UNIVERSITY of NICOSIA

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