυση, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ, 2η έκδοση, 2017.
- Ντούγιας Σωτήρης, Απειροστικός Λογισμός, Τόμος Α, LIBERAL BOOKS, 2007.

Measurement and Sensor Technology

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering
ACADEMIC UNIT:	Industrial Design and Production Engineering
LEVEL OF STUDIES:	Undergraduate

COURSE CODE:	**2005**	**SEMESTER**	**2**
COURSE TITLE:	Measurement and Sensor Technology		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures and Exercises	3	3
Optional Laboratory Exercises	1	2
	4	**5**

COURSE TYPE:	Special background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE135/

(2) LEARNING OUTCOMES

Learning Outcomes

Upon successfull completion of the course, the students will acquire:

1. Knowledge and understanding of the measurement process and measurement error estimation/computation.
2. Knowledge and abilities in measurement signal conditioning and conversion.
3. Knowledge and skills in signal processing via analog and digital platforms and the ability to analyze signals in the digital domain.

Specifically, the students will be able to:

1. Acquire measurements via various platforms, either analog or digital, with or without the use of computer systems.
2. Estimate measurement and signal error across all stages of a measurement system.
3. Employ suitable analog and digital hardware for measurement systems synthesis, adapted to given technical specifications.
4. Study signals in the digital domain and employ suitable mathematical tools to extract conclusions.

General Competences

Search for, analysis and synthesis of data and information with the help of modern technologies: study, design, implementation and performance analysis of measurement systems.

Adaptation to new, unexpected situations: evaluation, debugging and improvement of the operation of a measurement system.

Decision making: synthesis and error-free operation of the components of a measurement system.

Team working: conversational skills, ability for self-criticism and commitment to the implementation of a team project.

Working in an international and multi-disciplinary environment: communications skills in a foreign language, ability to grasp diverse problems and requirements and knowledge of problem-solving methods in measurement systems.

Promotion of free, creative, and inductive thinking for the development of new strategic approaches.

(3) SYLLABUS

1. Typical measurement chain, measurement error, calculation of systematic, random and total errors, error propagation.
2. Instruments and sensors characteristics.
3. Signal conditioning circuits, Wheatstone bridges, operational amplifiers and applications.
4. Analog passive/active filters, applications.
5. Sampling and signal digitization, sampling theorem, A/D converters.
6. Digital filters, applications.
7. Design and implementation of a measurement system with the use of a computer system.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching se of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Exercises</td><td>13</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>10</td></tr>
<tr><td>Non-guided personal study</td><td>40</td></tr>
<tr><td>Laboratory Exercises</td><td>48</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assesment
Greek (English for ERASMUS students upon request)
Description
Written exams, optional laboratory exercises

Methods of Assesment
• Written exam
• Laboratory exercises evaluation

The final course grade consists of:
• Final written exam
• Completion of optional laboratory exercises amounting up to 40% of the final grade.

Students with learning difficulties are examined in accordance with article 37 of the UniWA Internal Regulation.

The assessment criteria are announced to the students at the beginning of the semester and are posted on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Τεχνολογία Μετρήσεων, Αισθητήρια, Α. Γαστεράτος, Σ. Μουρούτσος και Ι. Ανδρεάδης,
Εκδόσεις Γκιούρδα.
2. Ηλεκτρικές Μετρήσεις, Κ. Ψωμόπουλος, Εκδόσεις Τσότρα.
3. Μετρήσεις, Ν. Σταθόπουλος, Εκδόσεις Δερμεντζή
4. Συστήματα Μετρήσεων, Ρ. Κινγκ, Εκδόσεις Τζιόλα.

Business Finance

COURSE OUTLINE

(1) **GENERAL**

SCHOOL	ENGINEERING SCHOOL		
ACADEMIC UNIT	INDUSTRIAL DESIGN AND PRODUCTION ENGINEERS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	2006	**SEMESTER**	8
COURSE TITLE	Business Finance		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Laboratory exercises and Practice Exercises	4	5

COURSE TYPE	MGY
PREREQUISITE COURSES:	THEY DO NOT EXIST
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(2) **LEARNING OUTCOMES**

Learning outcomes
The aim of the course is: • *To offer knowledge to students in relation to the overall financial figures* • *To assist students in understanding and evaluating the financial system, as shaped by the operation of individual markets* • *To present the basic tools of the modern financial system.* • *To offer students specialized knowledge on issues such as the globalized economy, economic and monetary unions, the spread of crises, etc.* • *To enable students to understand the operation of foreign trade, competitive advantage, etc., issues related to export companies*

- *To acquaint students with the conceptual framework, the content of entrepreneurship and the environment in which a business operates, as well as to introduce them to the basic aspects of business development and the process of starting and growing a business, from identifying business opportunity to financing and implementation of the business plan.*

Upon completion of this course, students will have the knowledge:

- *Use financial theory to make optimal corporate decisions.*
- *Understand and use corporate data and indicators, in the context of financial planning.*
- Interpret and evaluate the implementation of various economic policies.
- Understand and evaluate the operation of the various financial systems
- *Use the available macroeconomic tools to achieve the best growth and investment strategy each time*
- *Use theory and methodological tools to design the production process based on competitive advantage and relative prices with competitors.*

Understand the impact on corporate and government financial volumes of changes in relation to trade terms, exchange rates, etc

General Competences
• Search, analysis and synthesis of data and information, using the necessary Technologies • Adaptation to new situations • Decision making • Autonomous Work • Production of new research ideas • Exercise criticism and self-criticism • Promoting free, creative and inductive thinking

(3) **SYLLABUS**

Course Contents:

1. Historical Overview of Economic Welfare
2. Linking its economic welfare in the business world
3. A comprehensive business decision-making framework
4. Microeconomic Theory (Introduction, Market and Price Definition, Demand, Supply, Market Balance, Market Structures)
5. Abuse of (collective) Dominant Position of Businesses in the light of its financial welfare
6. Macroeconomic Theory (Introduction, Standard Prosperity Ratios - GDP, Labor Market Balance, Unemployment, Savings and Investment, Economic Growth, Portfolio, Asset Balance Assets / Examples, Economics, AD, Economy, L Crises, Fiscal Policy)
7. Application of models and indicators of recording prosperity in companies
8. Summary: The Business World, Economic Welfare and Growth

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Distance Learning via Teams</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td colspan="2">Learning process support through the electronic platform e-class</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (Enriched Presentation</td><td>60</td></tr>
<tr><td>Interactive Teaching (Questions - Answers, Brainstorming, Oral Group Work, Case Study)</td><td>60</td></tr>
<tr><td>Personal study</td><td>30</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total
(30 hours of workload per credit unit)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td colspan="2"></td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- Krugman Paul, Wells Robin, (2018), ΜΙΚΡΟΟΙΚΟΝΟΜΙΚΗ ΣΕ ΔΙΔΑΚΤΙΚΕΣ ΕΝΟΤΗΤΕΣ, Εκδόσεις Gutenberg
- Krugman Paul, Wells Robin, (2018), ΜΑΚΡΟΟΙΚΟΝΟΜΙΚΗ ΣΕ ΔΙΔΑΚΤΙΚΕΣ ΕΝΟΤΗΤΕΣ, Εκδόσεις Gutenberg
- Sen Amartya, (2000), Για την Ηθική και την Οικονομία, Εκδόσεις Καστανιώτη
- Gillis, Perkins, Roemer, Snodgrass (2000), Οικονομική της Ανάπτυξης, Εκδόσεις Τυπωθήτω - Γιώργος Δαρδάνος
- Parkin M., Powell M., Matthews K., (2013), Αρχές Οικονομικής, Εκδόσεις Κριτική
- Abel Andrew B., Bernanke Ben S., Croushore Dean, (2017), Μακροοικονομική, Εκδόσεις Κριτική
- Per-Olov Johansson, (1995), An introduction to modern welfare economics, Cambridge University Press
- Alex C. Michalos, (2003), Essays on the Quality of Life, Social Indicators Research Series, Springer

3rd SEMESTER

Differential and Integral Calculus II

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**3001**	**SEMESTER**	**3**
COURSE TITLE	Differential and Integral Calculus II		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures	3	3
	Laboratory	1	2
		4	**5**
COURSE TYPE	General background		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE237/		

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course, the students will be able to acquire: • the ability to deal with problems involving real number series, power series, indefinite integrals, definite integrals and their applications, in generalized integrals • the required theoretical background and the ability to use the differential calculus of functions of two independent variables, which refer to problems of three-dimensional space • the ability to deal with problems involving real number series, power series, and generalized integrals • the ability to apply optimization techniques to modeling problems of the engineering specialty involving functions of many independent variables • the ability to use the Matlab software environment for the implementation of the methods and algorithms of the course.
General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently

(3) **SYLLABUS**

Generalized integrals. Generalized integrals of the 1st order. Geometric interpretation. Convergence of generalized integral. Convergence criteria (Cauchy criterion, comparison criterion and marginal comparison). Generalized integrals of the 2nd order. Beta Function. Gamma function.

Series of real numbers. Convergence of series. Series of non-negative terms. Convergence criteria (geometric series, integral criterion, root-ratio criteria, comparison and marginal comparison criteria, Leibniz criterion, absolute convergence).

Function sequences. Function sequences convergence. Uniform convergence criteria (Cauchy criterion, Dini criterion, Weierstrass theorem, Newton-Gregory formula).

Series of functions. Convergence criteria. Continuity, integration and series derivation theorems.

Power series. Power series radius and convergence space. Cauchy-Hadamard Theorem. Theorems of continuity, integration and derivation. Taylor Series. Taylor formula. Binomial series.

Functions of many variables. Limit. Continuity. Partial continuity.

Differential calculus of functions of many variables. Partial derivative. Derivative by direction. Total derivative. Chain rule. Scalar field slope. Upper class differential. Deviation. Swirl. Material derivative. Jacobi Determinant. Taylor theorem for functions of two variables. Complex functions.

Optimization. Extremes of a function of many variables. Conditional extremes and Lagrange multipliers. Applications in the minimal squares' method.

Applications using Matlab software. Optimization of functions of many variables in Matlab. Numerical derivation and integration of functions of many variables.

(4) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY	Communication with students through the platform with emails & announcements on the course's website (e-class). Powerpoint display with projector and laptop. Demonstration of modern mathematical software (Matlab, Mathematica, Wolfram Alpha) on the taught subjects. Announcement of course notes in electronic form on the course's website (e-class). Referral to websites with related applications (Desmos, Maxima, Geogebra).

	Utilization of the computer laboratory of the Department. Possibility of examinations through the tool of Exercises in e-class.
TEACHING METHODS	

Activity	*Semester workload*
Lectures	39
Tutorials	26
Computing exercises	30
Individual study	55
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of assessment:** Greek (English for ERASMUS students upon request). Students are assessed through a written examination, which includes short-answer questions and problem solving. There is a possibility for an intermediate examination in the middle of the semester. Delivery of assignments and written/oral examination in the Tutorials (20%). Students with learning difficulties are examined in accordance with article 37 of the Internal Regulations of the UNIWA. The evaluation criteria have been presented to the students before the final examination and the individual grade of the subjects is written in them. Students can see their writing and their individual grades in the topics, as well as receive clarifications about them after pointing out any mistakes.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

- Goldstein Larry J., Lay David C., Schneider David I., Asmar Nakhle H. (2020). Διαφορικός και Ολοκληρωτικός Λογισμός-Θεωρία και Εφαρμογές, Εκδότης BROKEN HILL PUBLISHERS LTD.
- Ντούνιας, Σ. (2005). Απειροστικός Λογισμός, Τόμος Β, Εκδ. Leader Books.

CAD/CAM

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering
ACADEMIC UNIT:	Industrial Design and Production Engineering

LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**3002**	**SEMESTER**	**3**	
COURSE TITLE:	CAD/CAM			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)/Excercises			2	32.5
Laboratory			2	2.5
			4	**5**
COURSE TYPE:	General knowledge			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE109/			

(2) LEARNING OUTCOMES

Learning Outcomes

Upon completion of the course students will have:

1. Thorough knowledge and critical understanding of the theory and principles of the use of new technologies and information systems in the design of products and processes and the operation of production units.
2. Knowledge and skills in standardization and simulation of systems, optimization and design of products, processes and systems, planning and production control using computer systems.
3. Knowledge and skills of composition, construction, programming, maintenance, operation supervision, debugging and repair of design and production system using computer / information systems.

In detail, students will be able to:

1. Describe and identify parts, select CAD / CAM system functions and functions, and compile relevant specifications.
2. Explain the operation of a CAD / CAM system, evaluate its performance and calculate its operating parameters.
3. Develop and differentiate CAD / CAM system applications, compose and organize new applications, and evaluate system performance.
4. To apply certification and quality improvement techniques and to support Industrial Control Systems.
5. Recognize and implement regulations and recommendations related to social / professional ethics and environmental protection.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Teamwork
- Working in an international environment
- Work in an interdisciplinary environment
- Production of new research ideas

- Project Management
- Promoting free, creative and inductive thinking

(3) SYLLABUS

1. Introduction to production with new technologies
2. Systems standardization
3. Systems simulation
4. Systems control
5. Systems optimization
6. Decisions and forecasts with the application of computational methods
7. Design using information systems
8. Graphic principles and systems / design environments and ergonomics
9. Principles and method of designing production units using Information Systems
10. Production planning using Information Systems
11. Control of production processes using Information Systems
12. Quality / Certification / Principles and Systems of Quality Management / Approaches to continuous quality improvement
13. Design, Operation and Management of Industrial Control Systems

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	26
Laboratory work	26
Projects implemetation	50
Journal/paper reading & theoretical study	18
Non-guided personal study	30
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** • Written examination • Laboratory performance • Project assesment The final grade of the course consists of:

	• Final written examination in the entire course content (70%), • Elaboration of projects (30%) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. CAD/CAM, Tseles D., Modern Publishing Ltd.
2. CAD / CAM systems and 3D modeling,Bilalis

- Related academic journals:

1. **CAD Computer Aided Design.** Publisher: Elsevier. ISSN:0010-4485. https://www.sciencedirect.com/journal/computer-aided-design
2. **Integrated Computer-Aided Engineering**. Publisher: IOS Press. ISSN:1069-2509E-ISSN:1875-8835. https://www.iospress.nl/journal/integrated-computer-aided-engineering/
3. **IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems**. Publisher: IEEE. ISSN:0278-0070. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=43

Production Technology I

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**3003**	**SEMESTER**	**3**
COURSE TITLE:	Production Technology I		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures		**4**	**5**
COURSE TYPE:	Special Background Course		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE333/		

(2) LEARNING OUTCOMES

Learning Outcomes
The course belongs to **Level 6** of the European Qualifications Framework. Thus, upon successful completion: - Students will have sufficient basic and advanced knowledge to be able to understand issues of the physical and mechanical properties of metallic materials and alloys. - They will possess advanced knowledge and skills so that they can use them in a way that demonstrates professionalism. - Also, they will be able to solve complex and unpredictable problems related to the use of metallic materials and industrial alloys in specific mechanical applications. During the course, the student learns how to gather and interpret information on cases of proper selection of metal or metal alloy material and its proper processing. Thus, after the successful completion of the course, the student will be able to manage complex technical and professional activities.
General Competences
1. Search for, analysis and synthesis of data and information, with the use of the necessary technology 2. Adapting to new situations 3. Decision-making 4. Working independently 5. Team work 6. Working in an international environment 7. Working in an interdisciplinary environment 8. Production of new research ideas 9. Project planning and management 10. Production of free, creative and inductive thinking

(3) SYLLABUS

1. Structure of Metals: chemical and metallic bonds, Defects.
2. Main physical and mechanical properties (conductivity, Elasticity, fracture etc).
3. Mechanical tests (Tension test, bending test etc). Mechanical processing.
4. Processing technologies - removal processes.
5. Processing technologies - bulk Forming (rolling, forging etc)
6. Processing technologies – Sheet forming (bending, deep drawing etc)
7. Powder metallurgy
8. Casting metalworking procedure
9. Welding process
10. Surface properties. Methods of surface hardening.
11. Heat treatments.
12. Industrial alloys. Steels, Cast Iron, Copper Alloys, Al Alloys, Mg Alloys, Titanium Alloys, Zinc Alloys, Lead Alloys, Superalloys.
13. Methods of Characterization (destructive and non – destructive)

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face and distant learning
USE OF INFORMATION AND	• Use of ICTs theoretical teaching se of ICTs in lecturing

<table>
<tr><td>COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Project-based assignments</td><td>36</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>20</td></tr>
<tr><td>Non-guided personal study</td><td>42</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
• Written examination with short answer questions (Concluding)
• Written exams with multiple choice questions (Concluding)
• Laboratory/project work (Formative)
The final grade of the course consists of:
• Final written examination in the entire course content (80%),
• Elaboration of theoretical project (20%)

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Chrysoulakis Ioannis, Pantelis Dimitrios, Science and Technology of Metallic Materials, 2nd Rev. Version, Papasotiriou Publications, 2007
- Mamalis, Athanasios, Technology of Processing of Materials IV: Non-conventional treatments, TEKDOTIKI SELKA 4M Publications, 1990

Related academic journals:

- Materials, MDPI
- Journal of materials Science & Technology, Elsevier

Strength of Materials

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**3004**	**SEMESTER**	**3**
COURSE TITLE:	Strength of Materials		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	2	3
Tutorial/Excercises	1	1.5
Laboratory	1	1.5
	4	**5**

COURSE TYPE:	General background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE336/

(2) LEARNING OUTCOMES

Learning Outcomes

Upon successful completion of the course students will have:

1. Thorough knowledge and critical understanding of the topics and concepts of Strength of Materials.
2. Knowledge and skills for the identification, description and assessment of the static state of structures, by selecting the appropriate mathematical formulas and equations.
3. Knowledge and skills of perception and solution of technical problems of static balance of bodies, frames and constructions of mechanical nature as well as machines - mechanisms.

In detail, students will be able to:

1. Describe, identify and evaluate the type and nature of stress and study problems (dimensioning and selection of materials) of various mechanical structures and their bodies.
2. Know the basic equations that govern each case.
3. Formulate solutions to the problems of material selection or determination of dimensions of the structural elements of the constructions based on the equations that apply depending on the case.
4. Evaluate and accept or critically reject the results of research and problem solving.

General Competences

The course aims to contribute to the acquisition of the following general skills:

- Ability to search, analyse and synthesize data and information, with the use of the necessary internet technologies and bibliographic research and networking.
- Ability to make decisions, through the elaboration of solutions and options for

the processing of the assigned tasks and exercises.

- Ability for autonomous work, through the elaboration of individually executed tasks and exercises.
- Ability for group work, through the elaboration of group executions tasks and exercises.
- Ability to plan and manage projects, through undertaking and elaborating fully featured tasks (project).
- Promoting free, creative and inductive thinking.
  Critical thinking.

(3) SYLLABUS

Overview of materials engineering

- External loads / equivalent loads / centrifuges
- Types of supports and corresponding reactions
- Equilibrium equations
- Free body diagrams: internal forces and support reactions
- Diagrams of shear forces and bending moments

Tension

- Tension definition / calculation (3 main and 3 shear stresses)
- Definition / calculation of the main tension
- Tensile stress / strain diagrams
- Plastic deformation
- Ductile and brittle fracture

Mechanical behavior in tension and compression

- The measure of elasticity (Young's measure)
- Definitions of mechanical properties (eg leakage limit, tensile strength, etc.)
- Hooke's law
- Poisson's ratio
- Thermal stresses and displacements

Shear

- -Definition / calculation of shear stress
- Shear forces / shear surfaces for simple connections
- Permissible tensions / safety factor

Torsion

- Introduction to torsion / torsion of spindles
- Calculation of shear deformation by torsion
- The torsion equation
- Definition / calculation of the polar moment of inertia
- Absolute maximum shear stress

Bending of beams

- General overview of beams
- Diagrams of axial, shear forces and bending moments

- Moment of inertia of a cross section
- Centrifuges of surfaces: general equations, complex geometries, axes of symmetry
- Surface moment of inertia (2nd surface moment): Ix, Iy, Iz = J (polar moment of inertia)

Bending of beams
- Graphic method for the construction of force and moment diagrams
- Review of displacements in straight, prismatic and homogeneous beams due to net bending
- Calculation of the elastic line
- Examples of beam bending

Dislocations in beams and shafts
- The elastic line and how it is calculated
- Displacement and tilt angle with integration
- Examples of calculating inclination and displacement using the method of integration

Combined stress
- Review of the principle of superposition
- Linear correlation between charge and voltage or displacement
- Assumptions about geometry for the imposition of loading effects
- Intensive condition caused by combined stress

Mechanical behavior of metallic materials
- Creep
- Fatigue

Mechanical behavior of metallic materials
- Fatigue with the presence of cracks / notches
- Toughness
- Impact
- Effect of corrosion on the life of the material.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In the classroom and in working groups with physical presence of students. In detail: - Lectures with the use of projection and by solving applications and exercises on the blackboard. - Presentation and analysis of exercises and topics of semester assignments.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching and lecturing (slides of Power-point). • Use of the courses e-Class platform (Outline, Predicted Chart, Implemented Chart, Information for semester work, Lecture material - Notes and presentations). • Providing additional material on the courses e-Class and support of the learning process by providing notes with selected additional

<table>
<tr><td></td><td>exercises and illustrated examples on the courses Ms-Teams platform.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>15</td></tr>
<tr><td>Tutorials and Exercises</td><td>15</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>10</td></tr>
<tr><td>Project-based assignments/laboratory based exercises</td><td>30</td></tr>
<tr><td>Non-guided personal study</td><td>45</td></tr>
<tr><td>Semester project</td><td>35</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek

Description
Written exams, project evaluation

Student assessment methods
• Written examination with short answer questions (Concluding)
• Written exams with multiple choice questions (Concluding)
• Written assignment (Formative)
• Laboratory/project work (Formative)
The final grade of the course consists of:
• Final written examination in the entire course content (70%),
• Semester project (15%)
• Elaboration of laboratory-based projects/work (15%).

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Engineering Mechanics: Statics, Hibbeler Russell, 14th Edition, 2016
2. Vector Mechanics for Engineers: Statics, Beer F., Johnston E., Mazurek D., 11th Edition, McGraw Hill, 2020
3. Engineering Mechanics-Statics, J.L.Meriam, L.G.Kraige, Wiley, 5th Edition, 2003, ISBN: 0-471-26607-8
4. Strength of Materials: Fundamentals and Applications, T. D. Gunneswara Rao , Mudimby Andal, Cambridge University Press
5. Applied Strength of Materials, 5th Edition, Robert L. Mott, Pearson College

Electronics

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**3005**	**SEMESTER**	**3**
COURSE TITLE:	Electronics		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	3	3
Laboratory	1	2
	4	**5**

COURSE TYPE:	Special background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE321/

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion: - Students will have sufficient basic and advanced knowledge to be able to understand issues of electronics and electronic devices. - They will possess advanced knowledge and skills so that they can use them in a way that demonstrates professionalism. - Also, they will be able to solve complex and unpredictable problems related to the use of electronic components. During the course, students learn how to gather and interpret information on cases of proper selection of electronic components and their use on circuits. Thus, after the successful completion of the course, students will be able to manage complex technical and professional activities.
General Competences
11. Search for, analysis and synthesis of data and information, with the use of the necessary technology 12. Adapting to new situations 13. Decision-making 14. Working independently 15. Team work

16. Working in an international environment
17. Production of new research ideas
18. Project planning and management
19. Production of free, creative and inductive thinking

(3) SYLLABUS

Section A
1. Semiconductor Theory
2. pn contacts and diodes
3. Bipolar Transistors
4. JFET, MOSFET
5. Application of diodes and transistors
6. Operational Amplifiers
7. Active and passive filters

Section B
8. Digital Electronics
9. Boolean Algebra and logic gates
10. Integrated Circuits and combined circuits
11. Circuits and applications

Section C
12. Special topics of Optoelectronics
13. Special topics of micro- and nano- electronics

The course also includes an educational laboratory part where students can design, simulate and develop analog and digital circuits.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face and distance learning
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in theoretical teaching and use of ICTs in lecturing • Use of ICTs for the communication with students via the e-class platform
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	39
Laboratory work	30
Non-guided personal study	81
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE	**Language of Assessment**

EVALUATION	Greek **Description** Final exams with several type of questions such as multiple choice, short-answer questions and problem solving. **Student assessment methods** • Final Exams: 70% • Mid-term exams or written work, essay, report: 10% • Final written laboratory work/essay/reports: 20% The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. J. Charitantis, Electronics, Arakinthos University publisher, 2013 (in Greek)
2. A. Malvino, Electronics, Tziolas publisher, 2006 (in Greek)
3. R. Jaeger, Microelectronics, Part A, Tziolas Publisher, 2003 (in Greek)

- Related academic journals:

- *Solid-State Electronics, Elsevier*
- *Microelectronic Engineering, Elsevier*
- *Electronics, MDPI*
- *IEEE Transactions on Industrial Electronics*

System and Signal Analysis

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**3006**	**SEMESTER**	**3**
COURSE TITLE:	System and Signal Analysis		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures	3	4
Tutorial Exercises	1	1
	4	**5**

COURSE TYPE:	Special background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION	Greek

and EXAMINATIONS:	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE191/

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, the students will acquire: 4. Knowledge of signal and system concepts in continuous and discrete time and understanding of the mechanisms through which a system affects/modifies a signal. 5. Ability for mathematical analysis of systems operation. 6. Knowledge that is prerequisite for the completion of advanced courses of the curriculum. Specifically, the students will be able to: 1. Identify and comprehend the operation of primary components of a system, potentially consisting of multiple input/output signals. 2. Analyze the behavior of a system and compute its output signal, given an input signal. 3. Form a mathematical description of a physical, mechanical or electrical system that will aid in its operational analysis. 4. Participate more effectively in advanced courses of the curriculum.
General Competences
• Search for, analysis and synthesis of data and information with the help of necessary technologies: Analysis of general systems operation • Adaptation to new situations: comprehension, evaluation and improvement of the operation of new systems. • Decision making: Final selection of the operation model of a system among multiple possible models after assessment and evaluation. • Team working: ability and commitment to deliver assigned task as part of a team project. • Working in a multi-disciplinary environment: given that the concept of a system is found in various applications that stem from diverse scientific areas, the course aims to provide the graduate with adaptation skills and the ability to work efficiently in multi-disciplinary environment. • Brainstorming of novel research ideas: With the rapid evolution of system approach methods, the graduate will (and must be able to propose and process new research and development ideas.

(3) SYLLABUS

1. Continuous and discrete-time signals, signal operations.
2. Input-output systems in continuous and discrete time, characteristics and properties. Signals convolution. Linear and time-invariant systems (LTI). Eigenvalues of LTI systems. Process modelling via LTI systems.

3. LTI system output computation in the time domain, zero-input output, zero initial conditions output. Natural and forced system response. Transient response and steady-state system response. Applications in electrical circuits.
4. Periodic signals and Fourier series. Properties and applications of system analysis. Modelling and operation monitoring of a complex system.
5. Non-periodic signals and Fourier Transform (FT). Properties of FT. Signal spectrum, magnitude and phase system response. System analysis via FT, frequency response of a system, Bode diagrams. Electrical circuits impedance.
6. Laplace Transform (LT). Properties of LT. System analysis via LT. Interconnection of systems. LTI system output computation via LT.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>Use of ICT in teaching, communication with students and coursework submission</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Tutorial exercises</td><td>13</td></tr>
<tr><td>Written exercises</td><td>30</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>10</td></tr>
<tr><td>Non-guided personal study</td><td>58</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assesment
Greek (English for ERASMUS students upon request)
Description
Written exams, optional laboratory exercises

Methods of Assesment
• Written exam
• Written exercises evaluation

The final course grade consists of:
• Final written exam
• Completion of optional exercises ammounting up to 20% of the final grade.

Students with learning difficulties are examined in accordance with article 37 of the UniWA Internal Regulation.

The assessment criteria are announced to the students at the beginning of the semester and are posted on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1.Σήματα και Συστήματα Συνεχούς και Διακριτού Χρόνου, Χ. Καραϊσκος – Δ. Κάντζος, Σύγχρονη Εκδοτική ΕΠΕ, 2015.

2. Εισαγωγή στη Θεωρία Σημάτων και Συστημάτων, Σ. Θεοδωρίδης – Κ. Μπερμπερίδης, εκδόσεις Τυπωθήτω, 1998.

3. Σήματα και Συστήματα, Σ. Καραμπογιάς, Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, 2009.

4. Σήματα και Συστήματα Συνεχούς και Διακριτού Χρόνου, Α. Μάργαρης, Εκδόσεις Τζιόλα, 2014.

5. Signals and Systems, A. V. Oppenheim – A. S. Willsky, 2nd edition, Prentice Hall International, Inc., 1997.

6. Digital Signal Processing, G. Proakis – D. Manolakis, 2nd edition, Maxwell McMillan International Editions, 1992.

4th SEMESTER

Machine Elements

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**4001**	**SEMESTER**	**4**	
COURSE TITLE:	Machine Elements			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)/ Tutorials			3	3
Laboratory			1	2
			4	**5**
COURSE TYPE:	General Background			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion of the course, the student will be able to: • Select the appropriate connection means (type and dimension) for each assembly. • Identify the type of stress that a machine component is subjected to and calculate its intensive condition. • Calculate the strength of a connection for each case of stress. • Dimension fitting according to the application. • Design mechanical power transmission devices. • Predict possible failures in an assembly. • Recognize the usual elements that constitute the Mechanical assemblies and their subcategories. • Have the ability to select and dimension the appropriate element for each application. • Choose materials and processing of non-standard elements. • Establish a maintenance schedule for each item. • Predict possible failures in an assembly
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Decision making

- Teamwork
- Promoting free, creative and inductive thinking
- Exercise criticism
- Respect for the natural environment

(3) SYLLABUS

- Analysis of operation of simple mechanical constructions. Free body diagrams. Shape and friction connections. Determination of critical positions for calculating static and dynamic strength. Identification of critical calculation positions in wear. Technical strength of materials: Operating tensions, allowable tensions, notch tensions,
- Introduction to Dynamic Stress, calculation of dynamic endurance.
- Tolerances – Fittings
- Study, calculation and screw strength control.
- Study, calculation and welding resistance test. Welding configuration rules.
- Springs
- Elements of rotational motion, analysis of their main problems.
- Calculation of design and control of fuselages, rolling bearings and mounting principles. Shaft-hub connections.
- Rolling bearings
- Sliding Bearings
- Couplings - Clutches
- Lubrication, lubricants. Waterproofing.
- Calculation, study and testing of gears.
- Calculation, study and testing of belts.
- Study and design of complex mechanical constructions.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Laboratories • Assignments & Projects
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching and lecturing (slides of Power-point). • Use of the courses e-Class platform (Outline, Predicted Chart, Implemented Chart, Information for semester work, Lecture material - Notes and presentations). • Providing additional material on the courses e-Class and support of the learning process by providing notes with selected additional exercises and illustrated examples on the courses Ms-Teams platform.

<table>
<tr><td></td><td></td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Tutorials</td><td>13</td></tr>
<tr><td>Laboratory practice</td><td>26</td></tr>
<tr><td>Project elaboration</td><td>22</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>23</td></tr>
<tr><td>Non-guided personal study</td><td>40</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek

Description
Written exams, project evaluation

Student assessment methods
Written examination with short answer questions (Concluding)
Written exams/problem solving (Concluding)
Written assignment (Formative)

For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work, as well as in the elaboration and public presentation of the project (theoretical study). The final grade of the course consists of:

Final written examination in the entire course content (80%),
Semester project (20%)

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Fundamentals of Machine Elements, 3rd Edition, Steven R. Schmid, Bernard J. Hamrock, Bo. O. Jacobson, CRC Press, 2014
2. Analysis and Design of Machine Elements, Vijay Kumar Jadon, Suresh Verma, I. K. International Pvt Ltd, 2010
3. Fundamentals of Machine Component Design, R.C.Juvinall, K.M.Marshek: 2nd ed., John Wiley & Sons. Toronto

Statistics and Probabilities for Engineers

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering			
ACADEMIC UNIT	Industrial Design and Production Engineering			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	**4002**	**SEMESTER**	**4**	
COURSE TITLE	Statistics and Probabilities for Engineers			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**CREDITS**
		Lectures	3	3
		Laboratory	1	2
			4	**5**
COURSE TYPE	General background			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE178/			

(2) LEARNING OUTCOMES

Learning outcomes
The aim of the course is to introduce students to the basic principles of probability theory and statistics with emphasis on the use of new technologies (mainly with the use of appropriate software) in matters concerning and related to Management. Statistical tests and estimation are the predominant part of the material. Upon successful completion of the course the student must be able to: • Apply basic principles of probability theory. • Connect laws of probability with statistical inference. • Recognize the basic types of random variables and be able to record data in order to be able to process them. • Calculate and interpret descriptive measures. • Investigate the relationship between economic variables using correlation and regression techniques. • Apply descriptive statistics and regression methods using statistical packages. • Have understood the basic concepts of valuation with emphasis on the calculation of confidence spaces. • Perform statistical tests of average values and percentage for one and two samples and interpret the results. • Carry out a statistical X^2 test and interpret the results. • For the above there must be the corresponding familiarity with appropriate software through the laboratory part of the course.

General Competences
• Search for, analysis and synthesis of data and information, with the use of the necessary technology • Decision-making • Working independently • Production of free, creative and inductive thinking

(3) **SYLLABUS**

Laplace probability definition with applications.
Random variables.
Probability and distribution functions.
Basic discrete variables (binomial, geometric Poisson).
Continuous random variables and probability distributions (normal and uniform).
Central Limit Theorem.
Correlation of two variables.
Simple linear regression.
Study of good adaptation of a statistical model through residual.
Sampling data, sampling methods.
Descriptive statistics of primary data.
Descriptive statistics of grouped data.
Internship using a statistical package in the laboratory.
Point estimators.
Confidence interval.
Hypothesis tests of average prices and percentages.
X^2 check.
Use of statistical packages.

(4) **TEACHING and LEARNING METHODS - EVALUATION**

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY</td><td>Specialized Software (SPSS, Envi).
Learning process support through the electronic platform e - class.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Practical applications</td><td>13</td></tr>
<tr><td>Laboratory Exercises</td><td>26</td></tr>
<tr><td>Individual study</td><td>72</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of assessment: Greek (English for ERASMUS students upon request).
Written final exam (60%) (Concluding) which includes:
- Multiple choice or right-wrong questions.
- Short-Answer Questions.
<u>Purpose of assessment:</u> The test of understanding the basic elements of the course.
<u>Evaluation criteria:</u> The correctness, completeness,</td></tr>
</table>

	clarity and critical evaluation of the answers. **II. Multiple Choice Test** (10%) (Formative): It concerns the topics covered by the theoretical lectures. Purpose of evaluation: The control of the course of the students in relation to the educational objectives, feedback and possible modification of the teaching (fine tuning). Evaluation criteria: The correctness, completeness and clarity of the answers. **III. Laboratory Exercises** (30%) (Concluding): It concerns the topics covered by the laboratory courses. Purpose of evaluation: The control of the course of the students in relation to the educational objectives, feedback and possible modification of the teaching (fine tuning). Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. The evaluation criteria are explicitly mentioned on the course site and for each evaluation action.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

1. Παπαγεωργίου Ε., Χαλικιάς Μ. Πιθανότητες και Στατιστική για μηχανικούς με χρήση SPSS και MATLAB εκδόσεις BROKEN hill, Αθήνα. 2020.
2. Ζιούτας Γ. Πιθανότητες και Στοιχεία Στατιστικής για Μηχανικούς, Εκδόσεις Ζήτη, Θεσσαλονίκη 2003.
3. Καμαρινόπουλος Λ., Στοιχεία Πιθανοθεωρίας, Εκδόσεις Ζήτη, Θεσσαλονίκη 1996.
4. Δαμιανού Χ., Παπαδάτος Ν., Χαραλαμπίδης Χ. Εισαγωγή στις πιθανότητες και τη στατιστική, Εκδόσεις Συμμετρία, Αθήνα 2010.
5. Χαλικιάς Μ. Επαγωγική Στατιστική, Εκδόσεις Σύγχρονη Εκδοτική, 2012.
6. Ζαχαροπούλου, Χ. Στατιστική Μέθοδοι και Εφαρμογές, Εκδόσεις Ζυγός, δεύτερη έκδοση, Θεσσαλονίκη 2001.
7. Κίτσος Χ. Τεχνολογικά μαθηματικά και στατιστική, Εκδόσεις Νέων Τεχνολογιών, Αθήνα 2009.
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9. Κατωπόδη, Αλεξανδρόπουλου, Πρεζεράκου, Παλιατσού. Στατιστική. Σύγχρονη Εκδοτική, 1994.
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11. Κουνιάς Σ., Μωυσιάδης Χ. Πιθανότητες Ι, Εκδόσεις Ζήτη, Θεσσαλονίκη 1995.
12. Κούτρας Μ., Ευαγγελάρας Χ. Ανάλυση Παλινδρόμησης, Εκδόσεις Συμμετρία, Αθήνα 2011.
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14. Johnson R.A., Bhattacharyya G.K., Statistics: Principles and Methods. John Wiley and Sons, 2001.
15. Montgomery D. C., Peck E. A., Vining G. G., Introduction to Linear Regression Analysis,

3rd ed., Wiley-Interscience, 2001.
16. Bickel P.J., Doksum K. A. Mathematical Statistics, Volume 1, Basic Ideas and Selected Topics, 2rd ed. Prentice Hall, 2001.
17. Casella G., Berger R. L., Statistical Inference, 2nd ed., Duxbury Press, 2001.
18. Hogg R. V., Craig A. T., McKean J. W., An Introduction to Mathematical Statistics, 6th ed., Prentice Hall, 2004.
19. Landow, S. and Everitt, B. A., Handbook of Statistical Analyses Using SPSS, Chapman and Hall/CRC Press Company, New York, Washington 2004.
20. Norusis Marija, Οδηγός ανάλυσης δεδομένων με το IBM SPSS 19 για Windows, Εκδόσεις Κλειδάριθμος, Αθήνα 2012.
21. Mood A. M., Graybill F. A., Boes D. C., Introduction to the Theory of Statistics. McGraw-Hill Series in Probability and Statistics. McGraw-Hill 2002.

Supply Chain Management

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**4003**	**SEMESTER**	**4**	
COURSE TITLE:	Supply Chain Management			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)/Practice exercises			**4**	**5**
COURSE TYPE:	Specialised general knowledge, skill development			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE126/			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will have knowledge about the subject of Logistics, as they have been taught the following: 1. Definition, meaning of Logistics principles and actions. 2. Logistics data in Greece and worldwide. 3. Supply Chain Management. 4. Supply Chain parts. 5. Logistics and Supply Chain functions and differences between them. 6. Modern business environment and the role of the supply chain. 7. Shopping Organization

8. Stocks and Inventory Management
9. Transport and Storage.
10. Distribution principles.
11. Design of a distribution channel and their problems.
12. Logistics and Supply Chain in a business
13. Costumer service and marketing connection with Logistics
14. Costumer service policy and costumer-focused suppler chains.
15. Performance and level of service control
16. Logistics and environment
17. Green Logistics - Green Supply and application on the supply chain
18. Reverse Logistics
19. Targets, actions and objectives of Reverse Logistics
20. Cost principles and Logistics and cost sharing at key points
21. Costing Systems and Analysis
22. Logistics innovations and Business Outsourcing for service delivery

General Competences

The general skills that the student will develop in the course, include a full understanding of the concepts and the operation of this constantly evolving and quite protagonist branch, especially in the last 10 years. As the two concepts, Logistics and Supply Chain are now separated from the simple processes of a company and tend to play a leading role, the student will be able to make full and correct use of their potential and lead to significant calculable financial operational and quality results.
The aim of the course is to highlight the individual issues concerning logistics companies and how they are shaped in the modern international business environment. More specifically, the student will be trained for the unifying role of Logistics and the Supply Chain within the company, both for the Greek data and for the modern global environment, will be able to design the basic functions of a Logistics system and will have active role in businesses and organisations and in the marketing sector, especially in customer service. In addition to the learning outcomes are included the active participation of the graduate in issues related to the environment and energy development, costs and new costing systems which result from the basic and non-functions of the Supply Chain.

(3) SYLLABUS

The content of the course Supply Systems Design (Logistics) are provided categorised below:

1. Competitive advantage of Logistics and the supply chain
2. Definitions and concepts
3. The structure of the supply chain
4. Flow of materials and informations
5. The value and cost of Logistics
6. Strengthening the activities of Logistics
7. The axes and effects of internationalisation on Logistics
8. From geographical internationalisation to product segmentation
9. Centrally controlled stocks
10. Tolerance time management
11. Supply chain design and control
12. In-house planning and control
13. Dealing with poor coordination in supply chains
14. Flexible supply chain
15. The forms of unnecessary costs
16. Completion of the supply chain

17. Collaborations in the supply chain
18. Supplier Management
19. Synchronized production
20. Procurement and supply management
21. Future challenges and opportunities in Logistics

Additionally, in the exercises-practices of the course in a laboratory environment, supply chain simulation and inventory control software will be used, which will contribute positively to the creation of a complete perception of the graduate about the subject of the course. wireless communication utilising LoRaWAN standards, data collection, process, and analysis in edge-computing environments and sensor set-up and operation in simulated test conditions.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face
• Lectures
• Practice exercises</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching se of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Exercise practices</td><td>26</td></tr>
<tr><td>Project-based assignments</td><td>36</td></tr>
<tr><td>Non-guided personal study</td><td>49</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
• Written Exam that includes short answer questions and problem solving : 100%
• Optional mid-term evaluation that includes short answer questions and problem solving : 20%
Optional work pension and presentation up to a percentage, deducted from the percentage of the written examination : 40% The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class</td></tr>
</table>

	platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Alan Harrison and Remko van Hock *Logistics – Management & Strategy* Rosili Publications, 2013

Data collection and Analysis

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**4004**	**SEMESTER**	**4**
COURSE TITLE:	Data collection and Analysis		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	4
Laboratory		1	1
		4	**5**
COURSE TYPE:	Specialised general knowledge		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE139/		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will have: 1. Thorough knowledge and excellent understanding of the theory and principles of Data Acquisition Systems and Sensors as well as the methods of their design and application in existing systems. 2. Knowledge and skill in the analysis of data acquisition Systems application needs, the design, organization, implementation, programming and operation of Data Collection Systems in the requested application. 3. Knowledge and skills of composition, construction, programming, maintenance, operation supervision, debugging and repair of Data Collection and Sensor Systems. In detail, students will be able to: 1. Describe, identify parts and functions, and specify Data acquisition and Sensors Systems

2. To explain the operation of Data acquisition and Sensor Systems, to evaluate their performance and to calculate their operating parameters, as well as to prepare a study of installation needs of Data Acquisition Systems.
3. Design, develop, build, program, maintain, oversee operation, debug and repair Data Acquisitions Systems.
4. To know and apply regulations and recommendations related to social / professional ethics and environmental protection.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Teamwork
- Working in an international environment
- Work in an interdisciplinary environment
- Production of new research ideas
- Project Management
- Promoting free, creative and inductive thinking

(3) SYLLABUS

1. Signals, measurements, measurement and control systems
2. Signal sampling
3. Amplifiers
4. Filters
5. Receiving and arranging signals,
6. Sensors, analog signal processing
7. Convert analog to digital signals
8. Interconnection of measurement systems
9. Information and noise
10. Telemetry systems
11. Computer networks / measurement and control systems
12. System specifications and reliability
13. Implementation of measurement and control systems

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Laboratories
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	39

	Laboratory work	13
	Journal/paper reading & theoretical study	23
	Non-guided personal study	75
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Description** Written exams, laboratory evaluation **Student assessment methods** The final grade of the course consists of: • Final written examination in the entire course content (70%), • Laboratory projects assessment (30%) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Data Acquisition's Systems, Tseles D, Modern Publications LTD
2. Data Acquisition's Systems Applications, Piromali D, Tseles D. Modern Publications LTD.
3. LabView. kALOVREKTIS K., TZIOLAS PUBLICATION

Differential Equations

COURSE OUTLINE

(1) **GENERAL**

SCHOOL	Engineering			
ACADEMIC UNIT	Industrial Design and Production Engineering			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	**4005**	**SEMESTER**	**4**	
COURSE TITLE	Differential Equations			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures			3	3
Exercises/Tutorials			1	2
			4	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE298/

(2) **LEARNING OUTCOMES**

Learning outcomes
The aim of the course is the familiarity with the use and solution of differential equations so that students can use them in modeling problems in the specialty of Engineer. Upon successful completion of the course, students: • will have understood basic mathematical concepts and the methodology of solving first and higher order differential equations, differential equation systems as well as the use of Fourier series • will be able to utilize differential equations and model problems of their specialty, solve them and draw conclusions • will be able to connect the mathematical methodologies taught and apply the acquired knowledge in the subject of Engineering, in general will be able to apply all of the above in other thematic areas of the specialty of Engineer • will use the Matlab software environment to implement the course methods and algorithms.
General Competences
• Criticism and self-criticism. • Mathematical thinking and analysis. • Mathematical and analytical presentation of geometrical concepts. • Search for, analysis and synthesis of data. • Working independently. • Production of free, creative and inductive thinking.

(3) **SYLLABUS**

- **Basic concepts.** Classification of differential equations. Solution of differential equation (partial and general). Initial and boundary value problems. Well placed problem. Introduction to the modeling of simple physical problems with differential equations.
- **Ordinary First Order Differential Equations.** Classification and methods of solution. Separate variables. Linear. Homogenous. Complete. Integration factors. Bernoulli. Ricatti. Applications in problems of the Engineer's specialty.
- **Upper order linear differential equations with constant or variable coefficients.** Definitions. Wronsky Determinant. Solving methods. Homogenous solution. General solution of the linear differential equation. Method of determining the coefficients. Lagrange method of parameter change. Euler equation. Class demotion method. ODE systems. Initial values problems and applications in engineering and electricity.
- **Solution of differential equations using power series.** Regular and irregular (special) points. Existence of analytical solutions. Development of a solution in ordinary and normally specific points.
- Systems of linear differential equations, matrix method.
- **Laplace Transformation.** Definition, properties and inversion. Application in solving linear differential equations and systems of differential equations with constant coefficients. Evolution and applications.
- **Bessel and Legendre equations.** Gamma Functions, δ-Dirac.
- **Differential equations with partial derivatives.** 1st order PDE. 2nd order PDE (elliptical, parabolic, hyperbolic). Method of separation of variables. Laplace and Poisson boundary value problems. Initial-boundary value problems for the diffusion and wave equations. Applications in engineering.
- **Fourier series.** Dirichlet conditions. Parseval identity. Applications of the Fourier series.
- **Complex Functions** and their applications.
- **Applications using Matlab software.** Directional fields and integral ODE curves in Matlab. Matlab ODE Solvers (ODE Suite). Functions for ODE. Euler method. Runge-Kutta Method. Solution of 1st order ODE system. Solution of higher order ODE. Linearization. Numerical solution of ODE (direct and repetitive). Time-stepping methods. Convergence class investigation.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY	Communication with students through the platform with emails & announcements on the course's website (e-class). Powerpoint display with projector and laptop. Demonstration of modern mathematical software (Matlab, Mathematica, Wolfram Alpha) on the taught subjects. Announcement of course notes in electronic form on the course's website (e-class). Referral to websites with related applications (Desmos, Maxima, Geogebra). Utilization of the computer laboratory of the Department.

<table>
<tr><td></td><td colspan="2">Possibility of examinations through the tool of Exercises in e-class.</td></tr>
<tr><td>TEACHING METHODS</td><td colspan="2"><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Study of theory and examples</td><td>39</td></tr>
<tr><td>Individual study</td><td>72</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td colspan="2">Language of assessment: Greek (English for ERASMUS students upon request).

Students are assessed through a written examination, which includes short-answer questions and problem solving. There is a possibility for an intermediate examination in the middle of the semester.

Delivery of assignments and written/oral examination in the Tutorials (20%).

Students with learning difficulties are examined in accordance with article 37 of the Internal Regulations of the UNIWA.

The evaluation criteria have been presented to the students before the final examination and the individual grade of the subjects is written in them. Students can see their writing and their individual grades in the topics, as well as receive clarifications about them after pointing out any mistakes.</td></tr>
</table>

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

- Σεραφειμίδης Κ., 2009, Διαφορικές Εξισώσεις, Εκδόσεις Σοφία.
- Σταυρακάκης Ν., 2017, Διαφορικές Εξισώσεις: Συνήθεις και Μερικές. Θεωρία και Εφαρμογές από τη Φύση και τη Ζωή, Εκδότης: Τσότρας Αθανάσιος.
- W.E. Boyce, R.C. Di Prima, 2015, Στοιχειώδεις διαφορικές εξισώσεις και προβλήματα συνοριακών τιμών, εκδόσεις ΕΜΠ.
- Τραχανάς Σ., 2008, Συνήθεις διαφορικές εξισώσεις, ΙΤΕ-Πανεπιστημιακές εκδόσεις Κρήτης.
- Γεωργούδης Ιωάννης, Μακρυγιάννης Αριστείδης, Πρεζεράκος Νικόλαος, 2016, Μαθηματικά για Μηχανικούς, Εκδότης: Σύγχρονη εκδοτική ΕΠΕ.
- Χαλιδιάς Ν., 2021, Εφαρμοσμένα Μαθηματικά για Οικονομολόγους και Μαθηματικούς, Broken Hill Publishers.
- Richard Bronson, 1978, Εισαγωγή στις Διαφορικές Εξισώσεις, ΕΣΠΙ εκδοτική.
- Spiegel Murrey, 1978, Ανάλυση Fourier, ΕΣΠΙ εκδοτική.
- Goodwine B. , 2011, Engineering Differential Equations, Springer.
- Kalbaugh David V., 2017, Differential Equations for Engineers: The Essentials, CRC Press.
- Kreyszig E., 2005, Advanced Engineering Mathematics, 9th edition, Wiley.
- Glyn, J. et al., 2010, Advanced Modern Engineering Mathematics, 4th edition, Addison-Wesley Pub. Co.
- Wylie C.R. and Barrett L.C., 1995, Advanced Engineering Mathematics, 6th edition, McGraw-Hill.

- Zill D.G. and Cullen M.R., 2006, Advanced Engineering Mathematics, 3rd edition, Jones & Bartlett Pub.

Ergonomic Analysis and Design

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	4006	**SEMESTER**	4
COURSE TITLE	Ergonomic Analysis And Design		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Various teaching methods	4	5
Lectures, Laboratory and Practice Exercises		

COURSE TYPE	Special background/Compulsory
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

Upon completion of the course, students will have:
• Adequate understanding of basic relevant concepts such as ergonomic design, human-machine system and human-computer system, human reliability and efficiency, usability, cognitive representation, decision-making mechanism.
• Acceptance of the necessity of ergonomic work planning.
• Ability to compile an Ergonomic Design Study of workplaces and jobs
• Ability to use and utilize electronic applications related to ergonomics.
• Ability to distinguish the required elements of ergonomic design, as well as the relevant interventions to improve employee health and work efficiency
• Ability to formulate the relevant specifications and evaluate the adequacy and effectiveness of ergonomic interventions.
• Skills of measuring factors related to ergonomics (mental and muscle strain, work environment), processing measurements to draw conclusions and making decisions about how to reduce the consequences of these factors.

General Competences
Search, analysis and synthesis of data and information, using the necessary technologies *Production of free, creative and inductive thinking* *Decision-making* *Working independently* *Teamwork* *Respect for difference and multiculturalism* *Showing social, professional and ethical responsibility and* sensitivity to gender issues

(3) **SYLLABUS**

- Overview of ergonomic model. Ergonomic work methods analysis, human reliability analysis
- Ergonomic design of workplaces and equipment. Anthropometry and job design
- Physical or muscular work - planning to reduce physical load. Temperature control (optimum temperature) - risks, measurement and measures for prevention / reduction of risks.
- Hearing and sound environment - risks, measurement and measures for prevention / reduction of risks.
- Vision and lighting - rules of natural and artificial lighting.
- Time and work (biological rhythms, night work and alternating working hours, aging)
- Mental models of attention and memory, design of skills to support mental work, modern trends in work organization, human information processing, decision making
- Electronic ergonomics applications

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in teaching, laboratory education, communication with students. Support of Teaching/Learning process through the electronic platform e-class
TEACHING METHODS	

Activity	***Semester workload***
Lectures	36
Laboratory practice	26
Independent Study	88
Course total	150

STUDENT PERFORMANCE EVALUATION	**I. Written final exam** (60%) (Inductive) which includes: - Multiple choice or right/wrong questions - Short-Answer Questions Purpose of evaluation: The comprehension test of the basic elements of the course. Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. **II. Laboratory Exercises** (40%) (Inductive): It concerns the topics covered by the laboratory courses Purpose of evaluation: The control of the students' progress in relation to the educational objectives, feedback and possible modification of the teaching (fine tuning). Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. The evaluation criteria are explicitly mentioned on the course site and for each evaluation action.

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

In Greek:

- Μαρμαράς, Ν., Ναθαναήλ, Δ., 2015. *Εισαγωγή στην εργονομία*. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών.
- Λάιος Λάμπρος, Γιαννακούρου-Σιουτάρη Μαρία Σύγχρονη Εργονομία, εκδόσεις Παπασωτηρίου, 2003
- Jeremy Stranks, Μάνατζμεντ Ασφάλειας και Υγείας των εργαζομένων, Εκδόσεις Rosili

In English:

- Waldemar Karwowski, Marcelo Soares, Neville A. Stanton (ed), Handbook of Human Factors and Ergonomics in Consumer Product Design, 2 Volume Set, Routledge edition, , 2011
- Marcelo M. Soares, Francisco Rebelo Ergonomics in Design Methods and Techniques, CRC Press, 2017
- Jeremy Raskin, the human interface, Addison Wesley, 2005
- Nathanael, D. & Marmaras, N. Work practices and prescription: a key issue for organizational resilience. In Remaining Sensitive to the Possibility of Failure. E. Hollnagel, C. Nemeth, S. Dekker (eds). Hampshire: Ashgate
- Jens Rasmussen, Annelise Mark Pejtersen, L. P. Goodstein, Cognitive Systems Engineering, Wiley, 1994

5th SEMESTER

Design of Industrial Actuation Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**5001**	**SEMESTER**	**5**
COURSE TITLE:	Design of Industrial Actuation Systems		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	3	3
Laboratory	1	2
	4	**5**

COURSE TYPE:	Specialised general knowledge, skill development
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE

(2) LEARNING OUTCOMES

Learning Outcomes

Upon completion of the course students will have the ability to:

1. Make the appropriate selection of electronic and mechanical components to implement the required application as well as to select the appropriate test method in order to successfully complete its design.
2. Describes all the individual electrical, hydraulic and pneumatic components and modules.
3. Defines the process of composition, operation, and requirements of such systems which are fundamental parts of a factory and industrial unit.
4. Implements designs and compositions of integrated systems.
5. Dimension, design and develop in practice an application that will be assigned to him which will bring together the concept of control of linear and rotary motion systems such as a transmission line, a packaging process in an industrial environment, etc.
6. Solves computational and numerical problems of power and force management of fluids as well as problems of sizing of materials and components.
7. Distinguish all the technical characteristics and design needs of random complex or non-random applications, which will help the student to form a strong knowledge environment around the subject of control of Electrical, Hydraulic, and Pneumatic Systems.

General Competences

The general skills that the student will develop can be summarized as follow:

- Search, analysis, and synthesis of data and information using the necessary technologies and especially: Study of needs of a given application of a hydraulic or pneumatic system, dimensioning of application and selection of appropriate components for its implementation.
- Adaptation to new situations: Redesign and repositioning of hydraulic and pneumatic components in different environments, industrial and non-industrial, with the evaluation of new operating parameters.
- Autonomous work: Knowledge of safety regulations, operation, and taking initiatives in real-time.
- Teamwork: Ability to dialogue and necessarily develop skills to join working groups as well as the division of roles within these groups.
- Working in an international environment: Communicative ability in international languages, respect for diversity, multiculturalism, the environment, and demonstration of professional and ethical responsibility.
- Production of new research ideas: Promotion of free, creative, and inductive thinking for the development of new or alternative methods of implementing hydraulic and pneumatic systems in random applications.

(3) SYLLABUS

The content of the course Electrical, Hydraulic and Pneumatic Automatic Control System is based on basic principles and structural elements of electrical, hydraulic, and pneumatic automation, pneumatic and hydraulic diagrams, DIN-ISO standardization, drive and control circuits, hydraulic power generation units, complex pneumatic and hydraulic circuits for industrial applications.

Rotary and linear drive systems are one of the key components of modern technological devices and installations, not only in the purely industrial sector but also in agricultural production, transport, the environment, and many other areas of application. Therefore, the control of the drive systems, so that the drive systems operate safely and efficiently, is one of the most important and widespread areas of responsibility of the graduate of the Department. The course provides a detailed description and demonstration of technologies based on the transfer of energy through Electrical and Hydraulic-Pneumatic systems, refers to the importance of the development of automation, and the comparison of motion and control technologies as well as hydraulic and pneumatic production units. The course aims to develop in students the basic knowledge and skills required for this role, with emphasis on the ability to perceive and evaluate relevant technologies and methods.

The contents and outline of the course material are summarized as follows:
1. Static and Dynamic Description of Mechanical Movement, characteristics and curves of torque, and performance of driving devices, equilibrium point finding study.
2. Load-Engine link, description of the concept of transmission, gearbox with mathematical calculations of the relations that determine the gear ratio, study of losses
3. Drive systems and Applications, conveyor belts, conveyors, lifting systems, multiplication or multiplication of process execution speed, packaging, and storage systems and their maintenance.
4. Engines, description of the structure and functional characteristics of electric, hydraulic and pneumatic motors, separation of synchronous-asynchronous motors, and deepening in the way of selecting the appropriate motor for the respective application with emphasis on the advantages and disadvantages of each motor.
5. Adjustment and Power supply devices, power supply circuits for electric motors,

rectifiers, and power management devices.
6. Analysis of basic Pneumatic structural elements, reference to the necessary theoretical knowledge to understand their design and operation.
7. Analysis in the process of controlling Pneumatic systems with a description of all available technologies
8. Design and analysis of all basic Hydraulic components and circuits.
9. Analysis of the operation and assembly of random hydraulic circuits, description of symbols according to ISO, for the transport of fluids and modules.
10. Presentation of the Pneumatic Programmer, explanation of symbols and its implementation, programmable logic controllers, and methodologies for programming piston motion correlations
11. Analysis of complex automation systems, visualization of related movements, and examples of them.
12. Study and demonstration of special systems of pneumatic automation.
13. Alternative methodologies for compiling diagrams of Hydraulic and Pneumatic systems
14. Electropneumatically advanced circuits and applications in modern industries
15. Motion Control Systems, conventional three-term control methods and combinations thereof, introduction of microprocessors in drive systems and creation of closed and open-loop control, study of motion sensors with analog and digital signals, and additional introduction to modern intelligent control methods.

In laboratory applications or exercises-operations, the following are implemented:
1. Introduction to relays
2. Simple movement: operation and stop, start, stop and step, motor protection. simple movements in the electro-hydraulic system
3. Regression in the electro-hydraulic system and combined movements in the electro-hydraulic system
4. Time-controlled motion, and reciprocating piston motion control
5. Counting movements with relays and movements controlled by double-time relay
6. Static characteristic of a rotary hydraulic motor
7. Dynamic response electro-hydraulic rotary drive system
8. Determination of a DC electric motor drum's circuit components
9. Determination of the electric motor characteristic of switchable electricity and determination of the load's characteristic
10. Adjustment of an electric motor's speed with pulse width modulation
11. Dual-action pneumatic piston movement, increase-decrease dual-action pneumatic piston speed, increase-decrease power.
12. Increase-Decrease the speed of the dual-action pneumatic piston in both directions
13. Associated motion of continuously operated pistons
14. Piston regression with a stop in a random position
15. Transmission station automation with hydraulic piston control and differential speed hydraulic piston circuit control

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Laboratories
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Teaching using ICT with free or open-source software, audiovisual material and multimedia applications for Laboratory training, electronic communication and submission of works, use of Moodle LMS for asynchronous distance learning (open academic courses).

<table>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>25</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>23</td></tr>
<tr><td>Non-guided personal study</td><td>50</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
• Written examination with short answer questions (Concluding)
• Written exams with multiple choice questions (Concluding)
• Written assignment (Formative)
• Laboratory/project work (Formative)

The final grade of the course consists of:
• Written Exam that includes short answer questions and problem solving: 100%
• Optional mid-term evaluation including short answer questions and problem solving: 20%
Optional work pension and presentation up to a percentage, minus the percentage of the written exam: 40%The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. “Electric movement", Malatestas Pan., Tziola publications 2010, ISBN: 978-960-418-251-0
2. "Motion Control", Mich. Papoutsidakis, Theory Notes, 2011, http://islab.teipir.gr “Hydraulic & Pneumatic SAE ", Mich. Papoutsidakis, Theory Notes, 2011, http://islab.teipir.gr

OPTIMIZATION METHODS

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	5002	**SEMESTER**	5	
COURSE TITLE	OPTIMIZATION METHODS			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Tutorials			4	5
COURSE TYPE	General background			
PREREQUISITE COURSES:	NO			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE119/			

(2) LEARNING OUTCOMES

Learning outcomes
Upon completion of the course, students will have: 1. Knowledge and ability to describe optimization problems. 2. Knowledge and skills in applying mathematical models to formulate and analyze an optimization problem. 3. Ability to solve optimization problems by selecting the appropriate algorithm. In detail, students will be able to: 1. Describe the main types of optimization problems. 2. To formulate optimization problems with the help of mathematical models and to determine their complexity. 3. Explain the design and principles on which efficient optimization solutions are based. 4. Use the available software to solve optimization problems.

General Competences

- *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.*
- *Criticism and self-criticism.*
- *Production of free, creative and inductive thinking.*

(3) **SYLLABUS**

- Introduction to problem optimization, formulation and mathematical modeling.
- Introduction to Linear Programming, graphical solution, Simplex method, dual problem and Sensitivity Analysis.
- Introduction to Integer Linear Programming, Branch-and-Bound method.
- Graph Theory and Network Models, Minimum Spanning Tree Problem, Optimal Path Problems, Maximum Flow Problems.
- Transfer, transshipment and assignment problems.
- Applications in product production and inventory management, tool replacement and load optimization.

(4) **TEACHING and LEARNING METHODS - EVALUATION**

<table>
<tr><td>DELIVERY
.</td><td>Face-to-face (Lectures) and distance learning (Tutorials).</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>ICT is used in teaching, works submission and for communicating with students.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>100</td></tr>
<tr><td>Tutorials</td><td>30</td></tr>
<tr><td>Study & analysis of bibliography</td><td>20</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment: Greek

Assessment Methods:
• Written Exam (Multiple Choice Test, Short-Answer Questions, Essay Development Questions): 80%
• Exercises (Problem Solving): 20%

Assessment criteria:
• Accurate modeling of the problem.
• Selection and correct use of the most appropriate solution method.
• Finding the optimal solution.</td></tr>
</table>

	The criteria are accessible on the course website (URL).

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

1. Κολέτσος Ι., Στογιάννης Δ., «Επιχειρησιακή Έρευνα: θεωρία, αλγόριθμοι & εφαρμογές» (1η Έκδοση), Εκδόσεις Συμεών, Αθήνα 2021. Κωδ. Εύδ.: 94645784.
2. D.R. Anderson, D.J. Sweeney, T.A. Williams, K. Martin, «Διοικητική Επιστήμη – Ποσοτικές μέθοδοι για τη λήψη επιχειρηματικών αποφάσεων», Εκδόσεις Κριτική, Αθήνα 2014. Κωδ. Εύδ.: 41955482.
3. Bernard W. Taylor III, «Εισαγωγή στη Διοικητική Επιστήμη», Εκδόσεις Π.Χ. Πασχαλίδης & Broken Hill, Λευκωσία 2018. Κωδ. Εύδ.: 68373102.
4. Hamdy A. Taha, «Εισαγωγή στην Επιχειρησιακή Έρευνα» (10η Έκδοση), Εκδόσεις Τζιόλα, Θεσσαλονίκη 2019. Κωδ. Εύδ.: 59415056.

- Related academic journals:

1. International Journal of Applied Optimization Studies.
2. International Journal of Operations Research.
3. Quantitative Economics and Management Studies.
4. Journal of Applied Management and Advanced Research.
5. Journal of Applied Research on Industrial Engineering.
6. Journal of Business Administration Research.

Production Technology II

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**5003**	**SEMESTER**	**5**
COURSE TITLE:	Production Technology II		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		2	2.5
Laboratory		2	2.5
		4	**5**
COURSE TYPE:	General Background		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE185		

(2) LEARNING OUTCOMES

Learning Outcomes

Upon successful completion of the course students are expected to:

1. Thoroughly know and comprehend the theories of production, the laws of production kinetics, design of production, the machinery manufacturing principles, the production processes.
2. Apply procedures and control of production, analyze performance, optimization and modeling of processes and quality assurance.
3. Develop and evaluate production methods, maintenance, repair and adjustment of production and analytical equipment, patterns and specifications of production technology.

Specifically, students will be able to:

1. Describe and identify the production techniques, recognize the materials and reagents, select structures and equipment.
2. Assess the production parameters, composition and quality of products.
3. Compute the operational factors of production, examine the application of analytical methods.
4. Combine traditional processes and modern advanced processes of production, design quality systems, develop production processes, differentiate the quality specifications.
5. Develop new management strategies, organize the production quality control, revise procedures of quality certification.
6. Compare products and quality characteristics, evaluate their performance, support their proper application.
7. Respect for the working and natural environment.

General Competences

1. Search for, analysis and synthesis of data and information with the use of the necessary technology; project planning and management.
2. Adapting to new situations.
3. Decision making, by combining and use of scientific principles.
4. Team working, showing social sensitivity, professional and ethical responsibility, ability to criticism and self-criticism.
5. Generation of new research ideas with free, creative, inductive thinking.

(3) SYLLABUS

Polymer materials: microstructure, properties, physical properties. Mechanical properties of polymers (elastic behavior, fracture, viscoelasticity, creep, abrasion–wear, stress relaxation). Analysis of production technologies – processing of thermoplastic polymers (extrusion, injection molding, chemical reaction and injection, blowing, thermoforming, rolling, spinning, compression and sintering). Analysis of production technologies – processing of thermosetting polymers and elastomers (compression casting, transfer casting). Analysis of production technologies – foam polymers. Ceramics and Glasses: structure, classification, physical–mechanical properties. Analysis of production technologies – processing of ceramics. Analysis of production technologies – processing of glasses. Fiber-reinforced composites – classification, mechanical behavior, processing. Composites with particle reinforcement – classification, mechanical behavior, processing.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face
• Lectures
• Laboratories</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching se of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory work</td><td>26</td></tr>
<tr><td>Project-based assignments</td><td>18</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>20</td></tr>
<tr><td>Non-guided personal study</td><td>60</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation

Student assessment methods
The final grade of the course consists of:
• Final written examination in the entire course content (60%),
• Elaboration of laboratory-based projects/work (40%).
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

N. Hadjichristidis, A. Hirao, “Anionic Polymerization”, Springer, 2015.
P. Ghosh, “Fibre Science and Technology”, Tata McGraw-Hill Education, 2004.
J. E. McIntyre, The Textile Institute, “Synthetic Fibres: Nylon, Polyester, Acrylic, Polyolefin”, CRC Press, Manchester, 2005.
R. A. Charvat, “Coloring of Plastics: Fundamentals”, John Wiley and Sons, 2003.
A. Müller, “Coloring of Plastics: Fundamentals, Colorants, Preparations”, Hanser Verlag, 2003
J. W. S. Hearle, “High Performance Fibers”, Woodhead Publishing Ltd, 2004.
J. M. Hodgkinson, “Mechanical Testing of Advanced Fibre Composites”, Woodhead Publishing Ltd, 2000.
L. Tong, A. P. Mouritz, M. K. Bannister, “3D Fibre Reinforced Polymer Composites”, Elsevier, 2002.
B. D. Agarwal, L. J. Broutman, K. Chandrashekhara, “Analysis and Performance of Fiber Composites”, John Wiley and Sons, 2006.

P. K. Mallick, "Fiber-Reinforced Composites: Materials, Manufacturing, and Design", 3rd Edition, CRC Press, 2008.

Automatic Control Systems I

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**5004**	**SEMESTER**	**5**	
COURSE TITLE:	Automatic Control Systems I			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Lectures			2	3
Tutorial Exercises / Laboratory Practice			2	2
			4	**5**
COURSE TYPE:	Compulsory/ General background			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE110/			

(2) LEARNING OUTCOMES

Learning Outcomes
Having successfully completed the course, students will be capable of: • Defining a system, with respect to its structure, components and general operation, upon examination of a given application. • Deriving an accurate system model by means of standard mathematic and physical principles. • Analyzing and evaluating the contribution of each system component to the overall system operation using the system model derived (instead of carrying out experiments with the actual application) • Building upon conclusions drawn by the previous analysis for optimizing the overall system and evaluating effective control solutions.
General Competences
• Search for, analysis and synthesis of data and information, with the use of the necessary technology: The development of system models is based on the analysis and synthesis of operational data of the actual application using system modeling and representation methods. • Adapting to new situations: The ability of studying the operation of a given

application using its system model, helps the user to develop his/her ability of adapting to new requirements related to multiple operating environments and performance settings.

- Decision-making: The ability of monitoring and optimizing the system components based on a system model, helps to promote the user decision-making capabilities during the system design process.
- Working independently: The analysis and evaluation of a given application using system modeling techniques provides the student with a valuable theoretical tool for carrying out research and development tasks in an independent manner.
- Team working and working in an international environment: Studying and analyzing some state-of-the-art applications by means of system modeling and representation techniques is a strong plus for any student wishing to participate in multi-cultural, multi-ethnic product development teams both in Greece and abroad.
- Working in an interdisciplinary environment: Analyzing state-of-the-art interdisciplinary applications by means of system modeling and representation techniques helps developing the student's ability to communicate and work with team mates from various scientific fields.

(3) SYLLABUS

- The system definition, the concept of block diagram representations, some basic facts of open- and closed-loop representations and the objectives of (and prerequisites for) system control.
- Physics-based system modeling and representation in the time-domain.
- System modeling in the frequency-domain, Laplace transform, transfer function of open-loop and closed-loop systems and general rules for the derivation of transfer functions for applications with multiple subsystems.
- Time response of systems, part I: The concept of poles, zeros damping ratio and natural frequency, inverse Laplace transform, partial fraction expansion.
- Time response of systems, part II: Basic facts on the time response of first- and second-order systems'.
- Frequency-domain analysis of systems using Bode plots and their asymptotic approximations.
- Closed-loop proportional (-P) control of typical 1st and 2nd order systems.

4. TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td colspan="2">• Face-to-face lectures,
• Face-to-face laboratory exercises.
• Distance learning procedures for lecturing as well as distance training via simulated laboratory exercises used when required.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Tutorial Exercises</td><td>13</td></tr>
<tr><td>Laboratory Practice</td><td>13</td></tr>
<tr><td>Book/paper studying</td><td>20</td></tr>
<tr><td>Non-guided personal study</td><td>78</td></tr>
</table>
</td><td></td></tr>
</table>

	Total Contact Hours and Training	***150 (5 ECTS)***
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek/English (for ERASMUS students) **Description** • Written examination contributing to 60% of overall grade. • Mid-term exams and laboratory exercises contributing to 40% of overall grade. The assessment criteria are communicated at the beginning of the semester and are published in the announcement section of the e-Class platform course webpage.	

(4) ATTACHED BIBLIOGRAPHY

- Recommended Bibliography:

1. Dorf R. and Bishop R., Modern Control Systems, 12th ed, Prentice Hall, 2010.
2. Astrom K. J. and Murray R. M. Feedback Systems. Princeton University Press, ver 2.01b, 2009 available online http://www.cds.caltech.edu/~murray/books/AM05/pdf/am08-complete_22Feb09.pdf

OCCUPATIONAL SAFETY MANAGEMENT

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	5005	**SEMESTER**	5	
COURSE TITLE	Occupational Safety Management			
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**	
Various teaching methods		4	5	
		4	5	
COURSE TYPE	Special background/Compulsory			
PREREQUISITE COURSES:	None			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			

IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) **LEARNING OUTCOMES**

Learning outcomes
Upon completion of the course, students will have: • Adequate understanding of key relevant concepts such as work and living spaces, occupational safety, occupational accidents and occupational diseases, risks and accident prevention. Knowledge of the relevant legal framework and how to apply it, as well as understanding of the various reasons that require the prevention of accidents. • Ability to identify the individual harmful factors at work and their causes. • Ability to write an Occupational Risk Assessment Study • Ability to distinguish the required general means of protection and personal protective equipment (PPE), as well as the ability to formulate the relevant specifications and evaluate the adequacy and effectiveness of PPE. • Skills of measuring with the use of respective equipment of harmful factors, processing the measurements to draw conclusions and making decisions about how to reduce the consequences of these factors.

General Competences
Search, analysis and synthesis of data and information with the use of internet technologies and bibliographic research and networking. *Decision making, through the solution development and options for the elaboration of assigned tasks and exercises.* *Working independently, through the elaboration of individually performed tasks and exercises.* *Teamwork, through the elaboration of individually performed tasks and exercises.* *Project planning and management, through the undertaking and elaboration of integrated works (project).*

(3) **SYLLABUS**

- Concept of risk at work, Causes of accidents at work and occupational diseases and their investigation. Consequences of occupational accidents and diseases.
- Institutional framework on Occupational Safety and Health.
- Legislation and European Directives
- Occupational Safety and Health Management Systems.
- Identification and assessment of occupational risks.
- Ways to prevent the risk and reduce the consequences.
- Occupational Risk Assessment Study.
- Safety marking of workplaces.
- Sub-categories of risk-harmful factors: (a) machinery, (b) chemicals and dust, (c) radiation, (d) electricity, (e) fire and explosion, (f) noise and vibration, and (g) extreme or unsuitable environmental conditions.
- Description and analysis of the relevant risks.
- Choice of Personal Protective Equipment (PPE)
- Technical, economic and efficiency criteria.
- Protection of special categories of workers (pregnant women, nursing mothers, chronic patients, young people)
- Major Industrial Accidents, road transport of dangerous goods

(4) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in teaching, laboratory education, communication with students. Support of Teaching/Learning process through the electronic platform e-class and MS TEAMS	
TEACHING METHODS	***Activity***	***Semester workload***
	Lectures	39
	Laboratory practice	50
	interactive teaching	13
	Independent Study	28
	Course total	130

STUDENT PERFORMANCE EVALUATION	**I. Written final exam** (60%) (Inductive) which includes: - Multiple choice or right/wrong questions - Short-Answer Questions Purpose of evaluation: The comprehension test of the basic elements of the course. Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. **II. Laboratory Exercises** (40%) (Inductive): It concerns the topics covered by the laboratory courses Purpose of evaluation: The control of the students' progress in relation to the educational objectives, feedback and possible modification of the teaching (fine tuning). Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. The evaluation criteria are explicitly mentioned on the course site and for each evaluation action.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

In Greek:

- Θέματα υγείας και ασφάλειας της εργασίας για επιχειρήσεις β΄ κατηγορίας (αρθ. 2, Π.Δ. 294/1988), Εκδόσεις ΕΛΙΝΥΑΕ
- Σ. Μουρούτσος, Υγιεινή και Ασφάλεια στην εργασία, Εκδόσεις Τσότρας
- Jeremy Stranks, Μάνατζμεντ Ασφάλειας και Υγείας των εργαζομένων, Εκδόσεις Rosili
- Π. Αποστολάκης, Οργάνωση Εργαστηρίων και Πρόληψη Ατυχημάτων – Υγιεινή και Ασφάλεια Εργασίας (1994)
- Θ. Κουκουλάκη, Η Τυποποίηση σε Θέματα Υγείας και Ασφάλειας της Εργασίας, Εκδόσεις ΕΛΙΝΥΑΕ (1999)

In English:

- Introduction to Health and Safety at Work for the NEBOSH National General Certificate in Occupational Health and Safety, Phil Hughes MBE, Ed Ferrett, Published by Routledge, 2021Safety at Work,8th Ed., John Channing (ed), Published by Routledge, 2014

Thermodynamics

COURSE OUTLINE

(1) **GENERAL**

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**5006**	**SEMESTER**	**5**
COURSE TITLE	Thermodynamics		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHIN GHOURS	CREDITS
Theory (Lectures)	3	3
Tutorials/Problem solving	0.5	1
Laboratory	0.5	1
	4	**5**

COURSE TYPE	Specialised general knowledge
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE

(2) **LEARNING OUTCOMES**

Learning Outcomes

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

- Know the fundamental laws of thermodynamics
- Understand the thermodynamic properties that govern energy systems
- Solve simple thermodynamic problems
- Apply the laws of thermodynamics in solving energy problems
- Evaluate the performance of heat engines, refrigeration machines and heat pumps
- Analyse and calculate various thermodynamic quantities in energy systems

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Promoting liberal, creative and inductive/deductive thinking

(3) **SYLLABUS**

Thermodynamic systems, Thermodynamic properties, Thermodynamic equilibrium, Thermodynamic processes, Thermodynamic cycles, Energy, Work, Heat, Laws of ideal gases, Equation of state of ideal gases (Ideal gas Law), Equation of Van der Waals, Work of ideals gases, Properties of pure substance, Tables of thermodynamic properties, First Law of Thermodynamics, Equation of continuity, Specific Thermal Capacities, Joule - Thomson Coefficient, Second Law of Thermodynamics, Heat Engine, Cooling Engine, Heat Pump, Carnot Cycle, Pure substance Entropy, Mollier Diagram, T-dS Equations, Entropy of ideal gases, Clausius - Clapeyron Equation, Maxwell Equations, Thermal engine cycles (Otto, Diesel, Brayton, Rankine), Nozzle thermodynamic analysis.

(4) **TEACHING and LEARNING METHODS – EVALUATION**

DELIVERY	In-class face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform
TEACHING METHODS	

Method description / Activity	*Semester Workload*
Lectures	39
Tutorials	39

	Problem solving exercises	10
	Non-guided personal study	62
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek, English **Description** Written final exams **Student assessment methods** • Written examination with short answer questions (Concluding) • Written exams with multiple choice questions (Concluding) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.	

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

Νίκας, Π. Κ. (2011). Εφαρμοσμένη Θερμοδυναμική για Μηχανικούς. Leeder Enterprises.

Cengel & Boles. (2011). Θερμοδυναμική για Μηχανικούς (Μετάφραση). Τζιόλας.

Παπαϊωάννου, Α. (2007). Θερμοδυναμική (Βασικές αρχές και νόμοι-Καθαρές ουσίες). Τόμοι 1 & 2. Εκδόσεις Κοράλι.

Πολυζάκης, Α. (2013). Θερμοδυναμική και Προχωρημένη Θερμοδυναμική. Heat Cool Power.

Holman, J., P. (1988). Thermodynamics 4th Edition. NY. McGraw Hill Co.

Moran & Shapiro. (2006). Fundamentals of engineering Thermodynamics. J. Wiley & Sons

6th SEMESTER

INDUSTRIAL DESIGN I

COURSE: 6001 INDUSTRIAL DESIGN I

(1) GENERAL

SCHOOL:	Engineering			
DEPARTMENT:	Industrial Design and Production Engineering			
LEVEL OF STUDY:	Undergraduate			
COURSE UNIT CODE:	**6001**	**SEMESTER OF STUDY**	**6**	
COURSE TITLE:	Industrial Design I			
COURSEWORK BREAKDOWN			**TEACHING WEEKLY HOURS**	**ECTS Credits**
Various teaching methods			(2 THEORY +2 LABORATORY)	
			4	**5**
COURSE UNIT TYPE:			Scientific area course / specialization / skill development	
PREREQUISITES:	No			
LANGUAGE OF INSTRUCTION/EXAMS:	Greek			
COURSE DELIVERED TO ERASMUS STUDENTS	Yes			
COURSE WEB PAGE (URL)	https://eclass.uniwa.gr/courses/idpe			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will be able to: 1. Knowledge of aesthetics, functionality and technology according to the design specifications 2. Knowledge of product evaluation based on design specification 3. Basic knowledge of ergonomics and functionality 4. Basic knowledge of integrated product design and the various stages of the process In detail, students will be able to: 1. Understand and analyze the human activity of user group data in a given context of use in order to identify unmet needs 2. Utilize symbolism, conceptual content and cultural references in design 3. Compile a complete, detailed, organized and hierarchical list of specifications for product or system design summarizing all research findings 4. Apply activity observation and on-site research methodologies for the production of highly validated research prototypes
General Skills
• Search, analyze and synthesize data and information, using design tools • Adaptation to new situations: Evaluation • Decision Making: Synthesis of techniques for the solution of medium-sized complex projects. • Autonomous work: Knowledge of development tools and use • Teamwork: Ability to dialogue and collaborate to develop a new product and draft design specifications • Working in an international environment: Ability to look for solutions within the international community and ask for help. Communication skills in international languages, respect for diversity • Production of new research ideas: • Project design and management: Design of new projects with respect for the natural environment with ecological awareness and demonstration of social, professional and moral responsibility and sensitivity to gender issues • Exercise criticism and self-criticism • Promoting free, creative and inductive thinking • Aesthetic and functional analysis of products • Drafting design specifications • Creative capture of problematic situations • Morphological analysis and optimization of complex systems • Holistic picture of the product and systems development cycle • Support for collaboration between design / engineering teams • qualitative and quantitative Evaluation of the derivatives of the design process

(3) SYLLABUS

Industrial Product Design course I is an introduction to Industrial Product Design in design issues. The educational goal is the application of theoretical and practical knowledge gained by students, analyzing and evolving innovative and sustainable industrial products and systems. In this regard, professional practice and design theory are linked to a design process that emphasizes both the methodology and the quality of the final result.

The contents of the course include:

1. What is industrial product design?
2. Documentation of industrial design through the history of design.
3. The role of the industrial designer
4. Requirements - Industrial Product Design Guidelines and Methods
5. Introductory elements of ergonomics and product functionality.
6. Techniques and tools for developing ideas and industrial solutions.
7. Aesthetic, functional and technology applications according to design specifications.
8. Methods of activity observation and field research for the production of highly validated research prototypes.
9. Symbolism, conceptual content and cultural references in design.
10. Methods of evaluation and development of ideas and design solutions.
11. Solve complex problems of industrial design with multiple solutions.

(4) TEACHING METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING ORGANISATION</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>72</td></tr>
<tr><td>Laboratory work</td><td>36</td></tr>
<tr><td>Personal study</td><td>42</td></tr>
<tr><td>Total Contact Hours and Training (30h/ECTS)</td><td>150 (5 ECTS)</td></tr>
</table>
</td></tr>
<tr><td>ASSESSMENT METHODS</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation

Student assessment methods
• Written examination
• Laboratory/project work
For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work.
The final grade of the course consists of:
• Final written examination in the entire course content (60%),
• Elaboration of laboratory-based projects/work (40%).</td></tr>
</table>

	The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) RESOURCES

- Recommended Bibliography:

1.Ulrich K., Eppinger S., "Product Design and Development", TZIOLA Publications.
2.Donald A. Norman, "Designing Everyday Objects", KLEIDARITHMOS Publications
3. Skourboutis E., "Theory Notes".
4. Cheirchanteri Georgia, "Industrial Product Design. The communication role of Graphic Design through standardization"., Athens, 2017, University Studio Press publications.

- Relevant Scientific Journals:

QUALITY CONTROL AND TOTAL QUALITY MANAGEMENT

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**6002**	**SEMESTER**	**6**
COURSE TITLE	Quality Control And Total Quality Management		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	3
Practice Exercises	1	2
Total	**4**	**5**

COURSE TYPE:	Specialization General Knowledge – Compulsory
PREREQUISITE COURSES:	They do not exist
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE148/

(2) LEARNING OUTCOMES

Learning outcomes

The aim of the course is to introduce students to the concept of Quality Control, to present the main scientific methods and techniques of statistical quality control and their application in improving product quality. Additionally, the introduction of students to the philosophy and basic principles of Total Quality Management as well as their familiarity with the use of techniques and tools for its implementation.

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

1. Design sampling plans,
2. Analyze the capabilities of the production process,
3. Evaluate control charts,
4. Define the design characteristics of control charts.

Students will also have:

5. Clear understanding of Total Quality Management philosophy,
6. Ability to identify quality systems,
7. Ability to organize a total quality management system,
8. Ability to analyze statistical data.

In detail, students will be able to:

1. Understand:

- The various interpretations and definitions of quality (internal and external), quality control, quality assurance and total quality, total quality management,
- The various quality management programs, models and awards that lead organizations to business excellence,
- The various tools and techniques of quality management that facilitate the implementation of quality programs,
- The need for continuous measurement and improvement of customer satisfaction,
- The need for accurate estimation of quality cost data and process management,
- The importance of leadership and management commitment in highlighting quality in a strategic case,
- The importance of human factor in improving quality,
- Statistical control of procedures.

2. To know the international standardization bodies and the international quality control standards.
3. To develop and organize total quality systems.
4. Use analysis statistics properly.
5. To formulate the appropriate quality control program according to the capacity of the production unit.

General Competences

- Search for, analysis and synthesis of data and information with the use of the necessary technology.
- Decision making.
- Adapting to new situations
- Respect for difference and multiculturalism
- Showing social, professional and ethical responsibility and sensitivity to gender issues
- Respect for the natural environment
- Project planning and management
- Working in an interdisciplinary environment
- Criticism and self-criticism
- Working independently

- Team work
- Production of free, creative and inductive thinking to develop new strategic approaches.
- Working in an international environment

(3) SYLLABUS

1. Introduction to quality, quality control and quality improvement methods,
2. Quality Dimensions, Quality Cost, Quality and Productivity,
3. Sampling plans for QC inspections. Special acceptance control techniques,
4. Statistical Process Control and Process Capability Analysis, Control Charts for Variables and Attributes. Special Control Diagrams,
5. Introduction to Total Quality Management,
6. The Basic Philosophies of Total Quality Management (Deming, Juran, Crosby, Ishikawa, Taguchi, Feigenbaum),
7. The Basic Elements, Principles of Total Quality Management,
8. Systems - Organizations for Improvement, Quality Assurance and Verification of Total Quality Management,
9. Human Resources and its Role in Total Quality Management,
10. Quality Improvement Tools and Techniques,
11. The Six Sigma Methodology
12. Benchmarking,
13. Models and Total Quality Management Awards,
14. Environmental Management.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY:	Face-to-face lectures. Distance learning procedures for lecturing used when required.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Teaching using ICT, Laboratory Training using ICT, Electronic Communication and Assignment. • Support of learning process and communication through the electronic platform e-class • Using applications [MINITAB] - You Tube • Use of internet to demonstrate case studies
TEACHING METHODS	

Activity	Semester Workload
Lectures	40
Essays Writing & Presentation	30
Practice Exercises [MINITAB]	20
Independent Study	60
Course total	**150**

STUDENT PERFORMANCE EVALUATION	Language of Evaluation: Greek Methods of Evaluation: • Mid-term progress test: 20%. The progress test includes only multiple choice questions. • Compulsory writing of essays related to case studies and respective presentations: 30%. • Written final exam: 50%. The written examination includes: multiple choice questions and short answer questions for comparative evaluation of theory elements.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Greek:

1. Tagaras G.N. (2001). *Statistical Quality Control*, ZITI Publications.
2. Kitsos C. P. (2003). *Management and Statistical Quality Control*, New Technologies Publications.
3. Tsiotras G. (2016), *Total Quality Management*, 1st edition, Broken Hill Publishers, Ltd.
4. Goetsch L. David - Stanley B. Davis, Georgios Bochoris (ed.) (2018), *Quality Management and Organizational Excellence*, 8th ed., TZIOLA, A., PUBLICATIONS, & SONS S.A.
5. Logothetis N. (2015), *Total Quality Management, from Deming to Taguchi and the SPC*, 3rd edition, NIKITOPOULOS E. SARANTOS Publications.
6. Bochoris G., *Total Quality Management*, 1st edition / 2015, Publisher: GEORGE BOCHORIS.
7. Steiakakis M. and Kofidis N. (2015), *Management and Quality Control*, 2nd edition, TZIOLA, A., PUBLICATIONS, & SONS S.A.
8. Binioris S.(2009), *Total Quality Management T.Q.M.*, 2nd edition, Broken Hill Publishers, Ltd.
9. Dervitsiotis, K. (2001), *Competitiveness with Total Quality Management*, Athens, 2nd edition, Interbooks Publications.

Foreign language:

1. Montgomery D.C. (2009). *Introduction to Statistical Quality Control*, 6th Edition, John Wiley & Sons.
2. Ryan T.P. (2011). *Statistical Methods of Quality Improvement*, 3rd Edition, John Wiley & Sons.
3. Grant E.L., Leavenworth R.S. (1988). *Statistical Quality Control*, McGraw-Hill, 1988.
4. Deming, W. E. (2000), *Out of the Crisis*, MIT Press, Cambridge, MA.
5. Juran, J. M. (2004), *Architect of Quality: the autobiography of Dr. Joseph M. Juran*, Mc Graw
6. Hill, New York.
7. Juran, J. M. (1989), *Juran on Leadership for Quality*, Free Press, New York, 1989.
8. Juran, J. M. (1988), *Quality Control Handbook*, 4th Edition, McGraw-Hill, New York.

9. Crosby, P. B. (1979), *Quality is free: the art of making quality certain*, New York: McGraw-Hill.
10. Feigenbaum, A. V. (1983), *Total Quality Contro*l, 3rd ed. New York: McGraw-Hill.
11. Evans, J. R. and Lindsay, W. M. (1999), *The Management and Control of Quality*, 4th edition, South-Western College Publishing, Ohio.
12. Goetsch, D. L., and Davis, S. B. (2006), *Quality Management: Introduction to Total Quality Management for Production, Processing, and Services*, Pearson Prentice Hall, Upper Saddle River, NJ.
13. Nanda, V. (2005), *Quality Management System Handbook for Product Development Companies*, CRC Press, Florida.
14. Oakland, J. S. (1993), *Total Quality Management*, 2nd ed, Heinemann, Oxford.
15. Ishikawa, K. (1985), *What is Total Quality Control?* Prentice Hall, Enlewood.
16. Walsh, L. M., Wurster, R., Raymond, R. J. (1986), *Quality Management Handbook*, A. Dakker, New York.
17. Aguago, R. and Deming, W. E. (1990), *The American Who Taught the Japanese About Quality*, Secacus N.J.: Carol Publishing Group.

- Related academic journals:

Journal of Quality Technology
Quality Engineering
Quality and Reliability Engineering International
Total Quality Management
Quality Forum
Quality Magazine
Quality Progress
The TQM Magazine

Decision Support Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**6003**	**SEMESTER**	6
COURSE TITLE	Decision Support Systems		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	3
Practice Exercises	1	2
Total	**4**	**5**

COURSE TYPE:	GENERAL KNOWLEDGE
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	Yes

COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE201/

(2) LEARNING OUTCOMES

Learning outcomes
Upon completion of the course students will have: 1. A satisfactory level of knowledge of the fundamental principles and models of decision-making and decision support systems 2. Necessary knowledge for the study and application of multi-criteria decision analysis. 3. Knowledge and skills in the tools that help in the development and design of DSS In detail, students will be able to: 1. To understand the basic characteristics of the theory and methodologies of DSS 2. To distinguish when and why we apply DSS in a real system. 3. Utilize tools and techniques for development of DSS
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Decision making • Teamwork • Working in an international environment • Work in an interdisciplinary environment • Production of new research ideas • Project Management. • Promoting free, creative and inductive thinking

(3) SYLLABUS

1. Decision Analysis.
2. Decision-making process.
3. Making decisions at risk and uncertainty.
4. Multi-Criteria Decision Analysis.
5. Decision Support Systems.
6. Decision Support Systems Architectures.
7. Intelligent Decision Support Methods.
8. Multi-Criteria Decision Support Systems.
9. Spatial Decision Support Systems.
10. Applications of DSS in Industry, Production, Medicine, Environment, etc.
11. Training and use of the following software packages: Excel: Pivot Tables - Solver, Expert Choice, UTASTAR, MUSA - MUSA Plus, MARKEX.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY:	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Use of ICT in teaching, laboratory education, communication with students.

TEACHING METHODS	<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>100</td></tr><tr><td>Fieldwork</td><td>10</td></tr><tr><td>Essay Writing</td><td>20</td></tr><tr><td>Study</td><td>20</td></tr><tr><td>Course total</td><td>150</td></tr></table>
STUDENT PERFORMANCE EVALUATION	**Language of Evaluation:** Greek **Methods of Evaluation:** • Written examination: 60% • Project: 40%

(5) ATTACHED BIBLIOGRAPHY

1. Gaming and decisions, AN INTRODUCTORY APPROACH, E.MAGEIROU
2. Grigoris P. Chondrokoukis, "Decision Support Systems", Markella I. Varvarigou Publications, 2014
3. Decision Analysis-Rational Management, Goodwin P., Wright G. BROKEN HILL PUBLISHERS LTD

Microcontroller-based System Design

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**6004**	**SEMESTER**	**6**
COURSE TITLE:	Microcontroller-based System Design		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	4
Laboratory		1	1
		4	**5**
COURSE TYPE:	Specialised general knowledge		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will have: 1. Thorough knowledge and excellent understanding of the theory and design principles of microcontroller based systems. 2. Knowledge and skills in selecting the best hardware development tools and hardware microcontrollers. 3. Knowledge, ability and skill in material development. 4. Knowledge and understanding of the design parameters of systems based on microcontrollers. In detail, students will be able to: 1. To distinguish the differences between architectural microcomputers and microcontrollers. 2. To choose the optimal architecture in case of application. 3. Evaluate and select the optimal ecosystem of hardware development tools and microcontroller hardware. 4. Develop, debug and test microcontroller hardware. 5. To design and implement a complete system based on a microcontroller taking care of energy management, the printed circuit, and its physical form.
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Decision making • Autonomous work • Teamwork • Work in an international environment • Work in an interdisciplinary environment • Production of new research ideas • Project design and management • Respect for the natural environment • Promoting free, creative and inductive thinking

(3) SYLLABUS

1. Microcomputer and microcontroller architectures.
2. Hardware and hardware development tools.
3. Memory types and their management.
4. Analog and digital signal inputs / outputs.
5. Oscillation and timing circuits.
6. Timing of procedures.
7. Control flow control and interruptions.
8. Data communication peripherals.
9. Pulse Range Modulation (PWM).
10. Operating modes.
11. Design of energy management circuits.
12. Human-machine interface.
13. Printed circuit design and shielding techniques.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching se of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>25</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>15</td></tr>
<tr><td>Non-guided personal study</td><td>58</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek, English

Description
Written exams, project evaluation

Student assessment methods
• Written examination
• Project evaluation

The final grade of the course consists of:
• Final written examination in the entire course content (60%)
• Elaboration of laboratory-based work (40%)
• Elaboration of written project* (20%)
*Optional (Its percentage is deducted from that of the Written Examination)

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Ενσωματωμένα Συστήματα, οι Μικροελεγκτές AVR και Arduino, ΠΟΓΑΡΙΔΗΣ ΔΗΜΗΤΡΙΟΣ, Μούργκος Ιωάννης,
2. Ενσωματωμένα Συστήματα. Ο Μικροελεγκτής AVR, Πογαρίδης Δ., ΜΑΡΙΑ ΠΑΡΙΚΟΥ & ΣΙΑ ΕΠΕ.
3. Πρακτικά Θέματα Ενσωματωμένων Συστημάτων, Ευάγγελος Φιλιππάτος, Νικόλαος Σπ. Βώρος, ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΜΟΝ. ΕΠΕ.
4. Online Bibliography Updated Annually
5. Professor's Notes

Fluid Mechanics

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**6005**	**SEMESTER**	**6**
COURSE TITLE	Fluid Mechanics		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures		3	3
Exercises / Tutorials		1	2
		4	**5**
COURSE TYPE	General background		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE205/		

(2) LEARNING OUTCOMES

Learning outcomes
The course belongs to Level 6 of the European Qualifications Framework. Thus, the objectives of the course are: • Acquisition of the theoretical background by the student in subjects relating to Fluid Engineering. • Ability by the student to apply the basics concepts of Fluid Engineering. Upon completion of the course, the student will be able to: • solve with analytical or approximate techniques simple problems of Fluid Engineering and • to deepen the further understanding of such methods.
General Competences
• 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. • Production of new research ideas. • Production of free, creative and inductive thinking.

(3) **SYLLABUS**

- Natural properties of fluids;
- Fluid statics;
- Fluid kinematics;
- Conservation of mass - Equation of continuity;
- Flow function;
- Change of momentum;
- Differential equations of motion for non-real fluids - Euler equations;
- Differential equations of motion for real fluids - Navier-Stokes equations;
- Fluid engineering application.

(4) **TEACHING and LEARNING METHODS - EVALUATION**

<table>
<tr><td>DELIVERY</td><td colspan="2">Face-to-face and distance learning.</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY</td><td colspan="2">ICT is used in both parts of the course, theoretical and laboratory, both for teaching and for communicating with students.</td></tr>
<tr><td>TEACHING METHODS</td><td>Activity</td><td>Semester workload</td></tr>
<tr><td></td><td>Theoretical part with Lectures</td><td>39</td></tr>
<tr><td></td><td>Tutorial with works and/or midterm exam (optional)</td><td>50</td></tr>
<tr><td></td><td>Individual study</td><td>61</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td>Course Total (30h/ECTS)</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td colspan="2">Language of Assessment: Greek

Assessment Methods: The assessment of students is done with written exams at the end of the semester that include theory questions in various forms (e.g., multiple choice, short answer, filling in the gap, etc.) as well as exercises that require detailed problem solving.

Final written exam: 80%

Works and/or midterm exam (optional): 20%

The evaluation criteria are announced to the students at the beginning of the semester and are posted on the course website in eClass.</td></tr>
</table>

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

5. Μηχανική Ρευστών με εφαρμογές, Ξένος Μ. & Τζιρτζιλάκης Ε., Εκδόσεις Gotsis, Πάτρα 2018.
6. Μηχανική Ρευστών, Γούλας Α., Έκδοση 1η, 1986, Εκδότης: Σ. Γιαχούδης & ΣΙΑ Ο.Ε.
7. Μηχανική των Ρευστών - Τόμος 1, Ά. Παπαϊωάννου, Έκδοση 2η, 2002, Εκδότης: Γ. Γκέλμπεσης.
8. Εφαρμοσμένη Ρευστομηχανική, Δ.Γ. Παπανίκας, Έκδοση 4η, 2010, Εκδότης: Φ. Παπανίκα &ΣΙΑ Ο.Ε.
9. Υπολογιστική Μηχανική Ρευστών, Σούλης Ι., Έκδοση 1η, 2008, Εκδότης: Χ. Ν. Αϊβάζης.

- Related academic journals:

1. Journal of Fluid Mechanics
2. International Journal of Fluid Mechanics Research
3. ngineering Applications of Computational Fluid Mechanics

Internet Technology in the Digital Industry

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**6006**	**SEMESTER**	**6**
COURSE TITLE:	Internet Technology in the Digital Industry		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	4
Laboratory		1	1
		4	**5**
COURSE TYPE:	Specialised background, skill development		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE1300/		

(2) LEARNING OUTCOMES

Learning Outcomes
The aim of the course is to introduce the design principles and technologies of web application development with emphasis on applications for industrial environments. Upon successful completion of the course students will be able to:

- Know the basic concepts of computer networks (such as web architecture and OSI) both in terms of the required infrastructure and their installation and operation
- Analyze the communication process of computers and machines
- Understand and evaluate the operation of communication protocols and technologies
- Understand the modern internet technologies with emphasis on network, transport and application technologies
- Distinguish switching technologies and multiplexing techniques
- Study and evaluate the performance of networking technologies as well as the factors that affect them
- Know the design principles and basic available web application development technologies
- Understand the requirements of a web application
- To design a computer network taking into account the requirements of the respective industrial environment and the applications that it will serve
- Apply design principles and select technologies to develop a web application
- Design, develop and evaluate web applications

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

The theoretical part of the course covers the sections:

1. Basic Network Concepts, OSI Architecture, Internet Protocol Stack.
2. Physical layer and data link control
3. Switching techniques: circuit, packet and virtual circuit switching. Performance evaluation. Multiplexing in time, frequency, wavelength
4. Internet protocols: IP, routing;
5. TCP (transport protocol), flow control and error correction, congestion control and traffic management in various network types, service quality, sockets, endpoints
6. Basic concepts of software technology. Software design and development.
7. Distributed data management techniques. Relational databases, storage structures.
8. Application design and development technologies such as Web content presentation and formatting technologies (HTML5, CSS), Client side scripting: JavaScriptAPI, DHTML, PHP, Server side scripting, XML and XSL formatting
9. Specification analysis and system design.
10. Internet security
11. Examples of web application design for industry

In the laboratory practical part of the course, students are introduced to network technologies and infrastructure setup as well as web application development technologies such as PHP and MySQL. They develop applications for different sectors of the economy and industry (industry 4.0, smart production, digital twins, etc.)

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures

<table>
<tr><td></td><td>

- Practice exercises
- Laboratories
- Assignments & Presentations

</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>

- Use of ICTs theoretical teaching se of ICTs in lecturing
- Use of ICTs in laboratory-based training
- Use of ICTs for the communication with students via the e-class platform

</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratories</td><td>13</td></tr>
<tr><td>Assignments/Projects</td><td>28</td></tr>
<tr><td>Personal study</td><td>45</td></tr>
<tr><td>Book/paper studying</td><td>25</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek
Methods of evaluation for theory (60%):
• Final written exam with problem solving (100%)
Methods of evaluation for Lab (40%)
• Public Presentation

Student assessment methods
The final grade of the course consists of:
• Written Exam: 60%
• Assignment: 40%

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

1. "Δίκτυα και διαδίκτυα Υπολογιστών" COMER Εκδ. ΚΛΕΙΔΑΡΙΘΜΟΣ 2002 ISBN 9602095849.
2. *Παναγιωτόπουλος Ιωάννης - Χρήστος Π. «Εφαρμογές διαδικτυακού προγραμματισμού με Java» Εκδότης: Σταμούλη Α.Ε., Έτος Έκδοσης: 2010*
3. *ΑΝΑΠΤΥΞΗ ΔΙΑΔΙΚΤΥΑΚΩΝ ΕΦΑΡΜΟΓΩΝ, Παναγιώτης Δ. Κεντερλής, Έτος Έκδοσης: 2017, ISBN: 978-960-6607-60-8, Εκδόσεις Λύχνος.*
4. *Μήλιου Αμ., Πομπόρτσης Αν., «Υπηρεσίες Προστιθέμενης Αξίας στο Διαδίκτυο», Eds. Τζιόλα, 2004, ISBN: 960-418-021-5.*
5. Επικοινωνίες υπολογιστών και δεδομένων, W. Stallings, Eds. Τζιόλα, 2011 ISBN: 978-960-418-329-6, ΚΩΔΙΚΟΣ ΕΥΔΟΞΟΥ: 18548898
6. *Hall M., Brown L., «Servlets και σελίδες διακομιστή Java», Κλειδάριθμος Ed., 2007.*

- Related academic journals:

- IEEE Transactions on Industrial Informatics
- IEEE Transactions on Industry Applications
- Elsevier Computer Networks

- Journal of Industrial Information Integration - Elsevier

7th SEMESTER

Mechatronics

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**7001**	**SEMESTER**	**7**	
COURSE TITLE:	Mechatronics			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory/Tutorials			**4**	**5**
COURSE TYPE:	Special background			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE137/			

(2) LEARNING OUTCOMES

Learning Outcomes
At the completion of the course, students, students will acquire: - an understanding of Mechatronics and of the basic notions related to Mechatronic systems, - A set on knowledge and skills for identifying, evaluating and analysing real-life practical Mechatronic systems - Know-how ans skills for solving problems relating to the design, programming, testing and debugging complex Mechatronics systems. In particular, students will be able: - To name and enumerate the parts of a Mechatronic system, - To establish a description of the functional and information connections between the parts of a Mechatronic system, - To plan and implement the steps for designing and testing a Mechatronic system, - To design, develop and test the interfaces between the microcontroller and the peripheral sensors and actuators.
General Competences
- 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

(3) SYLLABUS

- Introduction, historical review, definitions, economic and social significance
- The Mechatronic system: structure, information flows, role of interfaces
- Actuator sub-system and interfacing: motors, e/m actuators
- Sensor sub-system and interfacing: binary and analog
- Microcontroller circuits: analog-digital conversion, hysteresis loop, filtering
- Communication sub-system: Serial, Serial Peripheral Interface, Inter-Integrated Circuit
- Microcontroller programming and operating system features
- Real-time programming: processing multiplexing, interrupts
- Examples and applications.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Various delivery methods
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	– Commercial and free / open source software – Multimedia applications – MS Teams, Open eClass system
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Face-to-face lectures	26
Tutorials	26
Individual study	64
Coursework (project)	34
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek or English **Description** Written exams **Student assessment methods** The final grade of the course consists of: Total mark B=max(5.0, 0.7*B1+0.3*B2) if B1≥5 or B=0.7*B1 if B1<5.0, where B1 is the mark of the final written examination and B2 the mark of the submitted coursework (project). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

Suggested bibliography:

- Nesculescu D. (2001). Mechatronics. Pearson.
- Auslander D.M. & Kempf C.J. (2000). Mechatronics: Mechanical Systems Interfacing. Prentice Hall.
- Stifler K. (1992). Design with Microprocessors for Mechanical Engineers. McGraw

Hill

Related academic journals:

- Transactions on Mechatronics, publ. IEEE/ASME
- Mechatronics - The Science of Intelligent Machines, publ. Elsevier

Information Production Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**7002**	**SEMESTER**	7
COURSE TITLE	Information Production Systems		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Various Forms of Teaching		4	5
COURSE TYPE:	Skills Development		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek/English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE315/		

(2) LEARNING OUTCOMES

Learning outcomes
Upon completion of the course students will have: 4. A satisfactory level of knowledge about the fundamental principles of production information systems 5. Knowledge and experience to design and prescribe complex information systems (eg ERP, CRM) 6. Knowledge and skills in tools that help develop and design Production Information Systems 7. Understand the concept of the software lifecycle 8. Necessary knowledge for the study application and evaluation of production information systems In detail, students will be able to: 4. To understand the basic characteristics of the theory and methodologies of Production Information Systems 5. To distinguish when and why we apply a Production Information System 6. Utilize tools and techniques for development of Production Information Systems
General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Teamwork
- Working in an international environment
- Work in an interdisciplinary environment
- Production of new research ideas
- Project Management.
- Promoting free, creative and inductive thinking

(3) SYLLABUS

1. Information systems with emphasis on their use in modern business and industry
2. Modern operating systems.
3. Databases and file management systems.
4. Business strategy and the role of information systems
5. Strategic information systems
6. Business Resource Management Systems.
7. Design techniques and methodologies
8. Methodologies for recording requirements
9. Techniques and methodologies for the development of production information systems.
10. Operational systems of production resources.
11. Operational resource management information systems
12. ERP systems and the Greek reality
13. Study of various scenarios for the design and implementation of production information systems

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY:	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Use of ICT in teaching, laboratory education, communication with students.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>100</td></tr><tr><td>Fieldwork</td><td>10</td></tr><tr><td>Essay Writing</td><td>20</td></tr><tr><td>Study</td><td>20</td></tr><tr><td>Course total</td><td>150</td></tr></table>
STUDENT PERFORMANCE EVALUATION	**Language of Evaluation:** Greek **Methods of Evaluation:** • Written examination: 60% • Project: 40%

(5) ATTACHED BIBLIOGRAPHY

1. Wallace Patricia: "Management information systems"
2. Management of production systems Basic theoretical principles and applications in administrative decision making - 2nd edition Sotirios G. Dimitriadis
3. Introduction to Management Information Systems: Processes, Systems and Information McKinney Earl, Kroenke David
4. FINANCIALS OF ENTERPRISES.MICHAEL GLEZAKOS
5. Information Systems of Economics and Administrative Sciences of Gotsina, Kalouvrektis

Artificial Intelligence

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**7003**	**SEMESTER**	**7**
COURSE TITLE:	Artificial Intelligence		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	3	3
Tutorial/Project	0.5	1
Laboratory	0.5	1
	4	**5**

COURSE TYPE:	Scientific area course / specialization / skill development
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE291/

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, students will have: 1. A satisfactory level of knowledge about the fundamental principles and models of fuzzy logic. 2. Necessary knowledge for the study and application of fuzzy logic systems. 3. Knowledge and skills in tools that help develop and design intelligent systems. In detail, students will be able to: 1. To understand the basic characteristics of the theory and methodologies of the intelligent systems. 2. Distinguish when and why we apply intelligent techniques to a real system.

3. Utilize tools and techniques for the development of intelligent systems. 4. Model complex systems when it is difficult to develop a mathematical model.
General Competences
• Ability to search, analyze and synthesize data and information, using the necessary internet technologies and bibliographic research and networking. • Ability to make decisions, through the consideration of solutions and options for elaboration of the assigned laboratory tasks and exercises. • Ability to work independently, through the preparation of individually performed tasks and exercises. • Ability for group work, through the elaboration of group work and exercises. • Ability to plan, manage and evaluate projects, through undertaking and elaborating completed work (project). • Ability to produce new research ideas and inductive thinking while designing systems operating in dynamic environments.

(3) SYLLABUS

Theoretical Lectures

- Introduction - Crisp Sets, Fuzzy Sets, Basic Features, Boolean Algebra
- Fuzzy Set Algebra - Properties of α-Sections, Fuzzy Relationships, Projection of Fuzzy Relations, Extension Principle
- Fuzzy Arithmetics - Fuzzy numbers, Interval arithmetic, Fuzzy arithmetic operations,
- LR-Fuzzy Numbers, Triangular and Trapezoidal Fuzzy Numbers
- Introduction to Fuzzy Systems - Characteristics and Function, Fuzzy Inference Machines, Fuzzification methods, Defuzzification methods
- Fuzzy logic controllers - Fuzzy control methodology
- Fuzzy methods in decision making
- Applications using MATLAB for fuzzy arithmetic operations and fuzzy control systems.

Laboratory

Projects aim to support the theoretical part of the course with emphasis on topics related to programming fuzzy systems using Fuzzy Logic Toolbox of Matlab.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Laboratories • Assignments & Presentations
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform • Specialised software tools for experimentation

<table>
<tr><td></td><td>• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>18</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>20</td></tr>
<tr><td>Non-guided personal study</td><td>60</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
• Written examination with answer questions
• Written assignment
• Public presentation
• Laboratory/project work
For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work. The final grade of the course consists of:
• Final written examination in the entire course content (60%),
• Group work (project), with intermediate and final individual oral exam (40%)
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Recommended Bibliography:

- L.X. Wang,A Course in Fuzzy Systems and Control, Prentice Hall, 1997.
- J. Jang, C. Sun, Neuro-Fuzzy and Soft Computing», E. Mizutani, Prentice Hall, 1997.
- T. Ross, Fuzzy Logic with Engineering Applications», MacGraw-Hill, NY, 1995.
- B. Kosko, Fuzzy Engineering, Prentice Hall, 1997.
- L. Tsoukalas, R. Uhrig, Fuzzy and Neural Approaches in Engineering, MATLAB.
- John Wiley & Sons, Supplement, 1997.
- F. Karray and C. De Silva, «Soft Computing and Intelligent Systems Desig, Addison-Wesley, 2004.
- D. Driankov, H Hellendoorn, M. Reinfrank, An introduction to fuzzy control», Springer 1995.

- Relevant Scientific Journals:

- Engineering Applications of Artificial Intelligence
- Artificial Intelligence Review
- Artificial Intelligence
- Journal of Artificial Intelligence Research
- Journal of Experimental & Theoretical Artificial Intelligence

.

ENTREPRENEURSHIP AND INNOVATION MANAGEMENT

COURSE OUTLINE

(1) **GENERAL**

SCHOOL	ENGINEERING SCHOOL			
ACADEMIC UNIT	INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	7004	**SEMESTER**	7	
COURSE TITLE	Entrepreneurship And Innovation Management			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHINGHOURS**	**CREDITS**
Lectures			2	3
Laboratory exercises			1	1
Practice Exercises			1	1
			4	5
COURSE TYPE	MEY (Special Infrastructure)			
PREREQUISITE COURSES:	Not exist			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:				
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES			
COURSE WEBSITE (URL)				

(2) **LEARNING OUTCOMES**

Learning outcomes

The aim of the course "Entrepreneurship and Innovation Management" is the deep and experiential understanding of the connection of human resources with entrepreneurship and innovation. More specifically, in addition to the established theories and methodologies, innovative methodologies and theories of recording welfare are presented with a strong original anthropocentric orientation towards entrepreneurship and innovation management. When the student feels and grasps the connection between economics and entrepreneurship and consequently the connection between financial welfare and innovation management, only then he can see himself as a participant and contributor to both human thought and promoting business innovation by approaching "blue ocean strategies". It seeks to understand what different (and possibly more) approaches to economic welfare that focus on entrepreneurship and innovation management can offer in contrast to the conventional approaches of business management theories by commenting on the importance of entrepreneurship and innovation, not only for economic welfare, but also for the overall development of societies.

Upon successful completion of the course students must be able to:

i) Knowledge Objectives

To define, interpret, correlate, connect, and compare theoretical concepts. To know by name these theories and the definitions. To realize the weaknesses of these theories and their strengths. To identify the conditions under which these theories were created, established, and evolved. To distinguish the various strategies that lead to innovation and to describe the most important points of the theories that emerge from them. Recognize the major weaknesses in the prevailing approaches to welfare and identify the most important concerns regarding these approaches. To know the most important indicators of welfare. Explain their weaknesses and compare them with an innovative methodology listed. Describe and interpret welfare indicators applied to business innovation. Identify their weaknesses or strengths and choose the innovative and most effective indicators of welfare. Recognize, identify, and interpret the importance of the human factor in leadership, innovation, and the creation of welfare. To relate the theories and methodologies that are taught with knowledge that they already have from other courses. To connect the knowledge, they receive from this course with the existing conditions of the current situation.

ii) Capacity level objectives
To construct, plan, use, implement business strategies and welfare indicators that are taught. To present arguments for or against a strategy. To apply wider knowledge, they acquire. To be able to run companies with the aim of promoting innovation which leads to a flourishing of social welfare.

iii) Attitude level objectives:
To accept, reject, challenge, and criticize the theories, approaches, strategies, and indicators being examined. To adopt a critical attitude towards deep-rooted ways of thinking and established positions of the theoretical and methodological framework of entrepreneurship and innovation management. To review the established and outdated standards of the leader, considering the emotional intelligence and ethics of the leader, factors that lead to a management on its part, capable of generating innovation within the company and welfare within society.

General Competences
• Search, analysis and synthesis of data and information, using the necessary Technologies • Adaptation to new situations • Decision making • Autonomous Work • Production of new research ideas • Exercise criticism and self-criticism • Promoting free, creative, and inductive thinking

(3) **SYLLABUS**

Course Contents:

1. Entrepreneurship and Economy
2. Effective Business Communication as a tool to promote business Innovation
3. Business Plans (Structure - Departments) (Market Research – Competitive Advantage), (Marketing – Pricing – Communication-Sales) (Costs - Economic Indicators - Cash Flows-Taxes), Financing Tools and Alternative Sources
Spatial Planning, Technopolis - Industrial Areas, Entrepreneurship in an International Environment
4. Spatial Planning and Analysis
5. Accountability Systems
6. Welfare Recording Models and their application for the promotion of business innovation
7. e - Entrepreneurship Social Entrepreneurship

(4) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Distance Learning via Teams	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Learning process support through the electronic platform e-class	
TEACHING METHODS	***Activity***	***Semester workload***
	Lectures (Enriched Presentation)	60
	Interactive Teaching (Questions - Answers, Brainstorming, Oral Group Work, Case Study)	60
	Independent Study	30
	Course total (30 hours of workload per credit unit)	**150**

STUDENT PERFORMANCE EVALUATION	. Written final exam (100%) (Concluding) which includes: - Multiple choice or right-wrong questions - Short Answer Questions Purpose of assessment: The test of understanding the basic elements of the course. Evaluation criteria: The correctness, completeness, clarity, and critical evaluation of the answers. The evaluation criteria are explicitly mentioned on the course site and for every evaluation action.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

- Bessant John, Tidd Joe (2017). Καινοτομία και Επιχειρηματικότητα. Θεσσαλονίκη: Εκδόσεις Τζιόλας.
- Καραγιάννης Ηλίας , Μπακούρος Ιωάννης Λ., (2010), Καινοτομία και επιχειρηματικότητα, Εκδόσεις: Σοφία, ΑΕ
- Mauborgne Renée , Kim W. Chan (2006), Η στρατηγική των γαλάζιων ωκεανών, Εκδόσεις Κριτική
- Παπαλεξανδρή Νάνσυ Α. , Μπουραντάς Δημήτριος Κ., (2016), Διοίκηση ανθρώπινου δυναμικού, Εκδόσεις: Μπένου
- Marilyn S. Sarow, Bonnye E. Stuart (2008), Αποτελεσματική επικοινωνία στις σύγχρονες επιχειρήσεις, Εκδόσεις Κριτική
- Goleman Daniel, (2011), Η συναισθηματική νοημοσύνη, Εκδόσεις Πεδίο
- Deakins David, Freel Mark, Επιχειρηματικότητα και μικρές επιχειρήσεις. Νεοφυείς επιχειρήσεις: μια δυναμική απάντηση των νέων στην ανεργία. Εκδόσεις Rosili, 2017.
- Storey David, Greene Francis, Χασσίδ Ιωσήφ, Φαφαλιού Ειρήνη (2011). Επιχειρηματικότητα για μικρές και μεσαίες επιχειρήσεις. Εκδόσεις Κριτική.
- White Margaret, Bruton Garry (2010). Η στρατηγική διαχείριση της τεχνολογίας και της καινοτομίας. Αθήνα: Εκδόσεις Κριτική.
- Per-Olov Johansson, (1995), An introduction to modern welfare economics, Cambridge University Press
- Sen Amartya, (2000), Για την Ηθική και την Οικονομία, Εκδόσεις Καστανιώτη
- Gillis, Perkins, Roemer, Snodgrass (2000), Οικονομική της Ανάπτυξης, Εκδόσεις Τυπωθήτω - Γιώργος Δαρδάνος

Environment – Management of Byproducts

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**7005**	**SEMESTER**	**7**
COURSE TITLE:	Environment – Management of Byproducts		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	ECTS CREDITS
Theory (Lectures)	2	3
Laboratory	2	2
	4	**5**

COURSE TYPE:	Special background
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes

Upon successful completion of the course students are expected to:

- Thoroughly know and comprehend the theory of chemical, biological and mechanical processing, the laws of energy saving, the principles of pollution minimization, the treatments of textile effluents.
- Apply procedures and control of waste treatment, analyze structures, processes and techniques of optimization and environmental protection.
- Develop and evaluate management of byproducts, maintenance and adjustment of equipment, methods and specifications of waste processing.

Specifically, students will be able to:

- Describe and identify methods of environmental protection, select the terms of environmental problem.
- Explain the function of equipment, assess the waste composition of a dyeing plant.
- Compute the determination parameters of pollution load, examine the basic quantities of wastewater characterization.
- Combine modern and traditional treatments, plan improvements in processes, develop effective techniques and discriminate between different types of processes.
- Compose new optimization strategies, organize waste minimization techniques, pretreatment and aftertreatment stages.
- Compare different methods, evaluate their performance, support recycling of liquid and gaseous wastes.
- Know and apply directives and regulations for environmental protection.

General Competences

1. Search for, analysis and synthesis of data and information with the use of the necessary technology; project planning and management.
2. Adapting to new situations.
3. Decision making, ability to criticism and self-criticism.
4. Working independently, showing social sensitivity, professional and ethical responsibility, with respect for the working and natural environment.
5. Production of new research ideas and free, creative, inductive thinking.

(3) SYLLABUS

Energy as an economic quantity. Methods of performance optimization. Technologies of energy saving in key production stages and, mainly, in dyeing, drying and finishing. Dyehouse mechanical equipment and automation. Methods of productivity optimization for blends dyeing. Waste minimization techniques. Waste composition of dyeing and finishing plants. Chemical, biological and mechanical processing methods. Wastewater characterization parameters. Measurement of the pollution load in sewage. Determination of basic parameters, pH, residual chlorine, conductivity, BOD5, BOD21, TC, TOD, COD. Aerobic and anaerobic biological treatment. Pretreatment and treatment stages. Grease traps, sand collectors, grates, fine sieves, supply and homogenization tanks, precipitation, flotation, flocculation, aggregation, chemical oxidation, neutralization, activated sludge tanks, biological refineries, anaerobic digestion systems. Treatment of textile effluents. Liquid and gaseous waste recycling methods. Pollution of lakes and streams (torrents, rivers). Environmental problem formulation.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of ICT in teaching, laboratory education, communication with students.
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	72
Laboratory work	36
Non-guided personal study	42
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Student assessment methods** • Written Examination: 60% • Laboratory Exercise: 40% The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. F. J. Cervantes, S. G. Pavlostathis, A. C. van Haandel, Advanced Biological Treatment Processes for Industrial Wastewaters, IWA Publishing (2006).

2. P. N. L. Lens, L. H. Pol, P. Wilderer, T. Asano, Water Recycling and Resource Recovery in Industry: Analysis, Technologies and Implementation, IWA Publishing (2002).
3. S. Manahan, Environmental Chemistry, 10th Edition, CRC Press, Taylor and Francis Group (2017).
4. M. Miraftab, A. R. Horrocks, Ecotextiles: The Way Forward for Sustainable Development in
5. Textiles, Woodhead Publishing Ltd (2007).
6. K. Slater, Environmental Impact of Textiles: Production, Processes and Protection, Woodhead
7. Publishing Ltd/The Textile Institute (2003).

Power Electronics – Smart Grid

COURSE OUTLINE

(1) **GENERAL**

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSECODE	**7006**	**SEMESTER**	**7**
COURSETITLE	Power Electronics – Smart Grid		
INDEPENDENTTEACHINGACTIVITIES		**WEEKLYTEACHING HOURS**	**CREDITS**
	Theory (Lectures)	3	3
	Tutorial/Project	0.5	1
	Laboratory	0.5	1
		4	**5**
COURSE TYPE	Specialized general knowledge, skills development		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students will acquire highly specialized knowledge in state's field of niche application domains. Specifically, students will be trained in knowledge areas such as: a) smart grid architectures, b) design and development of energy management systems such as energy converters and inverters, c) renewable energy systems renewable energy sources, d) smart meters, e) energy storage systems, f) energy management and control systems, and g) "smart" loads and "smart" actuators (smart loads and actuators). The knowledge that will be acquired in the above cutting-edge fields is the basis for original thinking. In addition, the study and implementation by students of real - world systems using in depth all the above state-of-the-art technologies will inspire them with critical thinking, synthesizing ability, and the ability to adapt new innovations / systems to the dynamically evolving and transforming environment. Taking into account fundamental changes such as the energy market, digital transformation, but also the emphasis on non-fossil energy use. Upon completion of the course students will have acquired specialized problem-solving skills, which are required in research and innovation in order to develop new knowledge and processes and to integrate knowledge from different fields. In detail, students will be able to: a) describe, analyze and specify an energy production and management system, b) model and specify the design of the energy control and management system, c) know and select the critical structural implementation of control systems. d) Evaluate and propose the best intelligent grid system design approaches. In particular, students through the study and development of real applications (real - world applications) will acquire important skills related to: a) the use of computer environment tools for the design and simulation and analysis of electronic power circuits (power electronics circuits), b) the study, evaluation and selection of circuits and methodology of converters and inverters, c) development of control circuits based on microcontrollers for energy control and management, d) study, evaluation and use of sensors measuring energy parameters (current, voltage, power), e) computer schematic design and printed electronic power circuits; (f) the development of firmware for microcontrollers integrated into wireless control and power management.
General Competences
Properly selected semester group projects cultivate and develop skills related to a) individual and group work guided by goals within predetermined schedules, b) analysis and synthesis of data and information using all necessary technologies and methods, c) adaptation new situations and environments, d) decision-making based on systematic and controlled empirical approaches, e) autonomous work to contribute to other multidisciplinary and interdisciplinary groups that share common goals, and new market solutions, h) project design and management, i) respect for the natural environment, and j) promoting free, creative and inductive thinking. Students will be able to manage and transform work or study environments that are complex, unpredictably and require new strategic approaches. Specifically, students through the knowledge and skills they will receive in the course will be able to use all the most important technologies and methods needed to support the revolution which supports the new legal / economic environment of the energy exchange. This course allows students to take responsibility for contributing to professional knowledge and practices and for evaluating team performance strategy.

(3) **SYLLABUS**

1. Intelligent Mesh Applications.
2. Thyristor applications.
3. Applications with MOSFT and IGBT.
4. Voltage, current and power measurements.
5. Built-in control.
6. Wireless and wired systems interconnection.
7. Converter Circuits.
8. Inverters Circuits.
9. Protection and safety devices.
10. Energy stock market environment.
11. Control of renewable energy sources.
12. Development of material and hardware energy control systems.
13. Internet control.
14. Standards and regulations.

(4) **TEACHING and LEARNING METHODS-EVALUATION**

DELIVERY	• Lectures • Practice Exercises • Laboratories • Assignments-Presentations
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in teaching, laboratory education in submission of assignments and communication with students
TEACHING METHODS	

Activity	*Semester workload*
Lectures	39
Laboratories	26
Educational visits	10
Personal study	13
Assignments	62
Coursetotal (30h/ECTS)	**150**

STUDENTPERFORMANCEEVALUATION	**Language of Assessment** Greek (English for ERASMUS students upon request). **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** • Written final exam, with problem solving questions (60%) • Group work (project), with presentation and intermediate and final individual oral examination (40%). The evaluation criteria are announced to the students at the beginning of the semester and are posted on the course website in eClass

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

1. Electronics Power Laboratory Exercises, Malatestas Pantelis V., Vylliotis Iraklis A., PUBLICATIONS A. TZIOLA & SONS SA

2. Renewable Energy Sources, Kioskeridis Iordanis, A. TZIOLA & SONS PUBLICATIONS SA

3. Introduction to Power Electronics, MohanNed, UndelandToreA., RobbinsWilliamP., A. TZIOLA & SONS PUBLICATIONS SA.

4. The Use Case and Smart Grid Architecture Model Approach [electronic resource], Marion Gottschalk / Mathias Uslar / Christina Delfs, HEAL - Link Springer ebooks.

5. Smart Grid Inspired Future Technologies [electronic resource], Eng Tseng Lau / Michael K.K. Chai / Yue Chen / Oliver Jung / Victor C.M. Leung / Kun Yang / Sandford Bessler / Jonathan Loo / Tomonori Nakayama, HEAL - Link Springer ebooks.

Electromechanical Installations Design

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**7007**	**SEMESTER**	**7**
COURSE TITLE:	Electromechanical Installations Design		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)/ Problem solving	1	1.5
Laboratory	3	3.5
	4	**5**

COURSE TYPE:	Specialised general knowledge, skill development
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE335/

(2) LEARNING OUTCOMES

Learning Outcomes
The aim of the course is to provide basic knowledge about Electromechanical (E / M) Installations in the construction sector, building and industrial installations. This knowledge will help the student to understand the basic calculations, as well as the study and design of

electromechanical installations that give life to buildings.

Upon successful completion of the course students will be able to:
• To know the laws, regulations, technologies and materials used in electrical installations.
• To have the knowledge about the dimensioning, the study, the design and the operation of the E/M installations.
• To know and apply regulations and recommendations related to E/M installations.
• To know and use appropriate software (software), for the study and design of E/M installations.
• To apply the appropriate methodology for the study, design and operation of E/M installations.
• To analyze the elements of the surroundings and to understand the structure of the E/M installations, so that they can combine and correlate the elements of the different installations.
• To compose and compare the data of the individual studies of the E/M installations.
• To organize in total and in full the supervision of the construction of the E/M installations.

Upon successful completion of the course students will have:
• Thorough knowledge and critical understanding of laws, regulations, technologies and materials used in electrical installations.
• Knowledge and skills for the design, design, supervision and operation of E/M installations.
• Knowledge and skills to use appropriate software, for the study and design of E/M installations.

In detail, students will be able to:
• Know the rules of study and design of E/M installations and gain insight into their technical thinking.
• Understand the technical peculiarities of the way of study and design that govern the respective content of the E/M installations.
• Apply the rules of study and design with flexibility, in order to turn their thoughts into calculations and plans and to make necessary corrections and modifications.
• Evaluate any design of E/M installations and judge the costing of its implementation.

General Competences

The course aims to contribute to the following:
• Search, analysis and synthesis of data and information, using the necessary technologies and especially: Study of needs of building and industrial installations in electromechanical systems, design and supervision of the installation and operation of these systems.
• Adaptation to new situations: Continuous information on legislation, European regulations, technologies and materials of E/M installations.
• Decision making: Study, design, dimensioning of E/M installations.
• Autonomous work: knowledge of laws, regulations, technologies and materials used in electrical installations.
• Group work: Collaboration in groups for the elaboration of studies and design of E/M installations, in the form of projects.
• Production of new research ideas: Promotion of free, creative and inductive thinking for the development of new approaches through studies.

(3) SYLLABUS

• Introduction to the study and design of Electromechanical (E/M) Installations. General instructions of the course. Types of E / M installations in buildings and industrial areas. General regulations and legislation. Software for the study and design of E / M installations.
• Study and design of electrical installations. Legislation and regulations. Elements and basic

connections. Study and design of electrical installations of strong and weak currents of houses, and respectively industrial spaces. Grounding. Lightning protection. Phototechny. A/V substations.
• Study and design of heating, cooling and air conditioning systems. "KENAK" and thermal insulation of buildings. Calculation of heat losses. Calculation of refrigerant loads. Psychometry. Methods of heating, cooling and air conditioning of buildings.
Examples:
• Study and design of water supply systems installations.
• Study and design of sewerage systems installations.
• Design and design of lifting installations (elevators for people and loads).
• Study and design of gas fuel installations.
• Study and design of fire safety systems installations.
• Study and design of installations of mild energy systems (photovoltaic systems, solar systems, wind turbines).
• Study and design of swimming pools.
• Study and design of production machinery installations in the handicraft industry.
• Examples of E/M installations.
• Design of E/M installations using computer and software.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In the classroom with physical presence of students. In more detail: THEORY Delivery from headquarters using ppt projection and by solving applications in the table. PRACTICE/EXERCISES Presentation and analysis of issues on the study of electromechanical applications and installations with the use of appropriate software and with the use of ppt projection. LABORATORY Student practice in a laboratory-based environment using computed programs for solving applications.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of electronic presentation media (slides in Power point). Use of the e-Class course website (Outline, Predicted Chart, Implemented Chart, Information for semester work, Lecture material - Notes and presentations). Providing additional material on the course website (e-Class) and supporting the learning process by providing notes with selected additional exercises and illustrated examples on the website or through the courses Ms-Teams platform. Communication with students is usually done face to face and -in special circumstances- by messages via e-mail and an exclusive team on the courses MS-Teams platform.
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	10
Exercise lectures	10

	Laboratory-based assisted solving of applications	40
	Non-guided personal study	40
	Study preparation-application design (semester project)	50
	Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek/ English (Erasmus) **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** • Written examination with short answer questions (Concluding) • Written exams with multiple choice questions (Concluding) • Written assignment (Formative) For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work, as well as in the elaboration and public presentation of the project (theoretical study). The final grade of the course consists of: • Final written examination in the entire course content (60%), • Elaboration of semester project/laboratory-based projects/work (40%) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Electromechanical Design Handbook 3rd Edition, Ronald Walsh, McGraw-Hill Professional, 2021
2. Electrical Installation Design Guide 2nd Edition, P. Cook, The Institution of Engineering and Technology, 2013
3. Building Technology: Mechanical and Electrical Systems, B. Stein, John Wiley & Sons, 1996
4. Design of Mechanical and Electrical Systems in Buildings 1st Edition, J. Trost, Pearson, 2003

INDUSTRIAL DESIGN II

COURSE: 7008 INDUSTRIAL DESIGN II

(1) GENERAL

SCHOOL:	Engineering			
DEPARTMENT:	Industrial Design and Production Engineering			
LEVEL OF STUDY:	Undergraduate			
COURSE UNIT CODE:	**7008**	**SEMESTER OF STUDY**	**7**	
COURSE TITLE:	Industrial Design Ii			
COURSEWORK BREAKDOWN			**TEACHING WEEKLY HOURS**	**ECTS Credits**
Various teaching methods			(2 THEORY + 2 LABORATORY) **4**	**5**
COURSE UNIT TYPE:			Scientific area course / specialization / skill development	
PREREQUISITES:	No			
LANGUAGE OF INSTRUCTION/EXAMS:	Greek			
COURSE DELIVERED TO ERASMUS STUDENTS	Yes			
COURSE WEB PAGE (URL)	https://eclass.uniwa.gr/courses/IDPE327/			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will be able to: 1. Knowledge of shaping, connection and technical characteristics of materials 2. Knowledge of solving complex issues of industrial product design 3. Basic knowledge of industrial design principles 4. Basic knowledge of ergonomics - anthropometry as basic parameters of industrial design In detail, students will be able to: 1. Apply rapid prototyping techniques 2. Customize the integrated design process 3. Compile design specifications for products and systems of complex structure and functionality 4. Write a project description for the design of an innovative product or system 5. Design and implement a physical and digital prototyping program according to the requirements of the different stages of the process
General Skills
• Search, analyze and synthesize data and information, using design tools • Adaptation to new situations: Evaluation • Decision Making: Synthesis of techniques for the solution of medium-sized complex projects. • Autonomous work: Knowledge of development tools and use • Teamwork: Ability to dialogue and collaborate to develop a new product and draft design specifications • Working in an international environment: Ability to look for solutions within the international community and ask for help. Communication skills in international languages, respect for diversity • Production of new research ideas: • Project design and management: Design of new projects with respect for the natural environment with ecological awareness and demonstration of social, professional and moral responsibility and sensitivity to gender issues • Exercise criticism and self-criticism • Promoting free, creative and inductive thinking • Aesthetic and functional analysis of products • Drafting design specifications • Creative capture of problematic situations • Morphological analysis and optimization of complex systems • Holistic picture of the product and systems development cycle • Support for collaboration between design / engineering teams • qualitative and quantitative Evaluation of the derivatives of the design process

(3) SYLLABUS

The Industrial Product Design II course delves into Industrial Product Design on issues of not only design but also innovation. The educational goal is the observation of human activity, the field research but also the production of physical and digital prototypes that are still a

precondition for the [re] feeding of the process with elements of high validity, with the difference that the teams have to compile their own their action plan, specialized in the requirements of their design project. The multidimensional functionality and inherently greater complexity of design objects require more extensive research and analysis, while the greater number of design specifications increases the importance of producing individual design solutions during the design phase.

The contents of the course include:

1. Basic principles of industrial design (product design).
2. The process of industrial design.
3. The stages of the industrial design process.
4. Production of ideas (concept stage) - evaluation of ideas.
5. Design and product design.
6. Modeling-Prototyping of industrial products.
7. Factors influencing the industrial design process.
8. Aesthetics and industrial design - Product life cycle.
9. Sustainability and environment-Circular economy.
10. Anthropometry-ergonomics: Basic parameters of industrial design
11. Ergonomics vs design
12. Formwork, connection and use of materials: the other dimensions of industrial design.

(4) TEACHING METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING ORGANISATION</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>72</td></tr>
<tr><td>Laboratory work</td><td>36</td></tr>
<tr><td>Personal study</td><td>42</td></tr>
<tr><td>Total Contact Hours and Training (30h/ECTS)</td><td>150 (5 ECTS)</td></tr>
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<tr><td>ASSESSMENT METHODS</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation

Student assessment methods
• Written examination</td></tr>
</table>

	• Laboratory/project work For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work. The final grade of the course consists of: • Final written examination in the entire course content (60%), • Elaboration of laboratory-based projects/work (40%). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) RESOURCES

- Recommended Bibliography: *1.Ulrich K., Eppinger S., "Product Design and Development", TZIOLA Publications.* *2. David Littlefield, "Architectural Composition: Building Design Data", KLEIDARITHMOS Publications* *3. Skourboutis E., "Theory Notes".* *4. Cheirchanteri Georgia, "Industrial Product Design. The communication role of Graphic Design through standardization"., Athens, 2017, University Studio Press publications*.

BUSINESS INTELLIGENCE AND BIG DATA ANALYSIS

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
DEPARTMENT:	Industrial Design and Production Engineering		
LEVEL OF STUDY:	Undergraduate		
COURSE UNIT CODE:	**7009**	**SEMESTER OF STUDY**	**7**
COURSE TITLE:	Business Intelligence And Big Data Analysis		
COURSEWORK BREAKDOWN		**TEACHING WEEKLY HOURS**	**ECTS Credits**
	Lectures	3	4
	Practice Exercises	1	1
	Total	**4**	**5**
COURSE UNIT TYPE:	Scientific area course / specialization / skill development		
PREREQUISITES:	-		
LANGUAGE OF INSTRUCTION/EXAMS:	Greek, English		
COURSE DELIVERED TO ERASMUS STUDENTS	Yes		
COURSE WEB PAGE (URL)	**https://eclass.uniwa.gr/courses/IDPE184/**		

(2) LEARNING OUTCOMES

Learning Outcomes
The aim of the course is to introduce students to the methods and techniques of modern Business Intelligence, Analytics in the age of Big Data. Initially the field was only about Classical Decision Support Systems which evolved with Data Warehouses and Data Mining to reach the use of Machine Learning and Data Science in predictive models that are cutting edge technologies. The goal is to turn data into knowledge with the aim of making more effective business decisions. Emphasis is placed on modern data analysis techniques, regardless of volume and format, in order to better support and make decisions. Upon completion of the course students will have: *1. Understanding of the methods of optimizing business performance using Business Intelligence systems* *2. Adequate knowledge of algorithms and modern techniques of analytical and machine learning of small and large volumes of data regardless of modality* *3. Ability to analyze problems and applications that require the use of Business Intelligence methods with predictive models based on machine learning* *4. Skills of developing machine learning applications for problem solving and creating predictive models* *5. Experience in using open source tools such as Scikit-learn, Hadoop / MapReduce, Apache Spark.* *In detail, students will be able to:* *1. Recognize and categorize decision problems.* *2. Analyze a big data problem in structured, semi-structured or unstructured format.* *3. Choose the appropriate method for efficient processing and analysis of big data.* *4. Understand the differences between algorithms and choose the optimal algorithm for each problem.* *5. Select the appropriate software tools for the implementation of the Business Intelligence system to solve the problem.* *6. Apply data analysis, data visualization, machine learning techniques for pattern recognition, trend detection, forecasting and knowledge mining.* *7. Evaluate the performance of the Business Intelligence system based on predictive modeling techniques.*
General Skills
The course aims to equip students with the following general skills: • Search, analysis and synthesis of data and information, using the necessary technologies. • Autonomous work. • Production of new research ideas. • Project design and management. • Work in an interdisciplinary environment • Exercise criticism and self-criticism • Promoting free, creative and inductive thinking

(3) SYLLABUS

- 1. Introduction to Business Intelligence
- 2. Decision Support Systems
- 3. Problem Modeling
- 4. Data visualization
- 5. Decision Making with Data Analysis

- 6. Introduction to the concept of big data
- 7. Big data handling
- 8. Intelligent decision support systems
- 9. Types of learning, supervised, unsupervised, reinforcement learning
- 10. Regression, classification, clustering, time series prediction
- 11. Open source computing tools in Python language for implementation of machine learning models and big data Hadoop / MapReduce, Apache Spark
- 12. Applications of machine learning algorithms in small and large data related to real world problems
- 13. Management of business intelligence projects

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-class face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-Class and Moodle platforms • Specialised software tools for experimentation • Support of the educational process via the e-Class and Moodle platforms
TEACHING ORGANISATION	

Method description / Activity	***Semester Workload***
Lectures	78
Laboratory work	13
Project-based assignments	39
Non-guided self-study	20
Total	***150***

ASSESSMENT METHODS	**Language of Assessment** Greek,English **Student assessment methods** • Written assignment plus oral presentation (40%) • Written exams (60%) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) RESOURCES

- Recommended Bibliography:

- Κύρκος, Ε.. Επιχειρηματική Ευφυΐα & Εξόρυξη Δεδομένων, Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. 2015
- Dean J., Big Data, Data Mining, and Machine Learning, Wiley, 2014
- Ramesh, S & Dursun, D., Turban, E.. Business Intelligence, Analytics and Data Science A Managerial Perspective, 4rd edition, Pearson. 2018
- C.M.Bishop Pattern Recognition and Machine Learning,Springer,2011
- S Theodoridis and K Koutroumbas, PatternRecognition, Academic Press 4thedition, 2008
- Σταλίδης, Γ. και Καρδαράς, Δ.. Διαχείριση Δεδομένων και Επιχειρηματική Ευφυΐα,
- Θεωρία και εφαρμογές για Στελέχη επιχειρήσεων, Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. 2015
- Galit Shmueli, Nitin R. Patel, and Peter C. Bruce,. Data Mining for Business Analytics: Concepts, Techniques and Applications in Python,Willey. 2019
-

- Relevant Scientific Journals:

Art, Technology and Culture

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**7010**	**SEMESTER**	**7**
COURSE TITLE:	Art, Technology and Culture		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	3
Laboratory		1	2
		4	**5**
COURSE TYPE:	Special background, skill development		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE212/		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion: - Students will have sufficient basic and advanced knowledge of general principles of technology applied in the study of artworks, archaeological artifacts and cultural goods. - They will possess advanced knowledge and skills about new technologies applied in

Cultural Heritage materials in a way that demonstrates professionalism.

- They will be able to solve complex and unpredictable problems related to the proper selection of a method for studding an archaeological material or artwork.
- Also, they will be able to solve specific problems related to cultural heritage
- He will have developed a critical awareness of the various issues when Technology is applied on Cultural Heritage
- They will be able to develop new knowledge and processes and integrate cutting-edge knowledge from different scientific fields.
- In terms of skills, they will be able to manage complex work environments and problems and develop new approach strategies.

General Competences

1. Search for, analysis and synthesis of data and information, with the use of the necessary technology
2. Adapting to new situations
3. Decision-making
4. Working independently
5. Team work
6. Working in an international environment
7. Working in an interdisciplinary environment
8. Production of new research ideas
9. Project planning and management
10. Respect for difference and multiculturalism
11. Respect for the natural environment
12. Production of free, creative and inductive thinking

(3) SYLLABUS

Art as an expression of thoughts and feelings, as aesthetics

Technology as a mean of implementation, as tools and processes, as skills and applied Knowledge.

Interdisciplinary approach of the relation of art, culture and technology

History of art. Art movements. Evolution of Technology.

Tangible and intangible cultural heritage.

Fine arts and new technologies

Applied arts and industrial design.

Special subjects of art and technology: non-destructive analyses of cultural heritage materials for revealing their chemical composition. Archaeometry. 3D digitalization and 3D printing. Reconstruction and Photogrammetry.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face and distance learning</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs in theoretical teaching and use of ICTs in lecturing
• Use of ICTs for the communication with students via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>30</td></tr>
<tr><td>Non-guided personal study</td><td>81</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
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<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Final exams with several type of questions such as multiple choice, short-answer questions and problem solving.

Student assessment methods
• Final Exams: 70%
• Final written laboratory work/essay/reports: 30%
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Liritzis I.(ed) New technologies applied to archaeological sciences, Dardanos Publications. 2008
2. Mpounia A, Nikonanou N. Oikonomou M, Technology In The Service Of Cultural Heritage, Apostolakis publications. 2008
3. Arnheim, Rudolf, Art and Visual Perception: A psychology of the creative eye; The New Version, University of California Press, 1997

- Related academic journals:

- *Journal of Archaeological Science, Elsevier*
- *Journal of Cultural Heritage, Elsevier*
- *Heritage, MDPI*

English Terminology I

COURSE OUTLINE

1. GENERAL

SCHOOL:	Engineering		
DEPARTMENT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	7011	**SEMESTER**	**7th**
COURSE TITLE:	English Terminology I		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Various forms of teaching	4	5

COURSE TYPE:	Special Background
PREREQUISITE COURSES	No
LANGUAGE OF INSTRUCTION and EXAMINATION:	Greek and English
IS THE COURSE OFFERED TO ERASMUS STUDENTS?	YES
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE328/

2. LEARNING OUTCOMES

Learning Outcomes
Upon successful completion students will: 1. Comprehend scientific texts pertinent to their field of studies whether globally (global understanding) or in detail (scanning-thorough comprehension). 2. Possess knowledge of the terminology and syntax of scientific texts through diverse strategic methods 3. Analyse the organisational structure and elements of scientific discourse on multiple levels (sentence, paragraph and text level) 4. Produce written texts of different types (instructions, description of components, functions and processes) 5. Produce academic essays and professional correspondence 6. Familiarise themselves with strategies of analysing special authentic technical texts (printed and electronic versions) More specifically students will be able to: 1. Possess knowledge of and use technical texts, technical and scientific vocabulary and the terminology associated with the field of studies. 2. Extract special information from texts about devices/machines, components, structures and processes. 3. Comprehend, recognise, and describe the structure and function of devices/ machines and components. 4. Nrespond to their academic duties (access to email, textbooks, scientific journals, research programmes) 5. Develop skills of understanding written discourse 6. Develop oral speech skills 7. Develop listening comprehension skills of oral speech.
General Competences

- Search, analysis and synthesis of data and information using the necessary technologies
- Independent work
- Group work
- Work in a scientific context
- Work in an interdisciplinary context
- Respect of diversity and multiculturality
- Ability to (self) critique
- Fostering free, creative and inductive thinking

3. SYLLABUS

Authentic texts, pertinent to the scientific fields of the programme of studies:

- Product Development
- Control Systems
- Computer-Aided Manufacturing
- Robotics
- Environmental Science
- Alternative Sources Of Energy
- Protection of The Environment
- Fundamentals of Management
- Distribution Systems
- Internet of Things
- Assembly Lines
- Industrial Engineering to The Emergence of Digital Engineering
- Job Related Skills

4. TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs in theoretical teaching, in assignment submission and for the communication with students via the e-class platform
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	39
Laboratory work	13
Independent study	98
Course Total (30h/ECTS)	***150***

STUDENT PERFORMANCE EVALUATION	**Language of Assessment:** Greek and English **Student assessment methods:** Written exam 80% Assignment 20% The assessment criteria are announced to students at the beginning of the semester and are published on the

	course webpage on the e-Class platform.

5. SUGGESTED BIBLIOGRAPHY

1. Various Internet sources
2. Specialised authentic texts
3. Tutor's notes

8th SEMESTER

Additive Manufacturing Processes - 3d Printing

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**8001**	**SEMESTER**	8
COURSE TITLE	Additive Manufacturing Processes - 3d Printing		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Exercises	3	3
Exercises on the Board / Tutorial	0.5	1
Laboratory	0.5	1
	4	5

COURSE TYPE:	Scientific field
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE269/

(2) LEARNING OUTCOMES

Learning outcomes
Upon completion of the course, students will have: **1.** Full knowledge and understanding of digital technology used in prosthetic processing / 3D printing. **2.** Knowledge about the historical evolution of the methods of prosthetic processing / 3D printing (how it started, how it evolved, where we are today). **3.** Knowledge and broader view of digitally guided manufacturing machines, learning the advantages and disadvantages of comparative methods. **4.** In detail, students will be able to: **5.** To make prototypes and end-use objects, knowing in detail all the stages of 3D printing (how we start from a CAD file and end up in the final made object). **6.** Utilize the different 3D printing technologies (FDM, SLA, SLS, etc.) depending on the dimensional characteristics of each object. **7.** To select the appropriate material for each 3D printing application according to the criteria set by each possible application (optimal mechanical behavior, resistance to sunlight, resistance to salinity and / or acidic environments) **8.** Successfully adjust the process parameters in the printer software (slicer software) for optimal print quality **9.** To enrich the knowledge they have gained about the mechanical design of 3D objects with computer in previous semesters and to properly export the files that are compatible with 3D printers.

General Competences
Upon completion of the course students will have acquired broader knowledge and critical ability in a developing technology field such as 3D Printing. They will be able to carry out projects related to modern product development, from the research and development stage (design and fabrication of prototypes) to the final fabrication of the product using digital processes according to the current trends in the fabrication sector. By systematically practicing the above acquired knowledge, the student develops skills for searching, analyzing and synthesizing new data and information, using the internet and bibliographic research and networking. Gains the ability to make decisions, through the elaboration of possible solutions and finding the best, utilizing the given resources and time constraints. This ability is sharpened through the elaboration of the assigned tasks and exercises.

(3) SYLLABUS

1. Teaching Aids
In addition to the recommended literature, all original material will be available to be used during the theoretical lectures, in the form of notes either electronically or in writing to students.
2. Visual Media (use of ppt, videos, demonstration materials, etc.)
During the teaching, originally produced Powerpoint presentations (ppt), originally produced videos but also selected from the internet, as well as 3D printing consumables as well as portable 3D printers (laboratory part of the course) will be used to familiarize students with technology and the materials used in it.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY:	Face to Face, Distance Learning (if required).
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Use of ICT in teaching, laboratory education, communication with students.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Laboratory exercise</td><td>26</td></tr><tr><td>Project preparation</td><td>23</td></tr><tr><td>Self-study</td><td>62</td></tr><tr><td></td><td></td></tr><tr><td>Course total (30h/ECTS)</td><td>150</td></tr></table>
STUDENT PERFORMANCE EVALUATION	**Language of Evaluation:** Greek **Methods of Evaluation:** • Written final exam, with problem solving questions (70%). • Individual and group work (project), with intermediate and final oral examination (30%). The evaluation criteria are announced to the students

	at the beginning of the semester and are posted on the course website in eClass.

(5) ATTACHED BIBLIOGRAPHY

1. Kantaros, A., Piromalis, D. (2021). Employing a Low-Cost Desktop 3D Printer: Challenges, and How to Overcome Them by Tuning Key Process Parameters, International Journal of Mechanics and Applications, 10(1): 11-19. doi:10.5923/j.mechanics.20211001.02
2. Ngo T. et.al. Additive manufacturing (3D printing): A review of materials, methods, applications and challenges. 2018, Composites Part B: Engineering, Volume 143,
3. Kumar. K. et.al. Rapid Prototyping, Rapid Tooling and Reverse Engineering. De Gruyter; 1st edition (8 Jun. 2020)
4. Lansdown H. Digital Modelmaking: Laser Cutting, 3D Printing and Reverse Engineering. The Crowood Press Ltd (4 Jun. 2019)
5. 3D Printing and Additive Manufacturing State of the Industry, Annual Worldwide Progress Report, Wohlers Report. 2019. Wohlers Associates, Inc., Fort Collins, Colorado 80525 USA, ISBN 978-0-9913332-1-9

Industrial Automation - PLC

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**8002**	**SEMESTER**	**8**
COURSE TITLE:	Industrial Automation - PLC		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	3	3
Laboratory	1	2
	4	**5**

COURSE TYPE:	Scientific area
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE210/

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, students will be able to: 1. Describe, identify and evaluate the operation of real industrial automation systems

2. Configure PID controllers using specialized tuning methods (Zeigler-Nichols, Cohen-Coon etc.)
3. Design industrial automation solutions based on Programmable Logic Controllers (PLC)
4. Design and evaluate industrial automation applications using Distributed Control Systems (DCS) as well as Supervisory Control and Data Acquisition (SCADA)
5. Design, organize and evaluate industrial automation solutions using complex techno-economic specifications.

General Competences

Search, analysis and synthesis of data and information, using the necessary technologies; Adaptation to new situations; Decision making; Autonomous working; Teamwork; Exercise of criticism and self-criticism; Promoting free, creative and inductive thinking.

(3) SYLLABUS

- Introduction to the operation of industrial control systems.
- Performance and specifications of Industrial Automation - evaluation criteria for Automation solutions.
- Industrial Processes and Industrial Controllers.
- Proportional, Integral, Differential Controllers (PID)
- Controller tuning methods (Ziegler-Nichols, Cohen-Coon)
- Digital control, Discrete time control systems
- Advanced industrial control methods
- Design of controllers with state equations
- Structure and operation of Programmable Logic Controllers (PLC).
- PLC programming and applications, typical applications
- Industrial SCADA and DCS applications
- Project management regarding complete industrial application systems development

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Laboratories • Assignments & Presentations
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	39
Laboratory work	13
Project-based assignments	30
Fieldwork	15
Non-guided personal study	53
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** • Written examination (Concluding) • Public presentation (Formative) The final grade of the course consists of: • Final written examination in the entire course content (60%). • Presentation of team projects, including individual oral examination (40%). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- «Βιομηχανική Πληροφορική», Βελώνη Αναστασία, εκδ. Τζιόλας κ Υιοί, 2017 [Εύδοξος 68369657]
- «Προγραμματιζόμενοι Λογικοί Ελεγκτές», Petruzella F., εκδ. Α. Τζιόλας κ Υιοί, 2018 [Εύδοξος 59421534]
- «Μηχανική Λογισμικού Συστημάτων Βιομηχανικού Ελέγχου», Χασάπης Γ., εκδ. ΕΑΗΣ «Κάλιππος», 2016 [Εύδοξος 59303594]
- «Βιομηχανικός Έλεγχος», Κουμπουλής Φ. Ν., εκδ. Νέων Τεχνολογιών, 1999 [Εύδοξος 3745]
- «Programming Siemens Step 7 (TIA Portal), a Practical and Understandable Approach, 2nd Edition, Jon Stenerson, David Deeg, 2019, ISBN-13: 978-1090954770
- «Automating with SIMATIC S7-1500 : Configuring, Programming and Testing with STEP 7 Professional, Hans Berger, 2017, ISBN13 9783895784606
- «Introduction to Programmable Logic Controllers», Dunning G., εκδ. Thomson-Delmar, 2005

Production Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**8003**	**SEMESTER**	**8**
COURSE TITLE:	Production Systems		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY**	**ECTS**

	TEACHING HOURS	CREDITS
Theory (Lectures)	3	4
Laboratory	1	1
	4	**5**

COURSE TYPE:	Skills development
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE

(2) LEARNING OUTCOMES

Learning Outcomes

Upon completion of the course students will have:

- in-depth knowledge of the scientific field of modern Production Systems, with emphasis on the development of the following skills:
  - Design and programming of production systems
  - Production Control
  - Scheduling of Production Systems Works
  - Inventory Control in Production Systems
  - Making Forecasts in Production Planning

In detail, the student should be able to:

- To know and fully understand the fundamental concepts, structure and operation of Production Systems
- To calculate the operating parameters of the Production Systems and to evaluate their performance.
- To design and program modern Production Systems.
- To develop and differentiate production processes as well as to compose new applications to upgrade their performance.
- To apply certification and quality improvement techniques of Production Systems.
- To know and apply regulations and recommendations related to social / professional ethics and environmental protection.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Teamwork
- Working in an international environment
- Work in an interdisciplinary environment
- Production of new research ideas
- Project Management.
- Promoting free, creative and inductive thinking

(3) SYLLABUS

- Introduction to the basic concepts of Production Systems. Role and objectives of production planning. Types of Production Systems. Productivity. Connection with environmental sustainability.
- Design and development of production processes.
- Planning of material requirements. Calculation of production start times. Supply Network Design. Whip effect (bullwhip effect). Resource management. ERP and MRP systems.
- Production control. Simple production and Just-In-Time (JIT) method. Traction type production control. Kanban method and its variants.
- Scheduling of works. Perform tasks on one or more parallel or series machines. Minimize time, task and cost parameters. Dynamic task scheduling.
- Inventory control and management. Items and related stock costs. ABC analysis. Mathematical order sizing models (EOQ, EPQ). Security stock level.
- Forecasts in production planning. Basic principles and forecasting methods. Prediction models. Selection of an appropriate forecast model. Check the accuracy of forecasts.
- Capacity planning and spatial planning of Production Systems. Location of facilities. Measurement and determination of capacity requirements. Location analysis. Types and design of spatial arrangements.
- Centralized production planning. Production plan types. Evaluation of current situation. Production plan preparation.
- Project management. Network design techniques. Completion time. Critical chain method.
- Production Systems Simulation with discrete event simulation software.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face
• Lectures
• Practice exercises
• Laboratories
• Assignments & Presentations</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching se of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>20</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>20</td></tr>
</table>
</td></tr>
</table>

	Non-guided personal study	58
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** The final grade of the course consists of: • Final written examination in the entire course content (6%), • Elaboration of laboratory-based projects/work (20%). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.	

(5) ATTACHED BIBLIOGRAPHY

- ***Suggested bibliography:***

1. Production and Business Operations Management: Design, Planning and Control in Production and Service Systems. Koulouriotis D. & Xanthopoulos A., A. Tziola & Sons Publications SA, Edition: 2nd / 2019, ISBN: 978-960-418-853-6 (Book Code in Eudoxus: 86056474)
2. Business Operations Management. Reid Dan R., Sanders Nada R., Kritiki Publications SA, Edition: 1st / 2016, ISBN: 978-960-586-044-8 (Book Code in Eudoxus: 59367825)
3. Production Management. Avlonitis. S., Tsotras Publications, Edition: 1st / 2019, ISBN: 978-618-5309-55-8 (Book Code in Eudoxus: 77271672)
4. Design and Management of Industrial Units. Adamidis E., Greek Academic Electronic Books and Aids - "Kallipos" Repository, Edition: 1/2016, ISBN: 978-960-603-328-5 (Book Code in Eudoxus: 59303646)

- ***Related academic journals:***

1. **International Journal of Operations and Production Management.** Publisher: Emerald. ISSN:0144-3577E-ISSN:1758-6593. http://www.ijsom.com/
2. **Operations Management Research.** Publisher: Springer Nature. ISSN:1936-9735E-ISSN:1936-9743. https://www.springer.com/journal/12063
3. **Manufacturing and Service Operations Management**. Publisher: Institute for Operations Research and the Management Sciences. ISSN:1523-4614E-ISSN:1526-5498. https://pubsonline.informs.org/journal/msom
4. **Foundations and Trends in Technology, Information and Operations Management**. Publisher: Now Publishers Inc. ISSN:1571-9545. https://www.nowpublishers.com/TOM
5. **Machines.** Publisher: Multidisciplinary Digital Publishing Institute (MDPI). E-ISSN:2075-1702. https://www.mdpi.com/journal/machines

Automatic Control Systems II

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**8004**	**SEMESTER**	**8**	
COURSE TITLE:	Automatic Control Systems II			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)			2	3
Tutorial/Practice			2	2
			4	**5**
COURSE TYPE:	Scientific area course / specialization / skill development			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE133/			

(2) LEARNING OUTCOMES

Learning Outcomes
Having successfully completed the course, students will be capable of: 6. Analyzing a system with respect to its operational and performance characteristics in open or closed-loop configuration. 7. Using standard controller design methods for delivering control solutions, which help to achieve the desired closed-loop system performance. 8. Forming a solid theoretical controller design background, useful for postgraduate control engineering studies.
General Competences
• Search for, analysis and synthesis of data and information, with the use of the necessary technology: The process of controller design for a system is critically based on the analysis and synthesis of operational system data using standard modeling and control methods. • Adapting to new situations: The controller design process helps the designer to develop his/her ability of adapting to new requirements with respect to the system's operational and performance settings. • Decision-making: The controller design process helps the designer to develop his/her decision-making capabilities, since these are prerequisites for the design process. • Working independently: The analysis and evaluation of a control solution using system control methodologies provides the student with a valuable theoretical tool for carrying out research and development tasks in an independent manner.

- Team working and working in an international environment: Knowing how to design and analyze some state-of-the-art control solutions is an advantage for any student wishing to participate in multi-cultural, multi-ethnic product development teams both in Greece and abroad.
- Working in an interdisciplinary environment: Designing control solutions for some state-of-the-art interdisciplinary applications helps developing the student's ability to communicate and work with team mates from various scientific fields.

(3) SYLLABUS

15. Steady state errors and stability in closed-loop representations, part I: Computing steady state errors, the influence of open-loop system type on steady state error, hints on the trade-off between closed-loop errors and stability.
16. Steady state errors and stability in closed-loop representations, part II: Stability assessment via the Routh criterion, the trade-off between closed-loop errors and stability revisited.
17. The root locus method: Closed-loop stability evaluation, controller design for transient response shaping and steady state error minimization.
18. Nyquist plots: Assessment of closed-loop stability and margins, hints on controller design.
19. Bode plots revisited: Design of closed-loop LEAD/LAG controllers based on the open-loop Bode plot.
20. System representation in State-Space, part I: The concept of state-space representation versus transfer functions, system eigenvalues and eigenvectors.
21. System representation in State-Space, part II: Solution of state-space equations via Laplace or eigenvalues/eigenvectors.
22. State feedback control.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Face-to-face lectures,
• Face-to-face laboratory exercises.
• Distance learning procedures for lecturing as well as distance training via simulated laboratory exercises used when required.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Tutorial Exercises/Lab Practice</td><td>26</td></tr>
<tr><td>Book/paper studying</td><td>28</td></tr>
<tr><td>Non-guided personal study</td><td>70</td></tr>
<tr><td>Total Contact Hours and Training (30h/ECTS)</td><td>150 (5 ECTS)</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek/English</td></tr>
</table>

	Description • Written examination contributing to 60% of overall grade. • Mid-term exams and laboratory exercises contributing to 40% of overall grade. The assessment criteria are communicated at the beginning of the semester and are published in the announcement section of the e-Class platform course webpage.

(5) ATTACHED BIBLIOGRAPHY

- Recommended Bibliography:

3. Dorf R. and Bishop R., Modern Control Systems, 12th ed, Prentice Hall, 2010.
4. Astrom K. J. and Murray R. M. Feedback Systems. Princeton University Press, ver 2.01b, 2009 available online
http://www.cds.caltech.edu/~murray/books/AM05/pdf/am08-complete_22Feb09.pdf

Non-destructive testing

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**8005**	**SEMESTER**	**8**
COURSE TITLE:	Non-destructive testing		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	3
Laboratory		1	2
		4	**5**
COURSE TYPE:	Special background, skills development		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE176/		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, students will have acquired comprehensive knowledge in a specialized field of technology, that of monitoring the proper operation of production

systems using methods that do not affect their integrity and functionality. These are cutting-edge methods applied in cases where traditional *invasive* diagnostic methods, namely shutting down and dismantling a production line to assess whether (or not) it is in proper operational condition, are not acceptable solutions. The student uses knowledge acquired in courses from past semesters, for instance methods related to non-destructive system excitation and response collection, or to digital data processing and use for identifying discrete-time system models. The aim is to combine this knowledge in an innovative way and introduce decision-making methods for evaluating whether the production system is properly functioning (or not).

Upon completion of the course, students will be able:

1. to distinguish the different categories of non-destructive techniques and system diagnosis methodologies and the applications and limitations of each category.
2. to use non-destructively acquired data in order to evaluate structural integrity and quality of materials and structures.
3. to monitor the "health" of a material or structure in order to assess the wear (aging) of this material or component.
4. to understand the two-way relationship between a system's response and its internal condition.
5. to combine knowledge on system modeling with signal analysis in order to draw conclusions on its internal structural condition.
6. to implement basic non-destructive methodologies in a digital computer and draw conclusions on their applicability in typical cases of system diagnosis.

General Competences

1. Search, analysis and synthesis of data and information, using the necessary technologies
2. Adaptation to new situations
3. Decision making
4. Production of new research ideas
5. Teamwork

(3) SYLLABUS

- Introduction to non-destructive testing
- Infrared thermography
- Ultrasonic testing
- UV/Vis/NIR reflectance spectroscopy with fiber optics
- X-ray Fluorescence Spectroscopy
- Fourier Transform Infrared Spectroscopy
- Raman vibrational Spectroscopy
- System modeling in a deterministic framework: Discrete time input/output structures
- System modeling in a stochastic framework: time-series with auto-regression characteristics (AR) and/or Moving Average (MA)
- Decision-making methodologies for fault diagnosis in deterministic systems
- Decision-making methodologies for statistical fault diagnosis in stochastic systems

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face and distance learning

<table>
<tr><td></td><td></td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>Use of ICT in teaching, laboratory education, communication with students.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>78</td></tr>
<tr><td>Laboratory work</td><td>20</td></tr>
<tr><td>Non-guided personal study, project writing in typical applications</td><td>52</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek
Student assessment methods
• Writing exams (50%)
• Midterm essay writing (50%)
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Μη καταστρεπτικές και φασματοσκοπικές μέθοδοι εξέτασης των υλικών, Κουή, Μαρία,Αβδελίδης, Νικόλαος,Θεοδωρακέας, Παναγιώτης,Χειλάκου, Ελένη 2015 http://hdl.handle.net/11419/6168

2. Ψηφιακός Έλεγχος, Κλασσικός Σύγχρονος Εξελικτικός Με Matlab, Σύρκος Γεώργιος, 2004

3. Ljung L. System Identification: Theory for the User, Prentice Hall information and system sciences series, 1999.

4. Fault-Diagnosis Applications. Model-Based Condition Monitoring: Actuators, Drives, Machinery, Plants, Sensors, and Fault-tolerant Systems. R. Isermann Springer-Verlag Berlin Heidelberg 2011, ISBN 978-3-642-12766-3

Internet of Things (IoT)

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering
ACADEMIC UNIT:	Industrial Design and Production Engineering
LEVEL OF STUDIES:	Undergraduate

COURSE CODE:	**8006**	**SEMESTER**	**8**
COURSE TITLE:	Internet of Things		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)	3	3
Tutorial/Project	0.5	1
Laboratory	0.5	1
	4	**5**

COURSE TYPE:	Specialised general knowledge, skill development
PREREQUISITES COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE185

(2) LEARNING OUTCOMES

Learning Outcomes

The course is a compulsory elective course (CE) of the 2nd Direction (Fundamental Sciences & Applied Technologies), aiming to introduce students the principles of Internet of Things (IoT), by offering them the necessary knowledge and skills to: a) architect, design and implement systems and applications, b) to analyze their overall performance as well as that of individual components, and c) to study techniques that will allow the development of innovative applications and system configurations for data collection, storage, process and analysis over heterogenous IoT platforms. In this context the course elaborates on the theoretical and practical extension of typical control systems with state-of-the-art technologies for remote management and monitoring of sensors and actuators, for data collection and analysis either at the network edges or at cloud environments, as well as for information visualization, decision making and resource management over IoT platforms. In this respect, communication and interoperability aspects among remote entities and subsystems (or applications) are also discussed, along with data security and information privacy issues related to diversified service scenarios (e.g. Smart Cities, Precision Farming, Cognitive Forestry, etc.). Upon successful completion of the course the student will be able to:

1. Understand the fundamentals of IoT architectures, the operational principles and the organization of Internet of Things systems and applications.
2. Knows, recognise and be aware of the tools used for the implementation and management of IoT systems, as well as the operation of the most widespread mechanisms for services and data provision/management over them.
3. Apply techniques for the analysis and the evaluation of the performance of IoTs, as well as mechanisms and methods for optimised operation.
4. Analyse and determine the principal characteristics of information transfer, caching, analysis and management over IoT infrastructures.
5. Interconnect various types of sensors (e.g. environmental sensors, infrared sensors, ultrasonic sensors, RTC) and actuators (e.g. relays and motors) with microcontrollers, program and install wireless sensor networks (Wireless Sensor Networks) over popular data communication protocols (e.g. Bluetooth, Ethernet, WiFi).
6. Control nodes via internet and / or mobile devices and collect, process, visualize data

related to sensor networks, as well as to propose solutions for the implementation and maintenance of IoT systems, and analysis of information that cross-through them by utilising international standards.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Work in an international environment
- Work in an interdisciplinary environment
- Promoting liberal, creative and inductive/deductive thinking

(3) SYLLABUS

Theoretical Lectures

- Sensors' classification and technologies
- Actuators' classification and technologies
- Microcontrollers' technologies
- Fundamental communication protocols
- Network technologies and interconnection protocols
- Sensor network technologies
- Wireless networking and LPWAN communication
- Organization and management techniques for the network and processing infrastructure on the server side – virtualization of resources and the edge computing paradigm
- Decision making and data processing techniques
- Closed loop distributed systems
- Interfaces and interaction protocols with emphasis on mobile and web-based implementations
- Machine-to-Machine (M2M) message exchange protocols
- Interaction between physical and virtual worlds
- Security issues related to data exchange and systems interconnection
- industrial Internet of Things and service scenarios for Smart Cities and Precision Farming

Laboratory

Projects aim to support the theoretical part of the course with emphasis on topics related to the exploitation of hardware and software tools the analysis of IoT operational characteristics, for studying data collection and analysis, sensor activation and management, the effects of wireless communication channels, and the security issues in IoT environments. The laboratory part is also focused on the implementation of IoT applications in Arduino and Raspberry Pi environments using various sensors and actuators related to the interconnection with the internet of different types of sensors (e.g. environmental sensors, infrared sensors, ultrasound sensors, RTC), as well as the interconnection with the internet of different types of actuators (e.g. relays and motors), including wireless communication utilising LoRaWAN standards, data collection, process, and analysis in edge-computing environments and sensor set-up and operation in simulated test conditions.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face
Lectures
Practice exercises
Laboratories
Assignments & Presentations</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>Use of ICTs theoretical teaching se of ICTs in lecturing
Use of ICTs in laboratory-based training
Use of ICTs for the communication with students via the e-class platform
Specialised software tools for experimentation
Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Tutorials</td><td>6</td></tr>
<tr><td>Laboratory work</td><td>12</td></tr>
<tr><td>Project-based assignments</td><td>9</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>9</td></tr>
<tr><td>Non-guided personal study</td><td>75</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
Written examination with short answer questions (Concluding)
Written exams with multiple choice questions (Concluding)
Written assignment (Formative)
Public presentation (Formative)
Laboratory/project work (Formative)
For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work, as well as in the elaboration and public presentation of the project (theoretical study). The final grade of the course consists of:
Final written examination in the entire course content (65%),
Elaboration of theoretical project (10%)
Public presentation of the project (5%),</td></tr>
</table>

	• Elaboration of laboratory-based projects/work (20%). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",1stEdition, Academic Press, 2014.*
- *Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer*
- *Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.*
- *Internet of Things Protocols and Standards, http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm*
- *Mark Weiser (1991) The computer for the 21st century. Scientific American, pp. 94–104*
- *Paul Dourish and Genevieve Bell, 2008. Yesterday's Tomorrows: Notes on Ubiquitous Computing's Dominant Vision. Personal and Ubiquitous Computing.*
- *Prolog, Chapter 1, and Chapter 4 from David Rose (2014) Enchanted Objects: Design, Human Desire and The Internet of Things, Scribner.*
- *Chapter 16, Nabaztag, an Ambiguous Avatar, from Mike Kuniavsky (2010) Smart Things, Ubiquitous Computing User Experience Design, Elsevier*
- *Rogers Y, Hazlewood W, Marshall P, Dalton NS, Hertrich S, (2010) Ambient Influence: Can Twinkly Lights Lure and Abstract Representations Trigger Behavioral Change?, UbiComp 2010*
- *The Secret Life of Electronic Objects - A Dunne, F Raby (2002) Design Noir: The Secret Life of Electronic Objects*

- Related academic journals:

- *IEEE Communications Magazine*
- *IEEE Internet of Things Journal*
- *IEEE Sensor Journal*
- *International Journal of Sensor Networks*
- *Future Generation Computer Systems*
- *IEEE Access*
- *Internet of Things - Journal – Elsevier*
- *MDPI Sensors*
- *IEEE Communications Surveys and Tutorials*
- *Springer Internet of Things*
- *Personal and Ubiquitous Computing – Springer*
- *Pervasive and Mobile Computing – Elsevier*
- *Pervasive Computing, IEEE*

INNOVATIVE DESIGN AND SUSTAINABLITY

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	8007	**SEMESTER**	8
COURSE TITLE	Innovative Design And Sustainablity		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Various teaching methods	4	5
Lectures, Laboratory and Practice Exercises		

COURSE TYPE	Specialised general knowledge
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

Upon completion of the course, students will have:

- Ability to design products and services based on the criteria of ecological-sustainable design, as well as ways to improve the design of products and services.
- Accepting the importance of sustainable product and service design
- Ability to apply appropriate product and service design procedures.
- Ability to identify and measure the impact of design on business performance.
- Search, interpret and implement all the laws and regulations that constitute the institutional framework for the safe operation of products or services, in combination with those of eco-design and labeling.
- Focus on creating value for the new product or service.
- Address the problems that arise during the design process of a new product or service, selecting the appropriate methods, tools and equipment to solve these problems.
- Compile studies on new products and services as well as the required technical documentation.
- Present and support product or service projects.

General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology *Decision making* *Working independently* *Teamwork* *Production of free, creative and inductive thinking* *Respect for difference and multiculturalism* *Respect for the natural environment*

(3) **SYLLABUS**

1. Introduction, concepts, evolution of concepts
2. The process of designing new products / services
3. Ecological design of products and services. National and European legislation. Ethics issues.
4. Ecological and sustainable design requirements.
5. Product / service design methodologies
6. The criteria for designing products and services
7. Performance Objectives and Quality
8. Ecological labeling of products
9. Product / service design and business performance
10. Test methods. Positioning of the final recipient/consumer
11. Technical documentation of new products / services
12. Business plan. Commercialization

(4) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in teaching, laboratory education, communication with students. Support of Teaching/Learning process through the electronic platform e-class	
TEACHING METHODS	***Activity***	***Semester workload***
	Lectures	26
	Laboratory practice	26
	Independent Study	68
	Course total	120

STUDENT PERFORMANCE EVALUATION	**I. Written final exam** (60%) (Inductive) which includes: - Multiple choice or right/wrong questions - Short-Answer Questions Purpose of evaluation: The comprehension test of the basic elements of the course. Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. **II. Laboratory Exercises** (40%) (Inductive): It concerns the topics covered by the laboratory courses Purpose of evaluation: The control of the students' progress in relation to the educational objectives, feedback and possible modification of the teaching (fine tuning). Evaluation criteria: The correctness, completeness, clarity and critical evaluation of the answers. The evaluation criteria are explicitly mentioned on the course site and for each evaluation action.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

In Greek:

- NORMAN A. DONALD, Σχεδιασμός των αντικειμένων της καθημερινότητας, εκδ Κλειδάριθμος, 2010
- ASHBY MIKE, JOHNSON KARA, Υλικά και Σχεδιασμός-Η τέχνη και η επιστήμη της επιλογής υλικών στον σχεδιασμό προϊόντων, εκδ Κλειδάριθμος, 2017
- Karl T. Ulrich, Steven D. Eppinger, Σχεδιασμός και Ανάπτυξη Προϊόντων, Έκδ Τζιόλας, 2015
- DESIGN: Ο σχεδιασμός των αντικειμένων στη σύγχρονη κοινωνία, Karl T. Ulrich, 2015, Νομική Βιβλιοθήκη

In English:

- Value Proposition Design: How to Create Products and Services Customers Want, Alexander Osterwalder and Yves Pigneur, Gregory Bernanda, Alan Smith, 2014, Wiley
- This is Service Design Thinking: Basics-Tools-Cases, Mark Stickdorn, WC-29931
- Design and management of service processes: keeping customers for life, R Ramaswamy, 1996, Addison-Wesley
- Design and marketing of new products, GL Urban, JR Hauser, 1980, Prentice Hall
- Concurrent Design of Products and Processes: A strategy for the next generation in manufacturing, JL Nevins, DE Whitney, 1989, McGraw-Hill
- Developing Products in Half the Time: New Rules, New Tools, Preston G. Smith and Donald G. Reinertsen, 1997, John Wiley & Sons
- Introduction to Product/Service-System Design, Sakao, Tomohiko, Lindahl, Mattias (Eds.) 2009, Springer

- Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Ben Reason, LavransLovlie, Melvin Brand Flu, 2016
- Designing for Service, Key Issues and New Directions, DanielaSangiorgi, Alison Prendiville (Eds), 2017, Bloomsbury

Intelligent Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**8008**	**SEMESTER**	**8**
COURSE TITLE:	Intelligent Systems		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	3
Tutorial/Project		0.5	1
Laboratory		0.5	1
		4	**5**
COURSE TYPE:	Scientific area course / specialization / skill development		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE264/		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course students will have: • Familiarity with the general objectives of Artificial Intelligence (AR), Artificial Neural Networks (ARN) and Genetic Algorithms (GA), with the aim of designing and developing intelligent systems. • A satisfactory level of knowledge about the fundamental principles and models of TNDs and GAs. • Knowledge and skills in tools that help in the development and design of TND. • Knowledge and skills for the study and application of GA in real problems. • A different way of dealing with the total optimization of complex systems with GA. In detail, students will be able to: • To understand the basic characteristics of the theory and methodologies of TND.

- Distinguish when and why we apply TND in a real system.
- Utilize tools and techniques for TND development.
- To model complex systems in which their mathematical modeling is complex.
- To know the tools and techniques for the development of GA.
- Be able to decide when and why we apply GA to a real system.

General Competences

- Ability to search, analyze and synthesize data and information, using the necessary internet technologies and bibliographic research and networking.
- Ability to make decisions, through the consideration of solutions and options for elaboration of the assigned laboratory tasks and exercises.
- Ability for autonomous work, through the elaboration of individually performed tasks and exercises.
- Ability for group work, through the elaboration of group tasks and exercises.
- Ability to plan, manage and evaluate projects, through the undertaking and elaboration of integrated works (project).
- Ability to generate new research ideas and inductive thinking by designing systems that operate in dynamic environments.

(3) SYLLABUS

Theoretical Lectures

- Introduction – Intelligent Systems
- Blind Search Algorithms
- Heuristic Search Algorithms
- Artificial Neural Networks: Basic Artificial Neuron Representation Models, Types of Activation Functions, Basic Architectural Structures of Neural Networks. Basic algorithms of the learning process.
- Perceptron algorithm (Algorithm foundation, convergence theorem and algorithm performance measure). Minimum Square Error Algorithm and ADALINE element training methodology).
- The Perceptron model of many mouths. The Back-Propagation training algorithm. The Generalized Delta Rule. Ways of training the network.
- Basic Genetic Algorithm.
- Structure of Genetic Algorithms, development of examples of how and where GAs are used.
- Optimization with or without restrictions

Laboratory

Projects aim to support the theoretical part of the course with emphasis on topics related to programming neuro-fuzzy systems using Matlab Neural Network Toolbox and programming Genetic Algorithms using Matlab Optimization Toolbox.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>

Use of ICTs theoretical teaching se of ICTs in lecturing
Use of ICTs in laboratory-based training
Use of ICTs for the communication with students via the e-class platform
Specialised software tools for experimentation
Support of the educational process via the e-class platform

</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Tutorials</td><td>13</td></tr>
<tr><td>Laboratory work</td><td>18</td></tr>
<tr><td>Project-based assignments</td><td>40</td></tr>
<tr><td>Non-guided personal study</td><td>40</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods

Written examination with answer questions
Written assignment
Public presentation
Laboratory/project work

For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work. The final grade of the course consists of:

Final written examination in the entire course content (60%),
Group work (project), with intermediate and final individual oral exam (40%)

The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.
</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Recommended Bibliography:

- S.J. Russell and P. Norvig.*Artificial Intelligence: A Modern Approach (3rd edition)*, Prentice-Hall, 2010.
- F. Karray and C. De Silva, Soft Computing and Intelligent Systems Desig, Addison-Wesley, 2004.

- Adrian A. Hopgood, Intelligent Systems for Engineers and Scientists, 3rd Edition, CRC Press, 2016.
- Kevin Gurney, An introduction to neural networks, UCL Press Limited, 1997.
- Michalewitz, Z. (1996), Genetic Algorithms + Data Structures5evolution Programs, 3rd ed., Springer, Berlin.
- Melanie Mitchell, An Introduction to Genetic Algorithms,MIT Press, Cambridge, 1998.

- Relevant Scientific Journals:

- International Journal of Intelligent Systems
- Journal of Intelligent & Fuzzy Systems
- Advances in Intelligent Systems and Computing
- International Journal of Computational Intelligence Systems
- International Journal of Intelligent Systems & Applications

Renewable Sources of Energy

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**8009**	**SEMESTER**	**9**	
COURSE TITLE:	Renewable Sources of Energy			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)			3	3
Laboratory			1	2
			4	**5**
COURSE TYPE:	Special background, skills development			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / English upon selected by foreign students			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)				

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion of the course students are expected to have acquired the following skills: • Description of reasons for the necessity of using RES

- Description of the methods of using solar energy and solar cells
- Analysis of photovoltaic manufacturing technologies and their use in everyday applications.
- Description of ways to use the energy of sea waves.
- Analysis of wind energy uses.
- Description of basic principles of geothermal and biomass.
- Analysis of hybrid power generation systems.

The aim is to acquaint students and engineers of other specialties with all the systems that can produce energy and gentle ways of producing energy.

General Competences

The general skills that are expected to be acquired during the course are:

1. Search, analysis and synthesis of data and information, using the necessary technologies.
2. Adaptation to new situations.
3. Decision making.
4. Autonomous work-Group work.
5. Working in an international environment.
6. Work in an interdisciplinary environment.
7. Production of new research ideas.
8. Project design and management.
9. Exercise criticism and self-criticism.
10. Promoting free, creative and inductive thinking
11. Search, analysis and synthesis of data and information, with the use of internet technologies and bibliographic research and networking.
12. Decision making, through the elaboration of solutions and options for the elaboration of assigned tasks and exercises.
13. Autonomous work, through the elaboration of individually performed tasks and exercises. Design and management of projects, through the undertaking and elaboration of integrated tasks (project).

(3) SYLLABUS

1. SOLAR ENERGY - SOLAR CELLS
1.1.Introduction
1.1.1. Solar Geometry
1.1.2.Solar map.
1.1.3. Solar radiation and its components.
1.2. Renewable Technology and Applications in Greece
Commitment of solar energy
1.2.1.1. Utilization of Solar Energy in Greece
1.2.1.2. Passive Building Design
1.2.2. Solar radiation
1.2.2.1 Solar radiation outside the earth's atmosphere.
1.2.3.2.Solar radiation on the ground surface.

1.2.3.4. Angle of incidence of sunlight
1.2.3.Solar radiation at an inclined plane
1.2.3.1. Hourly solar radiation at an inclined plane
1.2.3.2 Annual solar radiation at an inclined level

2. PHOTOVOLTAIC SYSTEMS
2.1.Characteristic curve and operating point of a photovoltaic cell
2.2.Types of photovoltaic cells
2.3.Silicon (Si) photovoltaic cells
2.3.1.T thin film photovoltaic cells
2.3.2. Other technologies
2.4.Main construction details of a photovoltaic cell
2.5.Photovoltaic frame and construction details
2.6.Photovoltaic array
2.6.1 Support and orientation of photovoltaic panels
2.6.2 Connecting frames and creating arrays
2.6.3 Construction details
2.7.Photovoltaic Systems
2.7.1 Categories of photovoltaic systems
2.7.2 Inverter / voltage converter
2.7.3 Charge controller / regulator
2.7.4 Electric Battery
2.7.5 Control panel
2.8.Specifications and guarantees
2.9.Cost of photovoltaic investments
2.10.Life cycle of photovoltaic panels
2.10.1 Production of photovoltaic panels
2.10.2 Recycling of photovoltaic panels
2.11.Advantages and disadvantages of photovoltaic systems
2.12.The situation on a global scale
2.13. The situation in Greece
2.14. Development perspectives

3. SEA WAVE ENERGY
3.1. Wave energy
3.1.1 Energy from the Sea Waves
3.1.2.Tidal energy
3.2.Historical Survey of Wave Energy
3.3. Energy from waves
3.4.1. Types of wave energy exploitation
3.4.2 Advantages of wave energy
3.4.3 Disadvantages of wave energy
3.4.Wave energy recovery devices depending on the generation
3.4.1. First generation devices
3.4.2.Second generation devices
3.4.3 Third generation devices
3.5. Main Types of Wave Energy Exploitation Systems
3.5.1 Offshore Facilities
3.5.2 Facilities Near The Mainland
3.5.3 Offshore Facilities
3.5.4.Pelamis
3.5.5Known Floating systems
3.6.The effects of wave energy on the environment
3.6.1 Abduction of wave energy

3.6.2 Charge on pollutants
Disagreement with other uses of the sea
3.6.4 Visual nuisance from the coast
3.7.Marine potential and Marine energy
3.7.1 Tidal or Sea Currents
3.7.2 Exploitation of Tidal or Marine Currents
3.7.2.1 Exploitation of Sea Currents
3.7.2.2 Tidal Dams
3.7.3.Wave Energy
3.7.4 Exploitation of Wave Energy
3.7.5 Surface Temperature Difference - Ocean Bottom
3.7.6 Exploitation of the Temperature Difference Surface - Bottom of the Oceans
3.7.7 Difference of Water Salinity or Osmotic Energy
3.7.8 Exploitation of water salinity difference or Osmotic energy
3.7.9 Assessment of Theoretical Marine Potential

4. WIND ENERGY
4.1 Wind Energy
4.2.Wind generators: Categorisation, Types
4.3. Wind Turbine Evaluation Parameters
4.4. Utilisation of Wind Energy in Greece

5. GEOTHERMIE-BIOMASS
5.1.3 Geothermal Energy
5.1.1 Domestic Uses of Geothermal
5.1.2 Geothermal energy in Greece
5.1.3 Geothermal Applications
5.1.2. Energy from Biomass

6. APPLICATIONS OF RES

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of ICT in Teaching Learning process support through e-class Use of computer programs (PPT, GNU OCTAVE, R) in lectures. Utilisation of the HEAL-LINK system for access to the international bibliography - specialised journals of the subject. Communication with students via e-class and e-mail.
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	39
Laboratory work	26
Paper and journal study	10

	Non-guided personal study	75
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek / English **Description** Final exams with several type of questions such as multiple choice, short-answer questions and problem solving. The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Gilbert M. Masters, E SBN: 978-960-546-743-2

- Related academic journals:

- All IEEE, Elsevier, Springer, Oxford University Press, Kluver Verlag etc

DESIGN AND DEVELOPMENT OF NANO DEVICES

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**8010**	**SEMESTER**	8
COURSE TITLE	Design And Development Of Nano Devices		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	2	3
Practice Exercises	2	2
Total	**4**	**5**

COURSE TYPE:	Special Background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION	Greek

and EXAMINATIONS:	
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	No
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE/

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course students are expected to: • Thoroughly know and comprehend the theory and laws of nanostructures and nanomaterials, the manufacturing principles of nanodevices design and production. • Knowledge of the main techniques for characterizing nanomaterials. • Apply procedures and control of production to estimate nanomaterials properties, analyze structures, processes and techniques for optimization and quality assurance of nanodevices. • Develop and evaluate nanodevices technology, methods and characterization of nanostructures. Specifically, students will be able to: • Describe and identify techniques, recognize the design needs of nanodevices, select their production equipment. • Assess the capabilities and uses of nanomaterials. • Combine traditional structures and modern nanostructures, design products with improved features, develop techniques of nanomaterials. • Compare different nanomaterials, evaluate their performance, support their correct application.
General Competences
1. Search for, analysis and synthesis of data and information. 2. Adapting to new situations with assessment and improvement of nanomaterials. 3. Decision making, by combining and use of nanomaterials science principles. 4. Team working, ability to criticism and self-criticism. 5. Generation of new research ideas with free, creative, inductive thinking.

(3) SYLLABUS

Introduction to Nanotechnology. Basic concepts of nanoscale. Nanostructures and nanomaterials. Properties and classes of nanomaterials. Scaffolds. Cellulose nanofibers and nanofibrils. Carbon based nanomaterials, nanofibers and nanostructures. Polymer nanocomposites, nanofibers, nanoobjects. Electrospun nanofiber. Electrospun scaffolds. Metal oxide nanoparticles and semiconductors. Metal-organic frameworks. Hybrid nanofibers and nanomaterials. Synthesis and development of nanostructures. Nanosensors. Bionanocomposites. Smart nanomaterials. Nanostructures and and nanomaterials characterization methods. Atomic Layer Deposition. Chemical vapor deposition. Thin films. Nano coatings. Nanostructures and nanomaterials applications.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY: .	Face to Face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Use of ICT in teaching, laboratory education, communication with students.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>72</td></tr><tr><td>Laboratory exercises</td><td>36</td></tr><tr><td>Personal study</td><td>42</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>**Course total**</td><td>**150**</td></tr></table>
STUDENT PERFORMANCE EVALUATION	**Language of Evaluation:** Greek **Methods of Evaluation:** • Written Examination: 60% • Laboratory Exercise: 40%

(5) ATTACHED BIBLIOGRAPHY

R. Vajtai, (Ed.), Springer Handbook of Nanomaterials, Springer Science and Business Media (2013).
R. A. Andrievski, Review of Thermal Stability of Nanomaterials, Journal of Materials Science, 49(4), 1449–1460 (2014).
V. Pokropivny, R. Lohmus, I. Hussainova, A. Pokropivny, S. Vlassov, Introduction to Nanomaterials and Nanotechnology, Ukraine: Tartu University Press (2007).
A. Majumdar, Thermoelectricity in Semiconductor Nanostructures, Science, 303(5659), 777–778 (2004).
C. Bréchignac, P. Houdy, M. Lahmani, (Eds.) Nanomaterials and Nanochemistry, Springer Science and Business Media (2008).

English Terminology II

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
DEPARTMENT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	8011	**SEMESTER**	**8th**
COURSE TITLE:	English Terminology II		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Various forms of teaching		4	5
COURSE TYPE:	Special background		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION	Greek and English		

and EXAMINATIONS:	
IS THE COURSE OFFERED TO ERASMUS STUDENTS?	YES
COURSE WEBSITE (URL))	-

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion students will: 1. Comprehend scientific texts pertinent to their field of studies whether globally (global understanding) or in detail (scanning-thorough comprehension). 2. Possess knowledge of the terminology and syntax of scientific texts through diverse strategic methods 3. Analyse the organisational structure and elements of scientific discourse on multiple levels (sentence, paragraph and text level) 4. Produce written texts of different types (instructions, description of components, functions and processes) 5. Produce academic essays and professional correspondence 6. Familiarise themselves with strategies of analysing special authentic technical texts (printed and electronic versions) More specifically students will be able to: 1. Possess knowledge of and use technical texts, technical and scientific vocabulary and the terminology associated with the field of studies. 2. Extract special information from texts about devices/machines, components, structures and processes. 3. Comprehend, recognise, and describe the structure and function of devices/ machines and components. 4. Nrespond to their academic duties (access to email, textbooks, scientific journals, research programmes) 5. Develop skills of understanding written discourse 6. Develop oral speech skills 7. Develop listening comprehension skills of oral speech.
General Competences
▪ Search, analysis and synthesis of data and information using the necessary technologies ▪ Independent work ▪ Group work ▪ Work in a scientific context ▪ Work in an interdisciplinary context ▪ Respect of diversity and multiculturality ▪ Ability to (self) critique ▪ Fostering free, creative and inductive thinking

(3) SYLLABUS

Authentic texts, pertinent to the scientific fields of the programme of studies:

- Product Development
- Control Systems
- Computer-Aided Manufacturing
- Robotics
- Environmental Science
- Alternative Sources Of Energy
- Protection of The Environment
- Fundamentals of Management
- Distribution Systems
- Internet of Things
- Assembly Lines
- Industrial Engineering to The Emergence of Digital Engineering
- Job Related Skills

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of ICTs in theoretical teaching, in assignment submission and for the communication with students via the e-class platform
TEACHING METHODS	***Method description / Activity*** | ***Semester Workload***
	Lectures | 52
	Laboratory work | 40
	Independent study | 58
	Course Total (30h/ECTS) | ***150***
STUDENT PERFORMANCE EVALUATION	**Language of Assessment:** Greek and English **Student assessment methods** Written exam 80% Assignment 20% The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage on the e-Class platform.

(5) SUGGESTED BIBLIOGRAPHY

1. Various Internet sources
2. Specialised authentic texts
3. Tutor's notes

9th SEMESTER

Robotics

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**9001**	**SEMESTER**	**9**	
COURSE TITLE:	Robotics			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)			3	3
Laboratory			1	2
			4	**5**
COURSE TYPE:	Scientific area course / specialization / skill development			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE263/			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, students will have: 1. Thorough knowledge and critical understanding of the basic concepts and themes of Robotics, with emphasis on the industrial applications of Robotics. 2. Knowledge and skills for the recognition, formulation and analysis of practical Robotic systems, and especially those using Industrial Robotic Arms. 3. Knowledge and problem solving skills of design, programming and Robotics Debugging System. More specifically, students will be able to: 1. Identify and list the basic parts of a Robotics system and in particular, the subsystems that make up a complex integrated Robotics device. 2. To formulate in the form of a diagram of functional and informational connections (architecture) and in the form of a structural and functional diagram a Robotics system. 3. List and describe common composition and programming problems of an industrial Robotics system. 4. Explain, in the form of a short report, the methods and techniques of dealing with common problems of organizing robotic work in industrial applications.

5. Formulate, in the form of a short report or appropriate timing diagrams or code examples, the control function in a Robotics system.
6. Design and present examples of integrated Robotics device (hardware, software) with sensors, action instruments, control unit.
7. Formulate the mathematical description, and use appropriate mathematics and computer tools for the numerical solution and simulation of kinematics and dynamic behavior of an Industrial Robotic Arm.
8. Formulate mathematical models and systems for the automatic control of the movement of an Industrial Robotic Arm.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Work in an international environment
- Work in an interdisciplinary environment
- Promoting liberal, creative and inductive/deductive thinking

(3) SYLLABUS

Theoretical Lectures

- Introduction: Background of robotics, the mechanics and control of mechanical manipulators, robotic applications.
- Structure ("architecture") of Robots: structural characteristics of robots, basic concepts.
- Geometric features of robots.
- Background of kinematics: Descriptions-positions, orientations and frames, Operators-translations, rotations, transformations, Transformation arithmetics.
- Manipulator kinematics: Link description, The Denavit-Hartenberg method and solution, Actuator space, joint space and Cartesian space, Examples for industrial manipulators.
- Inverse manipulator kinematics: solvability, algebraic and geometrical solution methods, Pieper's solution when the three axes intersect.
- Jacobians: Linear and rotational velocities of rigid bodies, Jacobians, Singularities
- Trajectory generation: General considerations on path description and generation, Joint space schemes, Cartesian space schemes.
- Linear control of manipulators: Feedback and closed loop control, Second-order linear systems, Control of second-order systems, Trajectory-following control, Modeling and control of a single joint.
- Robotic Project Planning: organization and flow of information, hardware and software in the industrial environment

Laboratory

Projects aim to support the theoretical part of the course with emphasis on topics related to programming robotic manipulators working in 3D environment cluttered with obstacles. The laboratory part is also divided into two sections: programming a SCARA robot to accomplish a task in a simulation environment and programming a robotic arm to execute simple tasks in a real environment.

(4) TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-class face-to-face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of ICTs theoretical teaching se of ICTs in lecturing
• Use of ICTs in laboratory-based training
• Use of ICTs for the communication with students via the e-class platform
• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>40</td></tr>
<tr><td>Journal/paper reading & theoretical study</td><td>18</td></tr>
<tr><td>Non-guided personal study</td><td>40</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, laboratory evaluation and project evaluation

Student assessment methods
• Written examination with answer questions
• Written assignment
• Public presentation
• Laboratory/project work
For the successful completion of the course the students must obtain a grade of ≥5.0 in both the final written examination and the laboratory work. The final grade of the course consists of:
• Final written examination in the entire course content (60%),
• Group work (project), with intermediate and final individual oral exam (40%)
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Recommended Bibliography:

- John J. Craig, Introduction to Robotics: Mechanics and Control, 3rd edition, Pearson Education, 2009.
- Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, Robot Modeling and Control, Wiley, 2006.
- Kevin M. Lynch and Frank C. Park,Modern Robotics: Mechanics, Planning, and Control, Cambridge University Press, 2017.
- Alonzo Kelly, Mobile Robotics: Mathematics, Models, and Methods, Cambridge University Press, 2013.*
- Bruno Siciliano and Oussama Khatib, eds. Springer Handbook of Robotics, Springer, 2008.
- Matthew T. Mason**,** Mechanics of Robotic Manipulation (Intelligent Robotics and Autonomous Agents series, The MIT Press Reader, 2001.

- Relevant Scientific Journals:

- IEEE Robotics and Automation Letters
- The International Journal of Robotics Research
- IEEE Transactions on Robotics
- Robotics and Autonomous Systems
- Robotics and Computer-Integrated Manufacturing
- Autonomous Robots
- Journal of Intelligent & Robotic Systems
- International Journal of Advanced Robotic Systems
- Journal of Mechanisms and Robotics

Self-Driving Vehicle Design

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**9002**	**SEMESTER**	**9**
COURSE TITLE:	Self-Driving Vehicle Design		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	4
Laboratory		1	1
		4	**5**
COURSE TYPE:	Scientific area course / specialization / skill development		
PREREQUISITES COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek, English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE325/		

(2) LEARNING OUTCOMES

Learning Outcomes
Self-driving vehicles are the future of smart transportation and promise more affordable, lower cost and above all safer transportation options. Automated vehicles at various levels of autonomy and driverless vehicles, sometimes known as autonomous vehicles, will soon play an important role in the way people and goods move from point A to point B. The approach this course takes on the design of self-driving vehicles in the one of the application of Artificial Intelligence in the driving task of a vehicle without a driver. In the laboratory part of the course students will design and implement autonomous vehicle behaviors in an simulation environment using open source tools. The final project of the course requires the system design and development of a control system for navigating a self-driving car around a track in a simulation environment. Upon completion of the course students will have: 1. Adequate knowledge of the terminology, design requirements and safety assessment of self-driving vehicles 2. Ability to analyze self-driving vehicle problems and applications that require the use of Artificial Intelligence methods 3. Ability to design individual functions of a driverless vehicle, based on machine learning, computer vision and probabilistic robotics. 4. Skills to develop machine learning applications to solve problems related to autonomous driving 5.Experience in using open source tools and simulators of autonomous vehicles through programming in Python and Java language.
General Competences
The course aims to equip students with the following general skills: • Search, analysis and synthesis of data and information, using the necessary technologies. • Autonomous work. • Production of new research ideas. • Project design and management. • Work in an interdisciplinary environment. • Exercise criticism and self-criticism. • Promoting free, creative and inductive thinking.

(3) SYLLABUS

- Introduction to self-driving vehicle design
- SAE autonomy levels
- Driverless vehicle sensors
- Perception of the environment
- Route planning
- Autonomous behaviors
- Machine learning and autonomous driving
- Neural networks for image recognition
- Autonomous driving architecture
- Main elements of self-driving software stack

- Implementation of a self-driving car in a simulation environment

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform • Specialised software tools for experimentation • Support of the educational process via the e-class platform
TEACHING METHODS	

Method description / Activity	***Semester Workload***
Lectures	39
Laboratory work	13
Project elaboration	50
Non-guided personal study	48
Course Total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek,English **Student assessment methods** • Written assignment plus oral presentation (30%) • Final project plus oral presentation (70%) The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) ATTACHED BIBLIOGRAPHY

- Recommended Bibliography:

- **«Τεχνητή Νοημοσύνη»,** Ι. Βλαχάβας, Π. Κεφαλας, Ν. Βασιλειάδης, Φ. Κόκκορας και Η. Σακελλαρίου-Δ' Έκδοση, 2020.
- **Μηχανική Μάθηση,** Κωνσταντίνος Διαμαντάρας, Δημήτρης Μποτσης, 2019
- **Artificial Intelligence: A Modern Approach**, S.J. Russell and P. Norvig, Fourth edition, 2020.
- **Introduction to Autonomous Mobile Robots,** Roland Siegwart, Illah Reza Nourbakhsh and Davide Scaramuzza, Second Edition, 2011.
- **Robotics, Vision and Control,** Peter Corke, Second Edition, 2017.

Cloud Computing

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering			
ACADEMIC UNIT	Industrial Design and Production Engineering			
LEVEL OF STUDIES	Undergraduate			
COURSE CODE	**9003**	**SEMESTER**	**9**	
COURSE TITLE	Cloud Computing			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**CREDITS**
		Theory (Lectures)	3	3
		Tutorial/Project	0.5	1
		Laboratory	0.5	1
			4	**5**
COURSE TYPE	Specialized general knowledge, skills development			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE301/			

(2) LEARNING OUTCOMES

Learning outcomes
The course aims to present the basic concepts and important capabilities offered today by cloud computing, to understand the supporting technologies and infrastructure required, to analyze the individual systems and techniques, to delve into programming technologies and application development , in the demonstration of the most important services offered, and in the application of all the above in areas of real problems and further research with emphasis on industrial applications and environments. Upon successful completion of the course the student will be able to: • recognize the basic features and capabilities provided by cloud computing, on which technologies its development is based, what are the distribution and service models it supports, etc. • understand what virtualization and virtual machines are, how they communicate with operating systems, how they are used in cloud computing, and how they are integrated into clusters and datacenters • explore and apply modern techniques and methodologies of analysis and design of systems and infrastructure in the cloud • delve into the architecture of applications, systems and distributed services over the cloud, and the mechanisms of distributed management, load distribution and balancing , and its high availability

- understand what cloud platforms and OS are and how to use them to develop integrated cloud solutions
- evaluate and design integrated solutions to transfer a company's cloud computing infrastructure and applications
- use programming technologies, integrated libraries, interfaces and tools offered for application / service development and cloud computing
- handle and utilize cloud applications and services offered to the end user by the various providers
- analyze advanced concepts of cloud computing, such as: capacity planning, workloads distribution, resource provisioning, load balancing, elasticity, high availability, cloudonomics, etc.

General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team work
- Adoption to new situations
- Working in an interdisciplinary environment
- Production of new research ideas
- Production of free, creative and inductive thinking

(3) **SYLLABUS**

The theoretical part of the course covers the sections:

1. Introduction to Cloud Computing: Definitions, key features, on which technologies its development is based, capabilities on the part of the developer and end user. The NIST model. The cloud cube model. Distribution and service models. IaaS, PaaS and SaaS concepts. The concepts of private, public, community and hybrid clouds, etc.
2. Virtual Machines - Computer Arrays - Datacenters: What are virtual machines and virtual machines (virtual machines - virtualization, types of hypervisor and supported types, containers, etc.),
3. Intermediate Software - Development Platforms: What are the interfaces and related development tools / platforms (toolkits / cloud platforms) and what is their importance for the development of services in the cloud, interface with lower levels (e.g. virtual machines)
4. Integrated service systems in the cloud (e.g. amazon), representative implementations e.g. Nimbus, Eucalyptus, OpenNebula, CloudStack, OpenStack etc.
5. Architectures - Design Issues: Cloud reference model, Capacity planning, Resource provisioning, auditing and monitoring. Workloads distribution, Load balancing, Resource pooling, Load testing and resource ceilings, Dynamic scalability, Elasticity. Cloud serverless architecture. Cloud computing & IoT (fog computing), etc.
6. Programming technologies - application development and scientific computing in the cloud: Available technologies and integrated libraries, integration of interactive applications and high-demand computing, interfaces required. Overview of relevant languages and tools (scripting languages, development tools, APIs - web services, microservices technology, etc.). Distributed file systems and big data management. Examples of usage and practice in the environments (indicative) of GAE / Google APIs and Hadoop / MapReduce, Spark.
7. Cloud applications / services for the end user: hosting services, office automation and collaboration services, web and mobile applications development services, big data processing and analysis services (big data processing and analytics), Overview of the main vendors (Google, Microsoft, Amazon etc.) and their services.
8. Integration technologies and environments (integration frameworks), integration

process design and modern methodologies
In the laboratory part of the course, students are introduced to cloud technologies, virtualization and integration such as Docker, Kubernetes, OpenStack. They design and develop application for industry.

(4) **TEACHING and LEARNING METHODS-EVALUATION**

DELIVERY	• Lectures • Practice Exercises • Laboratories • Assignments-Presentations
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in teaching, laboratory education (open source packages like VirtualBox), in submission of assignments and communication with students
TEACHING METHODS	

Activity	***Semesterworkload***
Lectures	40
Laboratories	30
Assignments	40
Personal study	40
Course total (30h/ECTS)	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** Methods of evaluation for theory (60%): - Final written exam with problem solving (100%) Methods of evaluation for Lab (40%) - Public Presentation Methods of evaluation: • Written Exam: 60% • Assignments: 40% The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

- Thomas Erl, Ricardo Puttini, Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 2013. [Ελληνική Μετάφραση: Σαμαράς Ιωάννης, Εκδόσεις Γκιούρδας, 2015]
- Velte Anthony T.,Velte Toby J.,Elsenpeter Robert P., "Cloud computing Μιαπρακτικήπροσέγγιση". 2010 (Κωδικός Ευδόξου 12250)
- Dan C. Marinescu, Cloud Computing: Theory and Practice, Morgan Kaufmann, 2013.
- Kris Jamsa, Cloud Computing, Jones & Bartlett Learning, 2012.
- Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
- Kai Hwang, Jack Dongarra, and Geoffrey Fox, Distributed and Cloud Computing, Morgan Kaufmann, 2011.

- Related academic journals:

- Transactions on Cloud Computing, IEEE
- Journal of Cloud Computing, Springer
- Future Computing and Informatics Journal, Springer

SMART MATERIALS

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**9004**	**SEMESTER**	9
COURSE TITLE	SMART MATERIALS		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures	2	3
	Practice Exercises	2	2
	Total	**4**	**5**
COURSE TYPE:	Special Background		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE/		

(2) LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course students are expected to: • Thoroughly know and comprehend the theory and laws of smart materials, the manufacturing principles of their design and production. • Apply procedures and control of production, analyze structures, processes and techniques for optimization and quality assurance of smart materials. • Develop and evaluate smart materials technology. Specifically, students will be able to: • Describe and identify techniques, recognize the design needs of smart materials, select their production equipment. • Explain the general characteristics of smart materials, assess the composition and their utility. • Combine traditional structures and modern advanced ones, design products with improved features, develop techniques of intelligent materials. • Compare different smart materials, evaluate their performance, support their correct application.
General Competences
1. Search for, analysis and synthesis of data and information. 2. Adapting to new situations with assessment and improvement of smart materials. 3. Decision making, by combining and use of materials science principles. 4. Team working, ability to criticism and self-criticism. 5. Generation of new research ideas with free, creative, inductive thinking.

(3) SYLLABUS

Introduction and basic concepts. Smart and intelligent products. Classification and properties of smart materials. The future of smart materials. Technology management and innovation strategies in the development of smart materials. Sustainability of smart materials. Applications of smart products (cars, constructions, fibers, fabrics). Polymer sensors. Smart products with embedded electronic functions. Materials sensitive to mechanical stimuli (contact, pressure, voltage, deformation) and applications. Soft expandable, transparent capacitors and sensors. Smart technology for textiles. Electrically active polymer materials. Electro conductive and semi conductive materials. Types and processes. Thermosensitive materials. Heat storage smart materials. Thermoregulating materials and products. Crosslinked substrates as intelligent materials. Permeation control through polymeric membranes.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY:	Face to Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Use of ICT in teaching, laboratory education, communication with students.

TEACHING METHODS	

Activity	Semester Workload
Lectures	72
Laboratory exercises	36
Personal study	42
Course total	**150**

STUDENT PERFORMANCE EVALUATION	**Language of Evaluation:** Greek **Methods of Evaluation:** • Written Examination: 60% • Laboratory Exercise: 40%

(5) ATTACHED BIBLIOGRAPHY

M. V. Gandhi, B. D. Thompson, Smart materials and structures, Springer Science and Business Media, (1992).
A. V. Srinivasan, D. M. McFarland, Smart structures, analysis and design, New York (2001).
M. Schwartz, Encyclopedia of Smart Materials, 2, Wiley-VCH (2002).
R. Bogue, "Smart materials: a review of capabilities and applications", Assembly Automation, 34 (1), 16–22 (2014).
W. D. Callister, Jr., Material Science and Engineering, An Introduction, Wiley, 9th Edition (2015).
D. Askeland, W. J. Wright, The Science and Engineering of Materials, 7th Edition (2017).

MARKETING

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**9005**	**SEMESTER**	**9**
COURSE TITLE	Marketing		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	3	3
Practice Exercises	1	2
Total	**4**	**5**

COURSE TYPE:	Special Background – Elective
PREREQUISITE COURSES:	They do not exist
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK

IS THE COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE189/

(2) LEARNING OUTCOMES

Learning outcomes
The course is designed to help students understand the concept, philosophy and role of Marketing in modern business. The course aims to familiarize students with the processes, methods and techniques of Marketing such as Strategic Business Planning, Marketing Planning and Process, Market Research and Consumer Behavior, Segmentation, Targeting, Product, Pricing, Distribution and Promotion - Communication Strategies. Upon successful completion of the course students are expected to: 1. Understand the philosophy, basic concepts and general principles of marketing and its importance in the operation and development of businesses. 2. Quickly understand all the processes and functions of marketing. 3. Recognize the elements of the marketing environment and explain how to make decisions. 4. Evaluate appropriate, on a case-by-case, strategies and marketing mix aiming to customer satisfaction. 5. Understand the whole marketing process in relation to ethical issues that arise and propose appropriate measures. 6. Utilize theoretical knowledge and practices in developing a comprehensive marketing plan for a business.
General Competences
• Search for, analysis and synthesis of data and information with the use of the necessary technology. • Adapting to new situations • Decision making. • Respect for difference and multiculturalism • Showing social, professional and ethical responsibility and sensitivity to gender issues • Working independently • Team work • Project planning and management • Criticism and self-criticism • Production of free, creative and inductive thinking to develop new strategic approaches. • Working in an international environment

(3) SYLLABUS

23. Marketing's Value to Consumers, Firms, and Society. Introductory Concepts and Definitions,
24. Evaluating Opportunities in the Changing Market Environment,
25. Final Consumers, Business and Organizational Customers and Their Buying Behavior,
26. Marketing Information Systems and Market Research,
27. Market Segmentation, Evaluation of the Attractiveness of Market Segments,
28. Focusing Marketing Strategy with Targeting and Positioning,
29. Marketing Mix,
30. Product Management, Product Life Cycle and New-Product Development,
31. Place and Development of Channel Systems,
32. Pricing Objectives and Policies,
33. Promotion—Introduction to Integrated Marketing Communications,
34. Strategic Marketing Planning. Implementation and Control of Marketing Plans.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY:</td><td>Face-to-face lectures.
Distance learning procedures for lecturing used when required.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:</td><td>Teaching using Information Technology, distance learning, Electronic Communication and Assignment.

Support of learning process and communication through the electronic platform e-class.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>40</td></tr>
<tr><td>Practice Exercises focusing on the application of methodologies and analysis of case studies on topics related to the taught modules in groups of students</td><td>29</td></tr>
<tr><td>Essay Writing & Presentation</td><td>21</td></tr>
<tr><td>Independent Study</td><td>60</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Evaluation: Greek

Methods of Evaluation:
• Mid-term progress test: 15%. The progress test includes only multiple choice questions.</td></tr>
</table>

	• Compulsory writing of essays related to case studies and respective presentations: 35%. • Written final exam: 50%. The written examination includes: short answer questions to clarify concepts, essay development questions and judgment questions for comparative evaluation of theory elements.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Greek:

1. Cannon P. Joseph, McCarthy E. Jerome, Perreault D. William. Jr. (2011). *Marketing: A Marketing Strategy Planning Approach,* 1st Greek edition, BROKEN HILL PUBLISHERS LTD. ISBN: 9789604891504.
2. Kotler, Philip και Keller, Kevin Lane (2017). *Marketing Management*. 15th American edition/2017, Athens, Klidarithmos. ISBN: 9789604617968.
3. Siomkos J. G. (2018). *Strategic Marketing* 5th edition/2018, BROKEN HILL PUBLISHERS LTD. ISBN: 9789925563685.
4. Paschaloudis D. (2018). *Introduction to Marketing*, 1st edition, *TZIOLA*, A., *PUBLICATIONS*, & SONS S.A. ISBN: 9789604187980.
5. Pantouvakis A., Siomkos J. G. and Christou E. (2015). *Marketing*, Athens, A.A. Livanis Publications. ISBN: 9789601429601.
6. Malliaris P., (2012). *Introduction to Marketing*. 4th edition. Athens, Stamoulis Publications. ISBN: 9789603519188.
7. Armstrong, G. and Kotler, P. (2009). *Introduction to Marketing*, EPIKENTRO PUBLISHERS (9th edition). ISBN: 9789604582014.
8. Tomaras P. (2009). *Introduction to Marketing and Market Research*, Personal Publication (4th edition). ISBN: 9609067409.
9. Siomkos J. G, Tsiamis I., Fotiadis T., *High-Tech and Industrial Marketing*, (2019), BROKEN HILL PUBLISHERS LTD. ISBN: 9789925575688.
10. Siomkos J. G and Fotiadis T., (2020), *Industrial Marketing*, 1st edition, BROKEN HILL PUBLISHERS LTD, ISBN: 9789925588022.
11. Porter, Michael (1980). *Competitive Strategy*. New York: The Free Press.
12. Levitt, Theodore (1960). *Marketing Myopia*. Harvard Business Review **38**(4): 45–56.

Foreign language:

18. Cannon P. Joseph, McCarthy E. Jerome, Perreault D. William. Jr. (2021)., Essentials of Marketing, 17th Edition, McGraw Hill.
19. Michael R. Solomon, Greg W. Marshall and Elnora W. Stuart, *Marketing: Real People, Real Choices*, 10th Edition, ©2020, Pearson.
20. Philip T. Kotler & Gary Armstrong, Principles of Marketing, 18th Global Edition, © 2020, Pearson.

- Related academic journals:

Journal of Marketing

Journal of Marketing Research

European Journal of Marketing

Journal of Academy of Marketing Science

Journal of Marketing Management

Journal of Services Marketing

Industrial Marketing Management

Journal of Customer Behaviour

International Marketing Review

- Websites:

www.ama.org (American Marketing Association)

www.emac.org (European Marketing Academy)

http://elam.gr/ (Hellenic Marketing Academy)

Methodology of research projects

COURSE OUTLINE

(1) **GENERAL**

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	Department of Industrial Design and Production Engineering		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	9006	**SEMESTER**	9
COURSE TITLE	Methodology of research projects		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Various teaching methodologies		4	5
COURSE TYPE:	Skills development		
PREREQUISITE COURSES:	NO		

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English upon selected by foreign students
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(2) **LEARNING OUTCOMES**

Learning outcomes
Upon successful completion of the course, students are expected to have acquired the following skills: •Familiarity with the terminology of scientific research. •Identification of the basic types of research. •Identification of the stages of organisation and conduct of research. •Preparation of a plan and implementation of quantitative and qualitative research •Ability to study and evaluate published scientific works. •Ability to search for bibliographic sources in valid scientific databases with a written report of the results. •Demarcation, formulation of questions and hypotheses for the investigation of new research topics. •Selection of sampling methods and research tools. •Checking the validity and reliability of the research process •Ability to prepare and write research dissertations in accordance with international standards for writing scientific papers.

General Competences
The general skills that are expected to be acquired during the course are: 1.Search, analysis and synthesis of data and information, using the necessary technologies. 2.Adaptation to new situations. 3.Decision making. 4.Autonomous work-Group work. 5.Working in an international environment. 6.Work in an interdisciplinary environment. 7.Production of new research ideas. 8.Project design and management. 9.Exercise criticism and self-criticism. 10. Promoting free, creative and inductive thinking 11. Search, analysis and synthesis of data and information, with the use of internet technologies and bibliographic research and networking. 12. Decision making, through the elaboration of solutions and options for the elaboration of assigned tasks and exercises.

13. Autonomous work, through the elaboration of individually performed tasks and exercises. Design and management of projects, through the undertaking and elaboration of integrated tasks (project).

(3) **SYLLABUS**

1.Introduction to the Methodology of Scientific Research. Institutional and ethical dimensions during the execution of a research.
2. The concept and importance of scientific research. Types of research. Research strategies. Stages of scientific research.
3. Identification, selection, delimitation and formulation of the research problem. Selection of research subjects. Means and techniques of data collection. Retrospective studies. Overview Surveys. Databases (Scholar, PubMed, Scopus, SCI).
4. Principles of data collection and analysis. Population sampling. Variables. Measurement uncertainties. Limitations from the existing apparatus. Research process design. Assumptions.
5. Data processing and analysis. Post-Analysis. GNU Octave Platforms, Matlab, R.
6. Research evaluation (impact factor, reports). Publications: Procedure and Ethics for writers, judges and readers.
7. Writing a scientific study.

(4) **TEACHING and LEARNING METHODS - EVALUATION**

<table>
<tr><td>DELIVERY</td><td>Face to face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of ICT in Teaching
Learning process support through e-class
Use of computer programs (PPT, GNU OCTAVE, R) in lectures.
Utilisation of the HEAL-LINK system for access to the international bibliography - specialised journals of the subject.
Communication with students via e-class and e-mail.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Practice Exercises focusing on the application of methodologies and analysis of case studies on topics related to the taught modules in groups of students</td><td>30</td></tr>
<tr><td>Essay Writing & Presentation</td><td>25</td></tr>
</table>
</td></tr>
</table>

	Independent Study: 43 **Course total: 150**
STUDENT PERFORMANCE EVALUATION	Language of Assessment: Greek-English Final written examination with: Multiple choice questions. Short Answer Questions.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

Quinlan Christina, Zikmund William
BROKEN HILL PUBLISHERS LTD
2017
68373083

Gall M.
BROKEN HILL PUBLISHERS LTD
2013
22767859

- Related academic journals:

All IEEE, Elsevier, Springer, Oxford University Press, Kluver Verlag etc

Cyberphysical Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**9007**	**SEMESTER**	9
COURSE TITLE	Cyberphysical Systems		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Exercises	3	3
Exercises on the Board / Tutorial	0.5	1
Laboratory	0.5	1
	4	5

COURSE TYPE:	Scientific field
PREREQUISITE COURSES:	None

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE322/

(2) LEARNING OUTCOMES

Learning outcomes
Upon completion of the course, students will have: 1. Thorough knowledge and excellent understanding of the theory and principles of Cyberphysical Systems as well as the methods of their design and application in existing systems. 2. Knowledge and skills in the analysis of application needs of Cyberphysical Systems, the design, organization, implementation, programming and operation of Cyberphysical Systems in the requested application. 3. Knowledge and skills of synthesis, evaluation and proposal of integrated Cyberphysical Systems. In detail, students will be able to: 1. Describe, analyze and specify a physical system. 2. To model and specify the design of the control system at the physical level. 3. To know and select the critical structural elements of the implementation of physical control systems. 4. To know and use the technologies of interconnection of physical and computer systems. 5. Apply data analysis and processing techniques at the governmental level. 6. To design and implement virtual and augmented reality applications. 7. Evaluate and propose the best cyberphysical systems design approaches.
General Competences
• Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations •Decision making • Autonomous work •Teamwork • Work in an international environment • Work in an interdisciplinary environment • Production of new research ideas • Project design and management • Respect for the natural environment • Promoting free, creative and inductive thinking.

(3) SYLLABUS

The content of the course is divided into 13 teaching units as follows: 1. Introduction to Cyberphysical systems and their applications 2. Interconnection of physical and computing environment

3. Hardware and hardware design architectures of integrated control systems
4. Wireless and wired sensor networks
5. Data portals and heterogeneous data networks
6. Cloud computing and data conversion into information
7. Modeling and identification of physical systems in Cyberspace
8. The level of cognitive function
9. Redefining functions and feedback to the natural environment
10. Virtual and augmented reality interfaces and sensors
11. Virtual and augmented reality software design
12. Modeling of physical processes
13. Security of cyberphysical systems

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY:	Face to Face, Distance Learning (if required).
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY:	Use of ICT in teaching, laboratory education, communication with students.
TEACHING METHODS	<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Laboratory exercise</td><td>26</td></tr><tr><td>Project preparation</td><td>13</td></tr><tr><td>Project writing</td><td>10</td></tr><tr><td>Self-study</td><td>62</td></tr><tr><td></td><td></td></tr><tr><td>**Course total (30h/ECTS)**</td><td>**150**</td></tr></table>
STUDENT PERFORMANCE EVALUATION	**Language of Evaluation:** Greek (English for ERASMUS students upon request). **Methods of Evaluation:** • Written final exam, (at the end of the teaching period): 60% • Laboratory Work: 40% • Optional Written Project (project): 20% (Its percentage is deducted from that of the Written Examination) The evaluation criteria are announced to the students at the beginning of the semester and are posted on the course website in eClass.

(5) ATTACHED BIBLIOGRAPHY

- Suggested Bibliography:

1. Embedded Systems Architecture for Agile Development [electronic resource]. Mohsen Mirtalebi, HEAL-Link Springer ebooks, Έκδοση: 1st ed./2017, ISBN: 9781484230510.
2. Kantaros, A.; Piromalis, D.; Tsaramirsis, G.; Papageorgas, P.; Tamimi, H. 3D Printing and Implementation of Digital Twins: Current Trends and Limitations. Appl. Syst. Innov. 2022, 5, 7. https://doi.org/10.3390/asi5010007
3. DebRoy, T.; Zhang, W.; Turner, J.; Babu, S.S. Building digital twins of 3D printing machines. Scr. Mater. 2017, 135, 119–124.

- Related scientific journals

• Cyber - Physical Systems. Publisher: Taylor & Francis. E - ISSN: 2333-5785

• ACM Transactions on Cyber - Physical Systems. Publisher: ACM. ISSN: 2378-962X EISSN: 2378-9638

• IET Cyber - Physical Systems: Theory and Applications. (Open Access) Publisher: Institution of Engineering and Technology. E - ISSN: 2398-3396

Transportation Systems Management

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering			
ACADEMIC UNIT:	Industrial Design and Production Engineering			
LEVEL OF STUDIES:	Undergraduate			
COURSE CODE:	**9008**	**SEMESTER**	**9**	
COURSE TITLE:	Transportation Systems Management			
INDEPENDENT TEACHING ACTIVITIES			**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)			3	3
Laboratory			1	2
			4	**5**
COURSE TYPE:	Specialised general knowledge			
PREREQUISITES COURSES:	No			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE220/			

(2) LEARNING OUTCOMES

Learning Outcomes
Upon completion of the course, students will have: 1. Thorough knowledge and critical understanding of subject matter of land, sea and air transportation systems as well as combined transportation systems. 2. Knowledge and skills for identifying, formulating and analysing decision problems for the design and management of transportation systems. 3. Knowledge and skills of formulating, simulating and analysing dynamic models of transportation system, with modern computer means. 4. Knowledge about the functional and technological synthesis of modern "intelligent" transportation systems, based on digital media.

In detail, students will be able to:

1. To identify and list the basic technologies for each category (branch) of transportation systems: land, sea, air, combined.
2. To distinguish the main effects of transportation systems on economy, on security and on the environment.
3. To formulate in the form of a diagram the main dynamic interfaces between the basic quantities involved in a transportation system.
4. Describe the common decision problems for the management of a transportation system and list the main parameters involved.
5. Describe the functional and technological composition of "intelligent" transportation systems, and evaluate relevant solutions to optimize the efficiency of a transportation system.

General Competences

The course aims to contribute to the acquisition of the following general skills:

1. Ability to search, analyse and synthesize data and information, using the necessary technologies of internet and bibliographic research and networking.
2. Ability to make decisions, through processing solutions and options for the elaboration of the assigned tasks and exercises.
3. Ability for independent work, through the elaboration of individually performed tasks and exercises.
4. Ability for group work, through the elaboration of group tasks and exercises.
5. Ability to plan and manage projects, through the undertaking and elaboration of integrated tasks (project).

(3) SYLLABUS

4. Physical elements of transportation systems: Infrastructure, terminals.
5. Transportation networks: land, sea, air and combined transport.
6. Land transportation (road, rail, urban): infrastructure and related technologies.
7. Maritime transportation: types of ships, port and related infrastructure, propulsion, communications, technologies, regulatory framework.
8. Air transportation: relevant infrastructure, regulatory framework, propulsion, communications, technologies.
9. Impact of transportation: economy, environment, security.
10. Models and analysis of the dynamics of transportation systems.
11. "Smart" or "Intelligent" Transport Systems (ITS), related information and communication technologies, added value.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face • Lectures • Practice exercises • Assignments
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform

<table>
<tr><td></td><td>• Specialised software tools for experimentation
• Support of the educational process via the e-class platform</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Method description / Activity</th><th>Semester Workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory work</td><td>13</td></tr>
<tr><td>Project-based assignments</td><td>40</td></tr>
<tr><td>Non-guided personal study</td><td>58</td></tr>
<tr><td>Course Total (30h/ECTS)</td><td>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Language of Assessment
Greek

Description
Written exams, project evaluation

Student assessment methods
• Written examination with short answer questions (Concluding)
• Written exams with multiple choice questions (Concluding)
• Written assignment (Formative)
• Laboratory/project work (Formative)
The final grade of the course consists of:
• Written final examinations, with problem solving questions (60%).
• Group assignments (assignments, study), with presentation and with group and individual examination (40%).
The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

12. Intelligent Transportation Systems: Functional Design for Effective Traffic Management 2nd ed. Gordon Robert, (2016), Springer
13. Transportation Systems, Singh S**.,** Martinetti A**.,** Majumdar A**.,** Dongen L**,** (2019), Springer
14. Transportation Systems Planning: Methods and Applications 1st Edition, Goulias G. Konstantinos, (2002), CRC Press

Project Management

(1) **GENERAL**

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF INDUSTRIAL DESIGN AND PRODUCTION ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	9009	**SEMESTER**	9
COURSE TITLE	Project Management		
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 and Practice Exercises		4	5
COURSE TYPE	Special background		
PREREQUISITE COURSES:	They do not exist		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://idpe.uniwa.gr/en/		

(2) **LEARNING OUTCOMES**

Learning outcomes
The course aims to provide knowledge and develop skills and competencies required for successful project and program management. Projects and programs include the design and implementation of a set of complex resource-intensive activities, within an agreed schedule, an estimated and acceptable budget, and the necessary technical specifications and requirements. In addition, the design, organization and management of projects is today a key professional occupation of modern engineering, organizations and companies operate more and more on a project basis in conjunction with the development of networks (extending the boundaries of their operation). Projects and networks coexist with their conventional organizational structures / functions and the range of products and services they produce and offer. The course seeks to highlight the interactions between time-cost and quality of the project, the role of the human factor and the environment in which the project is implemented, the importance of systematic monitoring of project progress and the need to manage the risk inherent in all projects. Upon successful completion of the course the student will be able to: 1. Understands the basic principles and concepts of project management.

2. Understands basic principles and techniques related to decision making
3. Understands basic concepts and tools related to project scheduling.
4. Understands basic concepts related to project costing and the relationship between time and cost.
5. Understands key concepts related to progress control and risk management.
And will have:
6. Familiarize yourself with basic methods and techniques applied for the analysis, planning and control of projects.
7. Familiarize yourself with computer project management tools.

General Competences
• *Project design and management.* • *Search, analysis and synthesis of data and information, using the necessary technologies.* • *Decision making.* • *Adaptation to new situations.* • *Autonomous work.* • *Demonstration of social, professional and moral responsibility and sensitivity.* • *Exercise criticism and self-criticism.* • *Promoting free, creative and inductive thinking.*

(3) **SYLLABUS**

More and more organizations are recognizing that they are "project-based", meaning that most of their value-added work is project-based. Projects, regardless of their nature, require an organized approach to their implementation, ie project management, as a necessary condition for their successful completion.
The main purpose of the course is to understand the importance and methods of good project management by familiarizing students with the main methods / techniques of project management, such as time planning), management and resource planning and financial monitoring of a project.
The course includes a complete overview of the activities of the project management, starting from the planning of the project process, the execution of the project and ending with the special knowledge - skills that the Project Manager should have, such as the methods of controlling a project, management human resources, problem solving as well as decision making. Finally, the course includes a laboratory part which teaches how to plan and manage projects through the use of MS Project software.
The contents of the course cover the following sections:
• Introduction to the Basic Concepts - Overview of General Terms
• Project Selection
• Project Organization and Management
• Project Planning
• Project Network Design
• Time Planning
• Cost and Quality Design
• Time Planning Techniques. Gantt Charts. The critical path method (CPM). Time Scheduling in Uncertainty Conditions. The PERT method. Resource Categories. Resource Allocation. Burden and Smoothing of Resources.
• Project Control

• Plan Analysis, Risk Management (location, recording, mitigation, review), Troubleshooting and Decision Making
• Project Completion and Review
• Multi-Criteria Project Evaluation Methods

(4) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Face to face and Distance learning (if required) and Laboratory Exercises.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Teaching using Information Technology, Laboratory Training using ICT, Electronic Communication and Assignment. • Presentation of specialized project management software (Microsoft MS Project). • Support of learning process and communication through the electronic platform e-class.
TEACHING METHODS	

Activity	***Semester workload***
Lectures	40
Computer Lab	20
Laboratory exercise	35
Independent study	55
Course total	*150*

STUDENT PERFORMANCE EVALUATION	Language of Assessment: Greek Assessment Methods: • Progress Test: 10%. The progress test includes only multiple choice questions. • Written final exam: 60%. The written examination includes which includes: short answer questions to clarify concepts, essay development questions, judgment questions, computational problem solving and comparative evaluation of theory data. • Examination in the laboratory: 30%. The lab test involves personalized troubleshooting in the MS Project software environment.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

Greek:

1. Kerzner, H. (2016), Project Management, 11th edition, A. Tziola & Sons Publications SA
2. Burke, R. (2014), Project Management: Principles and Techniques, Kritiki Publications, Athens.
3. Shtub A., Band J., Gliberson S. (2008), Project Management: Processes, Methodology & Feasibility Study, 2nd Edition, Epikentro Publications.
4. Chapman C., Ward S. (2009) Project Risk Management, 1st edition, Epikentro Publications.
5. Maylor, H. (2003), Project Management, 3rd English edition, Key Number Publications, ISBN: 9602098538.
6. Shtub A. (2008), Project Management, 1st edition, Epikentro Publications SA
7. Kirittopoulos, K. (2006), Project Risk Management Manual, Key Number Publications.

Foreign language:
1. Meredith J. R., Mantel Jr., S.J. (2008), Project Management: A Managerial Approach, Wiley publications.
2. PMI (2008), Project Management Body of Knowledge, Project Management Institute, USA.

- Related academic journals:
International Journal of Project Management.
International Journal of Project Organisation and Management.
International Journal of Managing Projects in Business.
The Journal of Modern Project Management.
Project Management Journal (PMI).
International Journal of Information Systems and Project Management.
International Journal of Information Technology Project Management.

Data Security and Protection

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Industrial Design and Production Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**9010**	**SEMESTER**	**9**
COURSE TITLE	Data Security and Protection		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Theory (Lectures)	3	3
	Tutorial/Project	0.5	1
	Laboratory	0.5	1
		4	**5**
COURSE TYPE	Specialized general knowledge, skill development		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE324/		

(2) LEARNING OUTCOMES

Learning outcomes
The course covers the general part of the scientific area of Data Security and Protection. The aim of the course is to create a very broad framework of theoretical and practical knowledge, which will equip the student for the labor market in the field of Security in Information Technology. Upon successful completion of this course, the student will: • know the problems of security and data protection in Information and Communication Systems as well as the distinction of data into sensitive, personal and private, • recognize the vulnerabilities of information and communication systems, • be able to apply basic security policy design principles, • know the features and security mechanisms that implement these policies (such as anonymity, encryption, etc.), • be familiar with examples that implement and apply security mechanisms in different Operating Systems, • have knowledge of Database Security, • know the different types of firewalls and how they are used and implemented, • be aware of authentication mechanisms, their role and importance, • be familiar with Computer Forensics and will be familiar with the tools that support them, • understand cryptography and cryptanalysis, and finally, • have understood the Intrusion Detection Systems, how they work and the techniques used in them
General Competences
• Search for, analysis and synthesis of data and information, with the use of the necessary technology • Working independently • Team work • Decision-making • Working in an interdisciplinary environment • Production of new research ideas • Production of free, creative and inductive thinking

(3) **SYLLABUS**

- General Information Security Issues in Information Technology (IT Security)
- Cryptography (mechanisms, algorithms, public encryption systems)
- Operating Systems Protection (Operating Systems Protection)
- Database Security (Data Base Security)
- Access Control
- Network and Distributed Systems Security
- Internet Security
- Attack Detection
- Computer Forensics
- Blockchain Technologies
- Risk Analysis
- Security Management
- Legal and Ethical Issues (GDPR)

(4) **TEACHING and LEARNING METHODS-EVALUATION**

DELIVERY .	• Lectures • Practical Exercises • Assignments-Presentations
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT in teaching, laboratory education in submission of assignments and communication with students
TEACHING METHODS	

Activity	***Semesterworkload***
Lectures	40
Assignments	50
Personal study	60
Course total (30h/ECTS)	**150**

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.*	**Language of Assessment** Greek **Description** Written exams, laboratory evaluation and project evaluation **Student assessment methods** Language of evaluation : Greek or English Methods of evaluation for theory - Final written exam with problem solving (60%) - Public Presentation (40%) Methods of evaluation: • Written Exam: 60% • Assignment: 40% The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.

(5) **ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

- Σουρής Α., Πατσός Δ., Γρηγοριάδης Ν., Ασφάλεια της Πληροφορίας, ΕΚΔΟΣΕΙΣ ΝΕΩΝ ΤΕΧΝΟΛΟΓΙΩΝ ΜΟΝ. ΕΠΕ, 2004, ISBN: 960-8105-66-8. 5. Κάτσικας Σ.Κ., Γκρίτζαλης Δ.,
- Γκρίτζαλης Σ., Ασφάλεια Πληροφοριακών Συστημάτων, Εκδόσεις Νέων Τεχνολογιών, 2004
- Stallings και Brown, Ασφάλεια Υπολογιστών: αρχές και Πρακτικές, 2016, ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, ISBN: 978-960-461-668-8.
- Γκρίτζαλης Σ., Γκρίτζαλης Δ., Κάτσικας Σ., Ασφάλεια Δικτύων Υπολογιστών, Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ ΟΕ, 2003, ISBN: 978-960-7530-45-5.
- Stallings, Κρυπτογραφία για Ασφάλεια Δικτύων Αρχές και Εφαρμογές, ΜΑΡΙΑ ΠΑΡΙΚΟΥ & ΣΙΑ ΕΠΕ, 2011, ISBN: 9789604117307.

- Related academic journals:

- International Journal of Information Security, Springer
- IEEE Transactions on Information Forensics and Security
- IEEE CyberSecurity

Design of Interactive Systems

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**9011**	**SEMESTER**	**9**
COURSE TITLE:	Design of Interactive Systems		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Theory (Lectures)		3	3
Laboratory practice		1	2
		4	**5**
COURSE TYPE:	Skills development		
PREREQUISITES COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/IDPE185		

(2) LEARNING OUTCOMES

Learning Outcomes
Upon successful completion of the course, the student acquires specialized knowledge and a holistic view of the principles, models and methods of Interactive Systems design, including cutting-edge knowledge in the design, modeling, development, evaluation and operation of innovative Interactive Systems. Also, during the course the student comes in contact and handles different technologies and different fields of application, thus developing a critical understanding of the relationship between methods and techniques on the one hand, and skills of continuous integration of human needs, requirements and constraints in the development of innovative technologies. In detail, the student should be able to: 1. Describe the conceptual framework of Human-Machine Interaction and the principles of operation of interactive systems. 2. Interpret the operation of interactive systems, evaluate their performance and calculate their operating parameters 3. To design modern interactive systems. 4. To develop and differentiate the functions of interactive systems 5. To compose new interactive applications and evaluate their performance based on operational and techno-economic specifications. 6. To evaluate and apply techniques for certification and improvement of the quality of interactive systems.

7. To know and apply regulations and recommendations related to social / professional ethics and environmental protection. *8.* To organize, coordinate and evaluate team work in the field of development of interactive systems and applications.
General Competences
Search, analysis and synthesis of data and information, using the necessary technologies • Adaptation to new situations • Decision making • Teamwork • Working in an international environment • Work in an interdisciplinary environment • Production of new research ideas • Project Management. • Promoting free, creative and inductive thinking

(3) SYLLABUS

- Expediency of Interactive Systems. Conceptual framework and object of study. The role of the user interface. Ease of use.
- Interaction. Definition and historical development. Basic stages of interaction design. Knowledge organization and mental models. Interaction and information retrieval models. Interaction programming technologies.
- Interactive Devices. Input-output device technologies. Input-output devices with sound and speech. Assistive technologies for people with special needs (disabled).
- Interaction style. Command language. Interaction with menus and forms. Graphic User Interfaces. Interaction in natural language. Direct handling. Accessibility technologies.
- Models and Methods of Designing Interactive Systems. Anthropocentric design. Requirements analysis methodology. Interface design and prototype development. Functionality and appearance of Interactive Systems.
- Tools and Methods for Designing Interactive Internet Applications. Peculiarities and rules of effective design. Search and Visualize Information. Principles and techniques of website information architecture. Navigation model evaluation.
- Interaction in 3D Space. Interactive augmented and virtual reality systems.
- Interactive Systems Evaluation Methods. Assessment tools and differentiating factors.
- Evaluation of Interactive Systems. Usability assessment methods. Economic usability assessment. Cost-benefit assessment. Net present value.
- Documentation and User Support. Measuring experience of using Interactive Systems.
- Modern Interactive Applications. Interaction experiments with users.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	In-class face-to-face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of ICTs theoretical teaching se of ICTs in lecturing • Use of ICTs in laboratory-based training • Use of ICTs for the communication with students via the e-class platform

TEACHING METHODS	***Method description / Activity***	***Semester Workload***
	Lectures	39
	Laboratory work	13
	Journal/paper reading & theoretical study	25
	Non-guided personal study	73
	Course Total (30h/ECTS)	**150**
STUDENT PERFORMANCE EVALUATION	**Language of Assessment** Greek **Student assessment methods** • Written examination: 70% • Multiple Choice Test (mid-term evaluation): 30% • Optional Written project (project): 20% * (Its percentage is deducted from that of the Written Exam). The assessment criteria are announced to students at the beginning of the semester and are published on the course webpage in the e-Class platform.	

(5) ATTACHED BIBLIOGRAPHY

- **Suggested bibliography:**

1. Interactivity Design. Preece J., Rogers Y. & Sharp H., Publications: Ch. Giourda & Co. EU, Edition: 4th / 2016, ISBN: 978-960-512-692-6. Book Code in Eudoxus: 59357418
2. Interaction Planning. Chorianopoulos K., Publishers: Korfiatis Ioannis, Edition: 1st / 2016, ISBN: 9786188242357 (Book Code in Eudoxus: 68371436)
3. Human-Computer Interaction: Principles, Methods and Examples. Koutsambasis K., Publications Key Number Ltd., Edition: 1st / 2011, ISBN: 978-960-461-439-4. (Book Code in Eudoxus: 12279101)
4. User Interface Design. Shneiderman B. & Plaisant C., A. Tziola & Sons Publications SA, 6th Edition 2016, ISBN: 978-960-418-655-6. (Book Code in Eudoxus: 59396199)
5. Introduction to Human-Computer Interaction. Avouris N., Katsanos Ch., Tselios N. & Moustakas K., Greek Academic Electronic Books and Aids - "Kallipos" Repository, Edition: 1/2016, ISBN: 978-960-603-407-7. (Book Code in Eudoxus: 320310)
6. User-Focused Interactive Systems Evaluation. Koutsambasis P., Greek Academic Electronic Books and Aids - "Kallipos" Repository, Edition: 1/2016, ISBN: 978-960-603-086-4 (Book Code in Eudoxus: 320155)

- **Related academic journals:**

6. Interacting with Computers. Publisher: Oxford University Press. ISSN:0953-5438E-ISSN:1873-7951. https://academic.oup.com/iwc
7. IEEE Transactions on Human-Machine Systems. Publisher: IEEE. ISSN:2168-2291. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6221037
8. International Journal of Technology and Human Interaction. Publisher: IGI Global

Publishing. ISSN:1548-3908E-ISSN:1548-3916. https://www.igi-global.com/journal/international-journal-technology-human-interaction/1084#table-of-contents Machines. Publisher: Multidisciplinary Digital Publishing Institute (MDPI). E-ISSN:2075-1702. https://www.mdpi.com/journal/machines

10th SEMESTER

COURSE OUTLINE

(1) GENERAL

SCHOOL:	Engineering		
ACADEMIC UNIT:	Industrial Design and Production Engineering		
LEVEL OF STUDIES:	Undergraduate		
COURSE CODE:	**10001**	**SEMESTER**	**10**
COURSE TITLE:	Thesis		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS CREDITS**
Project			30
ΤΥΠΟΣ ΜΑΘΗΜΑΤΟΣ	Skills development		
ΠΡΟΑΠΑΙΤΟΥΜΕΝΑ ΜΑΘΗΜΑΤΑ:	No		
ΓΛΩΣΣΑ ΔΙΔΑΣΚΑΛΙΑΣ και ΕΞΕΤΑΣΕΩΝ:	Greek, English		
ΤΟ ΜΑΘΗΜΑ ΠΡΟΣΦΕΡΕΤΑΙ ΣΕ ΦΟΙΤΗΤΕΣ ERASMUS	Yes (English)		
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)	idpe.uniwa.gr/		

(2) LEARNING OUTCOMES

LEARNING OUTCOMES
Having completed the preparation of the project, students will be able to: - evaluate and document the basic knowledge related to the subject of the research carried out - combine the data of the literature summarizing the existing offer at the level of scientific knowledge and know-how of the subject - define the characteristics of the scientific gap in the subject and the way in which the research carried out is expected to fill them - present the procedure and methodology for carrying out the stages of achieving the objective of the research carried out - analyze the problem by proposing one or more alternative solutions - design and simulate prototypes for the selected solution - evaluate the effectiveness of the proposed solution by analyzing relative advantages / disadvantages in relation to the results from similar cases in the Greek and international literature - prepare a study of scaling and implementation of the solution in real conditions / dimensions / environments - successfully write an extensive technical report on the subject and the proposed

solution and, in particular, present their work to a specialized audience

Upon completion of the work, specialized scientific skills are developed:

- In the search, analysis and synthesis of data and information, using the necessary technologies.
- Adapting to new situations as defined by the way information is provided, the different work environments in which the student will be asked to collect data, process it and generally exercise the activity necessary to achieve the goal of work.
- In the decision-making, for the evaluation of data, methodologies and their results that take place during the elaboration of a research work.
- In autonomous work when the student has to apply a methodology and produce a successful result, but also in group work, when different activities have to be coordinated for the organization and execution of eg a laboratory experiment necessary for implementation of the work.
- In the exercise of criticism and self-criticism, steps necessary for the proper organization and successful execution of the stages of elaboration of a research work.
- In the promotion of free, creative and inductive thinking, which allow the right combination of information, methods and research practices to achieve the desired result.
- o promote the integration of innovative practices that will improve the competitiveness of graduates as Engineers and will contribute positively to society

General Competences

Upon completion of the assignment students will have acquired skills:

- Search, study, analysis and synthesis of data and information, using specialized technologies and tools (software, computer programming, etc.)
- Autonomous work as required when writing a technical report
- Working in an interdisciplinary environment, as it results from the elaboration of research content work in an object related to more than one scientific field, as is the case in the vast majority of modern applications of Industrial Design and Production Engineer.
- Project design and management, as evidenced by the preparation of research content work that requires the collection of information and data and their processing in successive and clearly defined stages
- Promoting free, creative and inductive thinking, as required for the combination of large volumes of data, their creative exploitation in the most appropriate way (depending on the expected result) and their inventive combination and evaluation to achieve the final goal.
- Production of new research ideas, as is expected to happen when doing research work.

(3) SYLLABUS

Object:

The Diploma Thesis (D.T.) is a compulsory thesis of a minimum duration of a full academic semester and of considerable extent and depth, which is prepared by the graduate students in order to obtain the title of Industrial Design and Production Engineer. The successful completion of D.E. returns thirty credits (ECTS)

Preparation:

The D.T. is prepared under the responsibility of the student, with the continuous monitoring and support of the supervising member. The Department facilitates the smooth preparation and presentation of the P.O. through the mobilization of relevant available means and

resources. The extent of the processing of D.T. corresponds to an academic semester of full systematic employment, in an equivalent workload of the student of 900 hours. The actual completion time, depending on the response to the requirements of the subject and the degree of employment of the student, does not exceed two academic semesters.

Integration:

The deadline for delivery of the text of D.T. follows the academic calendar and, in any case, precedes the set examination date by at least ten days. The D.T. is submitted to the Secretariat of the Department in three copies which are forwarded to the members of the examination committee. Copy of D.T. in electronic form must be deposited in the electronic repository of the Central Library of the University and is publicly available. The text of the presentation of D.T. is delivered in the form of an electronic file, with standardization and marking of the approval of the Department, and includes among others: summary, summary in Greek and English, table of contents, bibliographic references.

(4) TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Face to face, use of laboratory infrastructure and software as required by the subject. Electronic Communication with the responsible faculty member, when required.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Language of Assessment Greek, English **Student assessment methods**: The examination and grading of D.T. is made by a three-member examination committee, consisting of the supervisor and two members with relevant or related specialization in the subject of D.T. The examination committee is formed by a decision of the Department Assembly after a reasoned suggestion of the Sector in which the Board of Directors has joined. • The examination is carried out with an oral and public presentation of the D.T. by the student before the examination committee, on a date within the time period specified in the academic calendar. The duration of the presentation is at least 30 minutes. • For the evaluation of D.T. The following criteria are mainly taken into account: updating the existing

Method description / Activity	*Semester Workload*
Study, Bibliography Analysis	150
Project preparation - analysis, design, simulation, evaluation	600
Thesis writing	150
Course Total	**900**

	knowledge with a corresponding bibliographic investigation, the collection of specific data (eg through laboratory experiments or field research), the logical processing, the originality of the work, the supervision of the specialization topic, the structure and quality of the deliverable, the zeal and initiatives of the student, the quality of the oral presentation. • The participation of the criteria in the evaluation is determined by a decision of the general assembly and is recorded in a grading form. The final score of D.T. appears as the arithmetic mean of the final scores of the three examiners, rounded to the nearest whole number or half on a scale of 0-10.