16 Σεπτεμβρίου 2016

Καθηγήτρια Μαίρη Κουτσελίνη – Ιωαννίδου
Πρόεδρο Συμβουλίου
Φορέα Διασφάλισης και Πιστοποίησης της Ποιότητας της Ανώτερης Εκπαίδευσης (ΦΔΠΠΑΕ)

Αξιότιμη κα. Πρόεδρε,

Θέμα: Παρατηρήσεις στην Έκθεση Εξωτερικής Αξιολόγησης για το Πτυχιακό Πρόγραμμα Σπουδών « Μηχανολογική Μηχανική»

Σε συνέχεια του ηλεκτρονικού σας μηνύματος, ημερομηνίας 07 Σεπτεμβρίου 2016, και της επισυναπτόμενης έκθεσης αξιολόγησης, παρακαλώ όπως βρείτε συνημμένα τα σχόλια / παρατηρήσεις στην έκθεση εξωτερικής αξιολόγησης για το πτυχιακό πρόγραμμα σπουδών Μηχανολογική Μηχανική.

Με εκτίμηση

Καθηγητής Φίλιππος Πουγιούτας
Πρύτανης

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UNIVERSITY OF NICOSIA
School of Sciences & Engineering

Απάντηση στην

‘Εκθεση Εξωτερικής Αξιολόγησης

του Προγράμματος Σπουδών «Μηχανολογική Μηχανική» του Πανεπιστημίου Λευκωσίας

Σεπτέμβριος 16, 2016

Σεπτέμβριος 16, 2016

Μέλη Επιτροπής Εξωτερικής Αξιολόγησης (ΕΕΑ)

Θέμα: Απάντηση στην Έκθεση της ΕΕΑ για το ΠΣ «Μηχανολογική Μηχανική»

Έντιμα μέλη της ΕΕΑ,

Θα θέλαμε να σας ευχαριστήσουμε για την εποικοδομητική συζήτηση που είχαμε την περασμένη Δευτέρα, 5 Σεπτεμβρίου, όσο αφορά το πρόγραμμα σπουδών στην Μηχανολογική Μηχανική του Πανεπιστημίου Λευκωσίας. Ιδιαίτερα, επισημαίνουμε τα θετικά σχόλιά σας όσο αφορά το περιεχόμενο και την διάρθρωση των μαθημάτων σε σχέση με διεθνής προδιαγραφές και τα κριτήρια αξιολόγησης που θέτει η ΕΕΑ, την εσωτερική αξιολόγηση του προγράμματος σπουδών που γίνεται περιοδικά, το σωστά δομημένο οργανωτικά διδακτικό έργο, τις υπάρχουσες υποδομές και τον εξοπλισμό σε αίθουσες διδασκαλίας και εργαστηρίων, την μεθοδολογία που ακολουθείται για την διασφάλιση ποιότητας σπουδών, την διαχείριση του προγράμματος με βάση τα διεθνή προβλεπόμενα, την αντιστοιχία του προγράμματος με άλλα προγράμματα στην Κύπρο και το εξωτερικό, την σύνδεση του Πανεπιστημίου με την κοινωνία και την αγορά εργασίας, τις ερευνητικές δραστηριότητες των μελών ΔΕΠ, και τους διοικητικούς μηχανισμούς.

Όπως φυσικά ήταν αναμενόμενο, η ΕΕΑ έχει προτείνει και ορισμένες αλλαγές οι οποίες στόχο έχουν την βελτίωση του προγράμματος έτσι ώστε να ικανοποιεί σε μεγαλύτερο βαθμό τους στόχους και τα μαθησιακά αποτελέσματα του προγράμματος σπουδών. Με βάση αυτές τις εισηγήσεις, έχουμε προχωρήσει στις εξής αλλαγές:

1. Το περιεχόμενο του μαθήματος CHEM-106 General Chemistry έχει επεκταθεί ώστε να συμπεριλάβει αρχές Φυσικής Χημείας και συγκεκριμένα αρχές Θερμοδυναμικής, Κινητική Αντιδράσεων και Ηλεκτροχημεία.

2. Το περιεχόμενο του μαθήματος MENG-262 Thermodynamics II έχει αναμορφωθεί με την διαγραφή των αντικειμένων που αφορούν θερμοδυναμικούς κύκλους και ψυκτικές διατάξεις. Επίσης, το μάθημα έχει εμπλουτιστεί με βασικές αρχές καύσης.

3. Το περιεχόμενο του μαθήματος MENG-280 Fluid Mechanics έχει εμπλουτιστεί με θέματα που υπάρχουν στο μάθημα MENG-462 Fluid Dynamics. Αυτά συμπεριλαμβάνουν Euler Equations, turbulent flows, Navier-Stokes equations, fluid energy losses, generation of eddies, Reynold's number, fluid instabilities, drag, friction and pressure drag, drag

reduction, lift (force) theory, aerodynamic forces, Prandtl theorem, Vortex theory, Mach number, steady flow 1-D compressible fluid flow, and 1-D isentropic flow. Το μάθημα MENG-462 Fluid Dynamics έχει επεκταθεί σε κάποιο βαθμό με την συμπερίληψη επιπρόσθετης ύλης χωρίς όμως την διαγραφή το πιο πάνω θεμάτων, τα οποία τώρα θα καλύπτονται σε μεγαλύτερο βάθος και με εκτενή ανάλυση.

4. Το μάθημα ECE-100 Electric Circuits I έχει αναμορφωθεί ώστε να συμπεριλαμβάνει αρχές ηλεκτρικών κυκλωμάτων και ηλεκτρικών δικτύων (DC/AC/μονοφασικά/τριφασικά) όπως και αρχές ηλεκτρικών κινητήρων (AC/DC μοτέρ). Το μάθημα έχει μετονομαστεί σε MENG-100 Electrical Networks and Machines.

5. Έχουμε προσθέσει ένα νέο μάθημα με τίτλο MENG-464 Air-Conditioning and Refrigeration στα μαθήματα επιλογής. Μεταξύ άλλων, το συγκεκριμένο μάθημα συμπεριλαμβάνει θέματα σε thermodynamic cycles, refrigerants and their properties, load calculations, design condition and refrigeration processes. Το περιεχόμενο σε θερμοδυναμικούς κύκλους και ψυκτικές διατάξεις έχει μεταφερθεί από το μάθημα MENG-262 Thermodynamics II μετά από εισήγηση της ΕΕΑ.

6. Το μάθημα MENG-482 Energy Conversion έχει αναμορφωθεί και μεταφερθεί από τα μαθήματα επιλογής στα υποχρεωτικά μαθήματα του προγράμματος. Συγκεκριμένα, το μάθημα έχει εμπλουτιστεί με τους θερμοδυναμικούς κύκλους, οι οποίοι έχουν διαγραφεί από το MENG-262 Thermodynamics II, θερμικές στροβιλομηχανές (gas turbines), ατμοστροβίλους (steam turbines), και τις υδροδυναμικές μηχανές (hydraulic engines). Το μάθημα έχει μετονομαστεί σε MENG-482 Energy Conversion Systems.

7. Έχουμε προσθέσει στοιχεία καύσης, ροές, καύση στερεών, εξάτμιση σταγονιδίων και καύση στο ήδη υπάρχον μάθημα MENG-430 Internal Combustion Engines.

8. Όπως έχει επισημανθεί από την ΕΕΑ, στο πρόγραμμα σπουδών υπάρχουν 7 μαθήματα μαθηματικών, αριθμός ο οποίος με βάση τα διεθνή δεδομένα είναι υπερβολικός. Συνεπώς, έχουμε πάρει την απόφαση να διαγράψουμε το μάθημα OGEE-290 Probability and Statistics for Engineers. Με αυτό τον τρόπο, δημιουργούμε χώρο στα υποχρεωτικά μαθήματα του κλάδου για το μάθημα MENG-482 Energy Conversion Systems, το οποίο έχει ήδη αναμορφωθεί.

Επίσης, η ακολουθία των μαθημάτων (semester breakdown) έχει τροποποιηθεί με την αντιμετάθεση μαθημάτων ώστε να διασφαλιστεί η συνοχή της διδασκόμενης ύλης όπως ακριβώς έχει εισηγηθεί η ΕΕΑ. Το αναθεωρημένο πρόγραμμα σπουδών και η τροποποιημένη ακολουθία μαθημάτων φαίνονται στο Παράρτημα 1 και 2, αντίστοιχα. Το περιεχόμενο των μαθημάτων που έχουν τύχει αναθεώρησης εμφανίζονται στο Παράρτημα 3.

Η εισήγηση του ΕΕΑ να γίνουν προσλήψεις εξειδικευμένου προσωπικού για την υποστήριξη του προγράμματος τουλάχιστον 3 ατόμων με αρχικό πτυχίο Μηχανολόγου Μηχανικού εκ των οποίων οι 2 να είναι ενεργειακής (Thermal) ειδίκευσης και ο τρίτος κατασκευαστικής (Manufacturing) ειδίκευσης γίνεται αποδεκτή. Όσο αφορά την πρόσληψη επαρκούς Ειδικού Διδακτικού Προσωπικού για τη κάλυψη των αναγκών των εργαστηρίων του προγράμματος, η πολιτική του Τμήματος Μηχανικής είναι τα μαθήματα αυτά να καλύπτονται από τους καθηγητές που διδάσκουν τα θεωρητικά μαθήματα. Παρόλα αυτά, θα λάβουμε σοβαρά υπόψη την εισήγηση της ΕΕΑ και θα προσλάβουμε Ειδικό Διδακτικό Προσωπικό για τα εργαστηριακά μαθήματα.

Όσο αφορά το μάθημα MENG-491 Internship (πρακτική άσκηση), δεν υπάρχει κανένας περιορισμός σε σχέση με τον τόπο ή χώρα που πρέπει να γίνεται δεδομένου ότι ακολουθούνται όλες οι προϋποθέσεις που προβλέπονται από το Τμήμα Μηχανικής και το περιεχόμενο του μαθήματος. Αυτές οι προϋποθέσεις συμπεριλαμβάνουν σχετικότητα με τον κλάδο, διάρκεια πρακτικής άσκησης, επίβλεψη από μηχανικό, και αναφορά δραστηριοτήτων.

Όπως έχει αναφερθεί και στην Αίτηση για Αξιολόγηση του συγκεκριμένου προγράμματος σπουδών, έχουμε δεσμευτεί να αναπτύξουμε περαιτέρω την υπάρχουσα εργαστηριακή υποδομή με την ίδρυση του εργαστηρίου «Mechanical Testing and Manufacturing Laboratory». Αυτό το εργαστήριο θα στεγάσει μία μηχανή τύπου Universal Testing, μία μηχανή για CNC Milling, ένα τόρνο και μία πρέσα. Επιπλέον, μέσω του ετήσιου προϋπολογισμού του Τμήματος Μηχανικής και μελλοντικών ερευνητικών προγραμμάτων, θα επιδιώξουμε τον περαιτέρω εμπλουτισμό των εργαστηριακών υποδομών του προγράμματος προκειμένου να διευκολυνθεί το ερευνητικό έργο των φοιτητών και των διδασκόντων.

Πιστεύουμε ότι οι παραπάνω βελτιώσεις που έγιναν, όσο αφορά το περιεχόμενο του προγράμματος σπουδών και την ακολουθία των μαθημάτων, έχει ως αποτέλεσμα τη δημιουργία ενός λογικού, ισορροπημένου και ολοκληρωμένου ακαδημαϊκού προγράμματος. Φυσικά, είμαστε πάντα δεκτικοί σε προτάσεις για περαιτέρω βελτιώσεις και αναπροσαρμογές, ειδικά όταν το πρόγραμμα θα έχει κλείσει τον τετραετή κύκλο του με την αποφοίτηση των πρώτων Μηχανολόγων Μηχανικών.

Προσβλέπουμε σε μία θετική απάντηση σχετικά με την έγκριση του προγράμματος «Πτυχίο Μηχανολόγου Μηχανικού». Η άμεση ανταπόκρισή σας, όσο αφορά τις αλλαγές που έχουν υιοθετηθεί και τα απαντητικά μας σχόλια στην έκθεση αξιολόγησης της ΕΕΑ, θα ήταν επιθυμητή ώστε το πρόγραμμα να μπορέσει να διαφημιστεί και να τρέξει κανονικά το ερχόμενο εξάμηνο (26 Σεπτεμβρίου, 2016).

Δρ. Γιώργος Γρηγορίου
Κοσμήτορας της Σχολής Επιστημών και Μηχανικής

Παράρτημα 1

Τροποποιημένο πρόγραμμα σπουδών

BSc in Mechanical Engineering Program Pathway (September 2016)

SUBJECT AND CODE	HOURS	ECTS CREDITS
MAJOR REQUIREMENTS		**132**
ECE-210 ELECTRONICS I	3	6
ECE-290 NUMERICAL METHODS USING MATLAB	3	6
OGEE-111 PROGRAMMING FOR ENGINEERS	4	8
MENG-100 ELECTRICAL NETWORKS AND MACHINES	4	6
MENG-110 COMPUTER AIDED DESIGN	3	6
MENG-250 ENGINEERING MECHANICS: STATICS	3	6
MENG-252 ENGINEERING MECHANICS: DYNAMICS	3	6
MENG-260 THERMODYNAMICS I	3	6
MENG-262 THERMODYNAMICS II	3	6
MENG-270 STRENGTH OF MATERIALS	3	6
MENG-272 MATERIALS SCIENCE AND ENGINEERING	3	6
MENG-280 FLUID MECHANICS	3	6
MENG-290 HEAT AND MASS TRANSFER	3	6
MENG-310 MECHANICAL ENGINEERING DESIGN	4	6
MENG-312 MANUFACTURING PROCESSES	4	6
MENG-340 SYSTEM DYNAMICS AND VIBRATIONS	3	6
MENG-342 SYSTEMS AND CONTROL ENGINEERING	3	6
MENG-350 MACHINE ELEMENTS	4	6
MENG-430 INTERNAL COMBUSTION ENGINES	4	6
MENG-482 ENERGY CONVERSION SYSTEMS	3	6
MENG-490 CAPSTONE DESIGN PROJECT I	1	4
MENG-492 CAPSTONE DESIGN PROJECT II	0	6

MAJOR ELECTIVES		**min 30**
MENG-410 WELDING	3	6
MENG-412 INDUSTRIAL PRODUCTION ENGINEERING	3	6
MENG-420 BIOMECHANICS	3	6
MENG-422 BIOMATERIALS	3	6
MENG-432 AUTOMOTIVE ENGINEERING	3	6

MENG-434 VEHICLE DYNAMICS	3	6
MENG-440 MECHATRONICS AND ROBOTICS	3	6
MENG-450 INTRODUCTION TO FINITE ELEMENTS	3	6
MENG-452 STRESS ANALYSIS	3	6
MENG-454 FATIQUE AND FAILURE ANALYSIS	3	6
MENG-460 COMPRESSIBLE FLOW	3	6
MENG-462 FLUID DYNAMICS	3	6
MENG-464 AIR-CONDITIONING AND REFRIGERATION	3	6
MENG-470 COMPOSITE MATERIALS	4	6
MENG-472 CORROSION ENGINEERING	3	6
MENG-480 WATER ENGINEERING AND DESALINATION	3	6
MENG-484 ENVIRONMENTAL POLLUTION	3	6
MENG-486 ALTERNATIVE ENERGY SYSTEMS	3	6
MENG-491 INTERNSHIP	0	6

MATH REQUIREMENTS		**36**
MATH-190 CALCULUS I	4	8
MATH-191 CALCULUS II	4	8
MATH-270 CALCULUS III	4	8
MATH-280 LINEAR ALGEBRA	3	6
MATH-330 ORDINARY DIFFERENTIAL EQUATIONS	3	6

SCIENCE REQUREMENTS		**30**
CHEM-106 GENERAL CHEMISTRY	5	8
PHYS-150 GENERAL PHYSICS I	5	8
PHYS-160 GENERAL PHYSICS II	5	8

BUSINESS ELECTIVES		**min 6**
ECON-261 PRINCIPLES OF MICROECONOMICS	3	6
MGT-281 INTRODUCTION TO MANAGEMENT	3	6

LANGUAGE REQUIREMENTS		**12**
ENGL-101 ENGLISH COMPOSITION	3	6
BADM-332 TECHNICAL WRITING AND RESEARCH	3	6

TOTAL CREDIT HOURS	**240**

Παράρτημα 2

Τροποποιημένη ακολουθία μαθημάτων

BSc in Mechanical Engineering – Semester Breakdown (September 2016)

FIRST YEAR				
FALL SEMESTER	**ECTS**		**SPRING SEMESTER**	**ECTS**
MATH-190 Calculus I	8		CHEM-106 General Chemistry	8
MENG-100 Electrical Networks & Machines	6		MATH-191 Calculus II	8
PHYS-150 General Physics I	8		MENG-110 Computer Aided Design	6
OGEE-111 Programming for Engineers	8		PHYS-160 General Physics II	8
	-----			**-----**
	30			**30**
SECOND YEAR				
FALL SEMESTER	**ECTS**		**SPRING SEMESTER**	**ECTS**
ECE-210 Electronics I	6		ENGL-101 English Composition	6
MATH-270 Calculus III	8		MATH-330 Ordinary Differential Equations	6
MENG-250 Engineering Mechanics: Statics	6		MENG-270 Strength of Materials	6
MENG-260 Thermodynamics I	6		MENG-280 Fluid Mechanics	6
MENG-272 Materials Science and Engineering	6		MENG-312 Manufacturing Processes	6
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	32			**30**
THIRD YEAR				
FALL SEMESTER	**ECTS**		**SPRING SEMESTER**	**ECTS**
BADM-332 Technical Writing & Research	6		ECE-290 Numerical Methods Using MATLAB	6
MATH-280 Linear Algebra	6		MENG-290 Heat and Mass Transfer	6
MENG-252 Engineering Mechanics: Dynamics	6		MENG-310 Mechanical Engineering Design	6
MENG-262 Thermodynamics II	6		MENG-340 System Dynamics and Vibrations	6
MENG-350 Machine Elements	6		Major Elective	6
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	30			**30**
FOURTH YEAR				
FALL SEMESTER	**ECTS**		**SPRING SEMESTER**	**ECTS**
Business Elective	6		Major Elective	6
Major Elective	6		Major Elective	6
MENG-430 Internal Combustion Engines	6		Major Elective	6
MENG-482 Energy Conversion Systems	6		MENG-342 Systems and Control Engineering	6
MENG-490 Capstone Design Project I	4		MENG-492 Capstone Design Project II	6
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	28			**30**

Παράρτημα 3

Περιγραφή μαθημάτων που έχουν τροποποιηθεί

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS**
CHEM-106	General Chemistry	8
Department	**Semester**	**Prerequisites**
Life & Health Sciences	Fall, Spring	None
Type of Course	**Field**	**Language of Instruction**
Required	Chemistry	English
Level of Course	**Year of Study**	**Lecturer**
1st Cycle	1st	Dr Photos Hajigeorgiou
Mode of Delivery	**Work Placement**	**Co-Requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Provide students an introduction to the basic principles of general chemistry, thermochemistry, chemical thermodynamics, chemical kinetics and electrochemistry
- Assist in the development of strong problem-solving skills in the aforementioned areas of chemistry
- Help cultivate critical thinking in the approach to learning
- Help in the acquisition of sound hands-on practical skills in the chemistry lab

Learning Outcomes:

After completion of the course students are expected to be able to:

- Use the concept of significant figures in calculations, and in particular apply the rules of significant figures using laboratory measurements and in the analysis of experimental data.
- Explain atomic and molecular structure and discuss the arrangement of atoms or molecules in different forms of matter.
- Utilize qualitatively and quantitatively chemical equations for a variety of chemical reaction types.
- Explain and use the results of quantum mechanics for the electronic structure in atoms
- Discuss the basic principles of thermochemistry and chemical thermodynamics with emphasis on chemical reaction spontaneity.
- Explain the basic principles of chemical kinetics and perform calculations on problems dealing with the rate of chemical reactions.
- Discuss the basic principles of electrochemistry, including redox equations, voltaic cells, batteries and fuel cells.
- Explain the process of corrosion and discuss the factors that contribute to this chemical change, with emphasis on the rusting of iron.

Course Contents:

- Introduction: Matter and Measurement
- Atoms, Molecules and Ions
- Stoichiometry: Calculations with Chemical Formulas and Equations
- Aqueous Reactions and Solution Stoichiometry
- Electronic Structure of Atoms
- Thermochemistry and Chemical Thermodynamics
- Chemical Kinetics
- Electrochemistry

Laboratory Experiments, Demonstrations and Workshops:

- Laboratory Safety Demonstrations
- Significant Figures – Making Measurements in the Chemistry Laboratory (Workshop)
- Basic Laboratory Techniques
- Graphs in Chemistry (Workshop)
- Experimental Determination of Density
- Double Displacement Reactions and Precipitates
- Acid-Base Titrations (Workshop)
- Determination of Citric Acid Concentration in Fruit Juices
- Determination of the Rate Law in Chemical Kinetics
- Molar Heat of Solution for Ionic Solids
- Spectrophotometric Methods in Chemistry (Workshop)

Learning Activities and Teaching Methods:

Lectures, Laboratory Practical Sessions and Assignments.
The course format is 3 h lectures and 2 h laboratory tutorial session per week.

Assessment Methods:

Laboratory Practical Sessions, Tests, Final Examination

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
T.L. Brown, H.E. Lemay, B.E. Bursten, C.J. Murphy	Chemistry The Central Science	Prentice Hall	2009 11th Edition	ISBN: 0-13-235848-4
P.G. Hajigeorgiou	CHEM-105 Laboratory Manual	University of Nicosia	2010	

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
John E. McMurry, Robert C. Fay, Jordan Fantini	Chemistry	Pearson Prentice Hall, 6th edition	2012	ISBN 10: 0-321-76087-5 ISBN 13: 978-0-321-76087-
Darrell D. Ebbing, Steven D.	General Chemistry	Houghton Mifflin	2009	ISBN-10: 0-618-85748-6

Gammon		Company		ISBN-13: 978-0-618-85748-7
R.H. Petrucci, W.S. Harwood, and F.G.Herring	General Chemistry Principles and Modern Applications	Prentice Hall	2002 8th Edition	ISBN: 0-13-014329-4

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
MENG-100	Electrical Networks and Machines	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	None
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	3rd	Dr Andreas Michaelides
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	MATH-190

Objectives of the Course:

The main objectives of the course are to:

- Introduce students to the basic electrical principles of electric circuit analysis and operation of electric motors
- Provide the tools for the analysis of DC circuits using simple techniques (e.g. Ohms Law, Kirchhoff's Laws, mesh analysis)
- Provide techniques for the analysis of AC circuits that incorporate resistors, inductors and capacitors
- Familiarize students with the three-phase current systems and its triangle-star connection mode
- Introduce students to basic electrical energy transformation and transmission
- Teach students the electromechanical principles and electromagnetic induction
- Provide the fundamentals for the construction and operation of the DC motor
- Provide the basic principles and operation of the single-phase AC induction motor
- Provide understanding of the operation and performance evaluation of three-phase asynchronous and synchronous motors
- Train students on how to connect, start and operate all basic DC/AC motors through laboratory experiments and hands-on experience

Learning Outcomes:

After completion of the course students are expected to:

- Differentiate among different type of motors based on fabrication, performance and application
- Know the operation and use of important laboratory equipment including oscilloscopes, power supplies, signal generators and digital multimeters
- Use specific techniques to analyze basic electrical networks through calculations
- Perform laboratory measurements for electrical networks and motors
- Construct simple circuits and measure voltage, current, power dissipation and phase-shift
- Explain briefly the major electric supply management scheme

- Explain the main types of motors and their specific applications
- Operate reliably any low wattage DC/AC motor used in the domestic electrical grid

Course Contents:

- Basic DC electric circuits; Ohms Law and electric power
- Electric circuit analysis methods; Series/Parallel connection
- AC Circuits with resistors, inductors, capacitors; Phase shift
- Three-phase voltage sources, star delta load connection
- Laboratory experiments with DC circuits and AC single/three phase circuits
- Electromechanical principles, induction law, force on current-carrying conductor
- DC motor, constructional and functional parameters, stator's lap/wave winding
- Universal motor and transmission lines
- One phase AC induction motors with auxiliary winding and starting capacitor
- Three-phase asynchronous motors; stepper motor
- Synchronous motors; synchronization of rotor with stator's field
- A series of laboratory experiments with motors

Learning Activities and Teaching Methods:

Lectures, Presentation of operating machines and their control in laboratory sessions.

Assessment Methods:

Homework, projects, mid-term exam, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
James W. Nilson, Susan A. Riedel	Electric Circuits	Prentice Hall	2008	0131989251
S.J.Chapman	Electric Machinery Fundamentals 4th edition pdf	McGraw Hill	2014	9780072465239

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Robert L. Boylestad	Introductory Circuit Analysis	Prentice Hall	2007	0131988263
David J. Irwin, Mark R. Nelms	Basic Engineering Circuits Analysis	Wiley	2008	9780470128695
A.E.Fitzgerald C.Kingsley Jr. S.D.Umans	Electric Machinery	McGraw Hill	2003	9780073660097
C.I.Hubert	Electric Machines: Theory, Operating Applications & Control	Prentice Hall	2001	9780130612106

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
MENG-262	Thermodynamics II	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-260
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	2nd or 3rd	Dr Constantinos Hadjistassou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

Thermodynamics II builds on Thermodynamics I and its main objectives are to:

- Further elaborate on the concept of entropy and its relevance to cyclic processes;
- Introduce exergy and its utility in optimising thermodynamic systems;
- Clarify how thermodynamic property tables are obtained;
- Develop an understanding of thermodynamic systems involving mixtures of substances;
- Explore the role of gas-vapour mixtures in the context of air-conditioning;
- Detail chemical reactions and chemical & phase equilibria;
- Familiarize attendees with statistical thermodynamics;
- Outline the basis of non-equilibrium thermodynamics;
- Investigate various physical phenomena.

Learning Outcomes:

Upon completion of the course students are expected to:

- Gain a better appreciation of the specifics of entropy in common engineering processes;
- Understand the concept of exergy and how it can be applied to maximise useful work;
- Comprehend the functions of vapour power cycles and cogeneration units;
- Become familiar with the fundamental relations used to derive common thermodynamic properties;
- Familiarise with the use and applications of mixed composition of gases;
- Be able to characteristics of combustion and the aspects of chemical and phase equilibria;
- Know the use of statistical mechanics;
- Appreciate the complexities of non-equilibrium thermodynamics;
- Understand different coupled phenomena.

Course Contents:

Course syllabus comprises:

- Applications of the Second Law of Thermodynamics & peculiarities of entropy;
- Isentropic efficiencies of steady-flow devices and topics of special interest;
- Definition of entropy and reversible work of various systems;
- Exergy destruction and exergy balance of closed and control volume systems;
- Performance of gas power cycles, the Carnot cycle, assumptions & simplifications;
- Vapour power cycles and the Second Law, the Rankine power cycle, reheat and regenerative vapour power cycles;
- Obtaining thermodynamic relations of various thermodynamic properties;
- Relationships between c_v, c_p, du, dh and ds and the Joule-Thomson coefficient;
- Mixture compositions and properties of distinctive components;
- Obtaining the mass fraction, mole fraction and volume fraction of mixtures;
- Fuels and combustion, balanced reaction equations, stoichiometric air-fuel ratio, enthalpy of combustion and flame temperature;
- Reacting systems, exhaust gas analysis, phase equilibrium, Gibbs phase rule, dissociation, enthalpy of reaction, calorific value of fuels;
- Kinetic theory of gases, molecular collisions, equipartition of energy;
- Classical non-equilibrium thermodynamics, local equilibrium hypothesis, entropy production;
- Thermoelectric effect and thermodynamics of fuel cells.

Learning Activities and Teaching Methods:

Lectures, in-class exercises, examples

Assessment Methods:

Problem sheets, mid-term, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Granet I. and Bluestein M.	Thermodynamics and Heat Power, 8th Ed.	CRC Press	2015	978-1-4822-3856-3

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Struchtrup H.	Thermodynamics and Energy Conversion	Springer	2014	978-3-662-43715-5
Lemons S. D.	A Student's Guide to Entropy	Cambridge University Press (CUP)	2014	978-1-107-65397-9
Blundell J. S. and Blundell M. K.	Concepts in Thermal Physics, 2nd ed.	Oxford University Press	2010	9780199562107

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
MENG-280	Fluid Mechanics	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	PHYS-150, MATH-330
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	2nd	Dr Constantinos Hadjistassou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Introduce student to the subject of fluid mechanics;
- Present the system and control volume approaches for analysing fluid behaviour;
- Explain the continuum hypothesis, viscosity, Newtonian & Non-Newtonian fluids
- Outline the fundamentals of fluid statics, hydrostatics and floating bodies;
- Appreciate the utility of differential analysis;
- Familiarize attendees with the fundamental fluid flow equations;
- Cover fluid kinematics and dynamics;
- Express the Bernoulli equation and dimensional analysis;
- Introduce the Navier-Stokes equation;
- Explain the characteristics of turbulent flow and energy losses;
- Analyze lift generation and aerodynamics;
- Elaborate on the importance of compressible and isentropic fluid flow;
- Relate fluid mechanics to real-world and research applications.

Learning Outcomes:

After completion of the course students are expected to:

- Recognise the characteristics of fluids and their behaviour;
- Utilize the system and control volume fluid methods of analysing flows;
- Distinguish between different systems of dimensions;
- Appreciate the notion of viscosity, Newtonian & non-Newtonian fluids;
- Tackle engineering problems associated with hydrostatic forces, buoyancy, and stability of floating & submerged bodies;
- Apply the conservation of mass & continuity equations;
- Understand fluid motion and deformation of fluids;
- Characterise rotational and irrotational flows;
- Know what is fluid circulation and lift-generation;
- Discern the subtleties of stream functions and the velocity potential;
- Apply the Bernoulli and energy equations to understand fluid behaviour;

- Use dimensional analysis and non-dimensionalisation;
- Appreciate the importance of Navier-Stokes equation;
- Comprehend the features of turbulent flow and energy losses;
- Calculate lift generation and aerodynamic parameters;

Course Contents:

- Distinction between fluids (liquid & gases) and solids;
- System and control volume fluid methods of analyses, Lagrangian & Eulerian descriptions;
- Dimensions, units, and systems of dimensions;
- Continuum hypothesis, velocity fields, steady & unsteady flows;
- Viscosity, Newtonian & non-Newtonian fluids;
- Pressure, hydrostatic forces, buoyancy, floating & submerged bodies;
- Integral and differential analyses;
- Conservation of mass & continuity equation;
- Motion and deformation of fluid elements;
- Fluid vorticity, rotational and irrotational flows;
- Circulation and lift-generation;
- Stream function and the velocity potential;
- Bernoulli and energy equations;
- Dimensional analysis and non-dimensionalisation;
- Euler equations, incompressible Navier-Stokes equation, approximate solutions;
- Turbulent flows, fluid energy losses, generation of eddies, Reynold's number, fluid instabilities;
- Drag, friction and pressure drag, drag reduction, lift (force) theory, aerodynamic forces, Prandtl theorem, vortex theory;
- Mach number, steady flow 1D compressible fluid flow, 1D isentropic flow.

Learning Activities and Teaching Methods:

Lectures, in-class examples, discussion

Assessment Methods:

Homework, project assignments, tests, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Robert W. Fox, Alan T. McDonald, Philip J. Pritchard	Fluid Mechanics	Wiley	2011	978-1-118-02641-0

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Clayton T. Crowe	Engineering Fluid Mechanics	Wiley	2009	9780470409435

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
MENG-430	Internal Combustion Engines	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-262, MENG-280
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Marios Alaeddine
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Provide students with easy-to-understand analyses of basic combustion concepts.
- Give an introduction of a wide variety of practical applications that motivate or relate to the various theoretical concepts of combustion.
- Provide students with an introduction to Internal Combustion (IC) engines.
- Present components and technologies used in IC engines.
- Students will gain an understanding of the fundamentals the design and operation of internal combustion and the factors governing engine design decisions affecting their performance & efficiency, fuelling strategies and environmental impact.
- Students will become knowledgeable in fluid flow, thermodynamics, combustion, heat transfer and friction phenomena and fuel properties relevant to engine power efficiency & emissions.

Learning Outcomes:

After completion of the course students are expected to:

- Describe main concepts within combustion theory.
- Understand the main characteristics of combustion chemistry, kinetics, and mechanisms
- Describe the main components of Internal Combustion engines.
- Apply engineering fundamentals to the analysis of IC engines.
- Demonstrate an understanding of the current engine technology and future trends.
- Perform analysis of internal combustion engine thermodynamic cycles.
- Determine basic engine performance parameters.
- Evaluate the influence of different design parameters and different technologies on engine performance.
- Be aware of issues relating to energy conversion and pollutant emissions in IC engines.

Course Contents:

- History of engines and modern developments, challenges facing internal combustion engines.

- Overview of Combustion
  - Combustion and Thermochemistry
  - Chemical Kinetics and Mechanisms
  - Thermal Analyses of Reacting Systems
- Combustion and Flows
  - Simplified Conservation Equations for Reacting Flows
  - Laminar Premixed and Diffusion Flames
  - Introduction to Turbulent Flows
  - Turbulent Premixed and Nonpremixed Flames
- Burning
  - Burning of Solids
  - Droplet Evaporation and Burning
- Engine types and configurations.
- Review of fuel chemistry, emissions, engine performance metrics & characteristics
- Spark Ignition (SI) engines, operating principle, standard cycles, combustion in SI engines, emissions and emission control.
- Induction, exhaust processes, and heat transfer in ICE;
- Compression ignition engines, combustion in diesel engines, diesel engine emissions and emission control.
- Turbo/supercharging.
- Alternative engine cycles.
- Alternative fuels.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises, in-class activities, designing, videos.
The course format is 3 h lectures and 1 h design tutorial session per week.

Assessment Methods:

Homework, mid-term exam, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Richard Stone	Introduction to Internal Combustion Engines	Macmillan	2012	0768004950
Turns, Stephen	An Introduction to Combustion: Concepts and Applications	McGraw-Hill	2011	9780073380193

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Y.Cengel and M. Boyles	Thermodynamics : An Engineering Approach 7^{th} Edition	McGraw-Hill	2010	007352932X

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
MENG-462	Fluid Dynamics	6
Department	**Semester**	**Prerequisites**
Engineering	Fall/Spring	MENG-280
Type of Course	**Field**	**Language of Instruction**
Required	Mechanical Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Constantinos Hadjistassou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

Fluid dynamics builds on MENG-280 Fluid Mechanics and its main objectives are to:

- Review the characteristics of internal flows;
- Explain fluid flow at low, moderate and high Reynolds Numbers;
- Analyse fluid mechanics phenomena of cavitation, advection, diffusion and convective transport;
- Present lubrication theory;
- Understand the characteristics of surface tension;
- Acquaint attendees with flows in porous media;
- Present the mathematical foundations of multi-phase flows;
- Outline the mathematical aspects of partial differential equations (PDEs) as applied to fluid flows;
- Numerical solution of Navier-Stokes equation;
- Appreciate the utility of computational fluid dynamics (CFD) and flow visualisation.
- Introduce non-Newtonian flow and rheology;

Learning Outcomes:

Upon completion of the course students are expected to:

- Better understand the mechanics of fluid flows in conduits;
- Distinguish between low, moderate and high Reynolds Number flows;
- Appreciate the challenges associated with the fluid mechanics of turbulence as applied to engineering problems;
- Learn the physics of cavitation, convection, diffusion and advection;
- Become acquainted with the lubrication approximation;
- Solve practical problems associated with drag forces and lift generation;
- Know some of the aspects of compressible flow;
- Understand the concepts associated with fluid flow in porous media;
- Familiarise themselves with two-phase and three-phase flows;
- Tackle problems related non-Newtonian flows and rheology;

- Comprehend the mathematics of partial differential equations in fluid dynamics;
- Become familiar with approximate results of the Navier-Stokes equation;
- Be aware of the numerical techniques used to solve PDEs and the tools used to solve and visualize such problems;

Course Contents:

Course syllabus comprises:

- Fully developed flow, turbulent flows in pipelines, minor and major energy losses, fluid compression and pumping, flow rate measurements;
- Open channel flow, hydraulic jumps, quantify flow rates;
- Stoke's equations, entrance flows, flow around a cylinder, Bernoulli equations;
- Physics of cavitation, cavitation inception, types of cavitation, cavitation issues on propeller blades, pumps and control valves;
- Convection in gases and liquids, the convection-diffusion equation, advection equation;
- Bearing theory equations and viscous adhesion;
- Bubbles & drops and constant tension flows;
- Creeping flow, Cauchy momentum equation, incompressible Navier-Stokes equation, approximate solutions;
- Porosity, seepage velocity, continuity equation, Darcy's Law, inertial effects;
- Flow assurance, mass conservation, energy conservation, slug flow, 2D & 3D fluid flow;
- Compressible Couette flow, power law, steady compressible flow;
- Governing equations of fluid flow, classification and the solution of PDEs, CFD and flow visualisation;
- Problem formulation, discretization methods, boundary conditions and initial conditions;
- The finite difference method, the finite element method and the finite volume method;
- Non-Newtonian fluid behaviour, visco-elastic fluids, particulate systems.

Learning Activities and Teaching Methods:

Lectures, in-class exercises, examples

Assessment Methods:

Problem sheets, mid-term, simulation exercises, final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Graebel W.P.	Advanced Fluid Mechanics	Academic Press	2007	978-0-12-370885-4

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Basniev S.K., Dmitriev M.N., Chilingar V.G., Gorfunkel M. & Nejad A.G.M.	Mechanics of fluid flow	Scrivener Publishing	2012	978-1-118-38506-7

Versteeg H.K. and Malalasekera W.	An Introduction to Computational Fluid Dynamics: The Finite Volume Method	Pearson Education	2007	978-0-13-127498-3

University of Nicosia, Cyprus

Course Code	**Course Title**	**ECTS Credits**
MENG-464	Air-Conditioning and Refrigeration	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-262
Type of Course	**Field**	**Language of Instruction**
Elective	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	3rd or 4th	Dr Andreas Chrysanthou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Provide students the fundamental principles and types of air-conditioning and refrigeration
- Teach students the most important refrigeration cycles and evaluate their performance based on scientific methods
- Introduce students to the different types of refrigerant providing classification based on their properties, applications and impact on the environment
- Explain the different processes of air conditioning based on psychrometric charts along with load calculations for different applications
- Provide students with the tools and knowledge to design air conditioning and refrigeration systems based on certain constraints and thermal comfort
- Introduce students to water and heating systems, absorption systems, thermal storage systems, and dehumidification

Learning Outcomes:

Upon completion of the course students are expected to:

- Demonstrate knowledge of the main principles, types and applications of air conditioning and refrigeration systems
- Explain the most well-known refrigeration cycles and evaluate their performance
- Identify different types of refrigerants and provide comparative studies based on their properties, potential application, and environmental impact
- Calculate the cooling capacity and the coefficient of performance for refrigeration systems
- Calculate the cooling load for air conditioning systems in different applications
- Design and analyse the performance of an air conditioning and refrigeration system including the air distribution system

Course Contents:

- Introduction to air-conditioning and air-conditioning systems
- Psychrometrics (moist air, humidity and enthalpy, moist volume, density, dew point of air, psychrometric charts, etc.)
- Air-conditioning processes, space conditioning, air-conditioning cycles, operating modes, sensible heating and cooling processes, humidifying and dehumidifying processes.
- Refrigeration system components and evaporative coolers (types and construction of compressors, condensers, expansion devices, evaporators, piping, thermal insulation)
- Classification of refrigeration systems
- Refrigeration cycles, refrigerants and their properties, cooling mediums, absorbents, refrigeration systems, refrigeration cycles, ideal single-stage vapour compression cycle, sub-cooling and superheating, refrigeration cycle of two-stage compound systems with a flush cooler, coefficient of performance of refrigeration cycle.
- Outdoor design conditions, indoor design criteria, thermal comfort, indoor air quality, outdoor air ventilation requirements.
- Load calculations (space loads, cooling load, conduction and internal heat gains, moisture transfer, etc.)
- Water and heating systems
- Absorption systems, absorption cycles and heat pumps
- Thermal storage systems
- Dehumidification
- Air distribution systems (air handling unit, types of ducts, duct materials, air flow through duct, friction, etc.)
- Laboratory experiments that demonstrate knowledge and understanding of the main principles of air conditioning and refrigeration systems
    - Analyse and explain the types of vapour compression cycle with T-S and P-H diagrams.
    - Determine the coefficient of performance of cycle and the capacity of refrigeration unit.
    - Demonstrate the procedure for evacuation charging and recovery of system refrigerant and define the optimum operation parameters.
    - Analyse the different psychrometric properties of air conditioning using the psychrometric process chart.

Learning Activities and Teaching Methods:

Lectures, in-class exercises, examples, laboratory exercises

Assessment Methods:

Mid-term exams, final exam, laboratory reports

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Shan K.Wang and Zalman Lavan	"Air-Conditioning and Refrigeration" Mechanical Engineering Handbook. Ed. Frank Kreith.	CRC Press LLC	1999	978-0849300578

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
W.C. Witman, W.M. Johnson, J.A. Tomczyk, E. Silberstein	Refrigeration and Air conditioning technology, 7th Ed.	Delmar Cengage Learning	2012	978-1111644475

University of Nicosia, Cyprus

Course Code	Course Title	ECTS Credits
MENG-482	Energy Conversion Systems	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MENG-262
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	4th	Dr Constantinos Hadjistassou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

- Detail gas power cycles as used in engineering applications;
- Explain vapour power cycles and cogeneration cycles;
- Present refrigeration cycles including vapour-compression and gas refrigeration;
- Analyse basic concepts and application of gas power cycles to gas turbines;
- Elaborate on basic concepts and application of vapour power cycles to steam turbines;
- Present basic concepts and application of hydraulic engines.

Learning Outcomes:

- Learn the principles and methods of analysis of the operation of gas cycles;
- Comprehend the functions of vapour power cycles and cogeneration units;
- Know the thermodynamics of refrigeration cycles;
- Learn about the application of gas power cycles to gas turbines;
- Comprehend the application of vapour power cycles to steam turbines;
- Understand applications and characteristics of application of hydraulic machines.

Course Contents:

- Performance of gas power cycles, the Carnot cycle, assumptions & simplifications;
- Reciprocating engines, the Otto cycle and the Diesel cycle;
- The Stirling cycle, Brayton cycle and jet-propulsion systems;
- Vapour power cycles and the Second Law, the Rankine power cycle, reheat and regenerative vapour power cycles;
- Refrigerators and heat pumps, the Reversed Carnot cycle and actual vapour compression refrigeration;
- Shaft power cycles; gas turbine cycles for aircraft propulsion; centrifugal compressors; axial flow compressors; combustion systems; axial and radial flow turbines; prediction of performance of simple gas turbines; and prediction of performance;
- Variable load operation of steam turbines. Basic concepts of gas dynamics as applied to

steam turbines as well as design and construct ion of steam turbines and their details with regard to mechanical strength. Description of turbines of various manufacture;
- Fluid dynamics of liquid turbomachines, particularly pumps;
- Centrifugal pumps, rotary pumps, reciprocating pumps, special service pumps;
- Basic pump design and performance principles.
- Hydraulic accumulators, power transmission, hydraulic cylinders and control valves;
- Flow features, cavitation parameters and inception, bubble dynamics, cavitation effects on pump performance, and unsteady flows and vibration in pumps.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises

Assessment Methods:

Homework, exams, final exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Granet I. & Bluestein M.	Thermodynamics & Heat Power, 8th Ed.	CRC Press	2015	978-1-4822-3856-3

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Struchtrup H.	Thermodynamics and Energy Conversion	Springer	2014	978-3-662-43715-5
H.I.H. Saravanamuttoo; G.F.C. Rogers; H. Cohen; Paul Straznicky	Gas Turbine Theory (6th Edition)	Pearson Education Limited	2009	978-0132224376
P. Shlyakhin	Steam Turbines: Theory and Design	University Press of the Pacific	2005	978-1410223487
Christopher E. Brennen	Hydrodynamics of Pumps, 1st Edition	Cambridge University Press	2011	978-1107002371