UNIVERSITY of NICOSIA

Course Code	Course Title	ECTS Credits
OGEE-522DL	LNG Systems	7.5
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	None
Type of Course	**Field**	**Language of Instruction**
Required	Oil, Gas and Energy Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
2nd Cycle	1st/2nd	Dr Constantinos Hadjistassou
Mode of Delivery	**Work Placement**	**Co-requisites**
Distance Learning	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Review the Liquefied Natural Gas (LNG) market focusing on major producers and importers, market trends, cost drivers and challenges;
- Elaborate on natural gas field extraction and processing, gas compression, acid gas removal, dehydration and hydrocarbon recovery;
- Present the main natural gas liquefaction cycles: a) Joule-Thomson, b) Classical cascade, b) Mixed-refrigerant, c) Pre-cooled mixed refrigerant;
- Outline the LNG storage facilities, namely, above ground metal tanks, above or subterrain concrete tanks, inground frozen earth tanks & mined caverns;
- Present export and import facilities, (LNG) pipelines, floating storage and regas units;
- Explain the main LNG tank(er) designs, containment systems, gas boil-off issues, LNG hazards such as roll-over and sloshing;
- Detail safety & security considerations for LNG plants, storage & transport

Learning Outcomes:

After completion of the course students are expected to:

- Appreciate the dynamics of the LNG market and existing & emerging export and import countries, cost considerations and patterns;
- Understand the natural gas field processes, role of compression stations, sour gas removal, dehydration and hydrocarbon fractionation;
- Compare and contrast the different natural gas liquefaction cycles and refrigeration issues;
- Understand the engineering and construction aspects of LNG storage facilities, materials, insulation systems, common failures, limitations;
- Familiarize with (LNG) pipelines, floating, storage & regas units, land regas terminals;

- Learn about the dominant LNG carrier designs of prismatic & spherical geometries, containment systems and land and marine gas boil-off utilization;
- Understand the layout of LNG plants, LNG storage and export option as well as safety and security considerations.

Course Contents:

- The US, EU, and Asian LNG markets, market trends and LNG unique features;
- Major LNG export players (Qatar, Australia, Indonesia) and import countries (Japan, South Korea, India, China), emerging markets, forthcoming projects;
- Natural gas quality metrics, stream processing including liquids removal, water gaseous components and acid gases;
- Liquefaction refrigeration cycles: a) Joule-Thomson cycle, b) Classical cascade, c) Mixed-refrigerant, d) pre-cooled mixed refrigerant;
- Characteristics of above ground metal tanks, above or underground concrete pre-stressed tanks, inground frozen earth tanks and mined caverns;
- Export and import LNG facilities, floating storage and regas vessels, pipeline insulation, LNG carrier loading arms, on-board LNG re-liquefaction, etc.;
- Particulars of dominant LNG tanker designs, containment systems, gas boil-off use, stratification, roll-over and sloshing;
- General arrangement of LNG plants, LNG storage, characteristics of LNG ships;
- Safety and environmental issues associated with LNG plants, security challenges such as cyber attacks and strategies on how to guard against them.

Learning Activities and Teaching Methods:

Lectures, Projects, On-line discussion

Assessment Methods:

Exercises, Assignments, Final exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Kidnay J Arthur & Parrish R William	Fundamentals of Natural Gas Processing	Taylor & Francis	2006	978-0-8493-3406-1

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Guo Boyun and Ghalambor Ali	Natural Gas Engineering Handbook	Gulf Publishing Company	2005	0976511339
Gas Processors Suppliers Association (GPSA)	Engineering Data Book, 12th ed.	GPSA	2004	9789998095533
Wang Xiuli and	Advanced Natural Gas	Gulf	2009	9781933762388

Economides J Michael	Engineering	Publishing Company		
Ikoku U. Chi	Natural Gas Production Engineering	Krieger Publishing Company	1984	0471894834