MEER504 Introduction to Oil and Gas Exploration and Exploitation

Course Title	Introduction to Oil and Gas Exploration and Exploitation				
Course Code	MEER504				
Course Type	Elective				
Level	Masters (2nd Level)				
Year / Semester	1st year/ 2nd semester or 2nd year/ 3rd semester				
Teacher's Name	Dr. Christodoulos Christoudoulou				
ECTS	10	Lectures / week	3	Laboratories/week	0
Course Purpose	From car fuel, to electricity, to petrochemicals and plastics, Oil & Gas as an energy source plays a vital role in the current energy mix. The main purpose of this course is to allow the students to become familiar with the various phases of the Oil and Gas value chain, upstream, midstream and downstream – recognize key industry players and understand the lifecycle of an oil and gas field from seismic surveys and geology to drilling engineering and production and all the way through to decommissioning.				
Learning Outcomes	By the end of the course, students must be able to: 1. Describe the chemistry of combustion and calculate its chemical reaction thermodynamics (Enthalpies, Free Energies) and calorific value 2. Understand the basic principles of oil and gas upstream production facilities, the typical configurations each component of the processing train and basic sizing criteria. 3. Know the different methods of offshore production such as platform, FPSO, semisubmersible and subsea and have an understanding of the design and operation of subsea and land pipelines. 4. Understand the principles of gas processing to sales gas specification. 5. Have an overview of the different offshore structures concepts and their application field and of the basic physical characteristics of the marine environment 6. Handle and measure in the field by means of specific oceanographic instruments				
Prerequisites	MEE510			Corequisites	None
Course Content	**1. Introduction to conventional and alternative energy sources** - Fossil fuels (Coal, Oil, Gas) - Nuclear - Renewable energy sources (Solar, Wind, Biomass, Geothermal Hydro, Tidal and Wave) - Hydrogen and Hydrogen Fuel Cells **2. Fuel combustion (Coal, Oil, Gas, Hydrogen)** - Chemical composition - Complete and incomplete combustion reactions - Enthalpy and free energy of reaction - Chemical reaction thermodynamics - Calorific value - Adiabatic flame temperature - Carbon dioxide and combustion byproducts (NOx, SO2, dust) - Exhaust gases, gas emissions and purification **3. Oil & Gas exploration (Onshore and Offshore)** - Geological surveys - Onshore and offshore seismology - Magnetometers - Gravimeters - Logging **4. Oil & Gas extraction** - Crude oil - Natural Gas **5. Oil & Gas processing and production** - Upstream production facilities - Typical configurations each component of the processing train - Basic sizing criteria				

	- Principles of gas processing to sales gas specification **6. Introduction to Offshore Structures** - Fixed Structures - Floating Structures **7. Basics on Marine Environment** - Physical and chemical properties of sea water, - The salinity of the oceans, - Temperature of the oceans, - Density of sea water, - Ocean currents **8. Introduction to oceanographic measuring devices and methods** - Oceanographic measuring instruments. Working principles. - Commercial measuring devices. - Long term offshore data acquisition. - Data link and communications. Data loggers - Data analysis, handling, long-term storage and retrieve. - Construction elements for developing simple subsea measuring devices
Teaching Methodology	The course will be presented through theoretical lectures in class. The lectures will present to the student the course content and allow for questions. The material will be delivered using visual aids (e.g. PowerPoint presentation slides, documentaries). The aim is to familiarize the student with the material at a faster pace of presentation, while allowing the instructor to use the presented material for meaningful discussions. The learning process will be enhanced with the requirement from the student to carry in-class discussions and tackling of hypothetical scenarios in small-group exercises. In-class case-studies are an integral part of this course. Homework assignments / mini projects, which will be required as part of the students' assessment for the course, will allow students the opportunity to carry out independent research, synthesize basic concepts presented in class, as well as hone their analytical, writing and presentation skills. Besides from the notes taken by students in class, all of the course material will be made available through the class website which will be available through the University's E-learning platform. The instructor will be available to students during office hours or by appointment in order to provide necessary guidance.
Bibliography	**Textbooks:** 1. "Oil & Gas Production in Nontechnical Language" by Martin S. Raymond, PennWell Corp., October 2005 2. "Fundamentals of Natural Gas Processing", Arthur Hidnay, Taylor & Francis, 2007 3. "Introduction to Power Generation Technologies", Andreas Poullikkas, 2009, Nova Science Publishers, Inc., ISBN:978-1-60876-472-3 4. L.D. Talley, G.L. Pickard, W.J. Emery, J.H. Swift: "Descriptive Physical Oceanography", Elsevier, 6th Edition, 2011, ISBN: 978-0-7506-4552-2 **References:** 1. "Petroleum Refining in Nontechnical Language", William Leffler, PennWell Corp., 4th Edition, Nov 2008 2. "Oil & Gas Pipelines in Nontechnical Language", Thomas O. Miesner, PennWell Corp., March 2006 3. "Operational Aspects of Oil and Gas Well Testing (Handbook of Petroleum Exploration and Production)", S. McAleese, Elsevier Science, 1st edition, March 2000 4. "Handbook of Ocean and Underwater Engineering", Eds. J.J. Myers, C.H. Holm, R. F. McAllister, McGraw-Hill Book Company, New York, 1969 5. "Introduction to Chemical Engineering Thermodynamics", J. M. Smith, Mcgraw Hill Higher Education, 7th edition, Feb 2005 6. The Mediterranean Moored Multi-sensor Array (M3A): System development and initial results. Annales Geophysicae (2003) 21:75-87. European Geosciences Union 2003.

	7. K. Nittis, L. Perivoliotis, G. Korres, C. Tziavos, I. Thanos: Operational monitoring and forecasting for marine environmental applications in the Aegean Sea. , Progress in Marine Environmental Modeling, Volume 21, Number 2, February 2006, pp. 243-257 8. C. Tsabaris, I. Thanos: An underwater sensing system for monitoring radioactivity in the marine environment. Mediterranean Marine Science Vol. 5/1, 2004, 05-17 9. R. H. Steward: "Introduction to Physical Oceanography", Department of Oceanography, Tex-as A& M University
Assessment	Assignments 30% Mid-Term Exam: 30% Final Exam 40%
Language	English