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**GOPELC**  
**Gaz and Oil Processing, a European Lebanese Cooperation**  
**Erasmus Plus. Capacity Building**  
**561530-EPP-1-2015-1-RO-EPPKA2-CBHE-JP**

**A Challenging Curriculum in Gas and Oil Processing**  
**Second draft**

**Objectives**

This new curriculum programme in the field of Gas and Oil Engineering is introduced by a joint effort between the EU and the Lebanese Universities within the framework of the Erasmus Plus Capacity Building project **GOPELC 561530-EPP-1-2015-1-RO-EPPKA2-CBHE-JP**.

This new programme will address the main issues, that the Lebanese society and the Lebanese Higher educational system are facing in the field of Gas and Oil processing.

The new Master programme contents will provide qualified professional resources capable of sustaining and managing the gas and oil industry development in Lebanon and abroad. Students will learn new and advanced tools for gas and oil processing and environmental sustainability. The new curriculum graduates will be fully acquainted with all contemporary issues of gas and oil Engineering, in which researchers and practitioners community are currently involved and are practicing. The graduates will be in position to best serve their country in developing the newly established oil and gas industry which will serve the Lebanese people in particular and the people in the surrounding countries.

## Program Framework

Common Core: choose 4 out of 5 courses

### **GOP\_01: Petroleum Economics and Management (7.5 ECTS)**

Introduction to financial reporting for oil companies. Capital budgeting: Cash flow analysis. Risk analysis: Probability theory and methods. Reserve estimation. Market theory: Supply and demand, oil price models, product prices, profit maximization, inflation and depreciation. The main geopolitical characteristics of the Energy Industry in the Gulf and Levant regions. Oil field project (Upstream and Downstream) management topics: project planning and scheduling techniques, project monitoring and control techniques. Overview of the factors that affect states' failure and success in management of petroleum resources. General knowledge of the regulation of pollution control.

### **GOP\_02: Geology & Reservoir Engineering (7.5 ECTS)**

Basic concepts of rock classification, geological processes, and depositional environments. Overview of petroleum geology processes (emphasizing hydrocarbon sources, migration, and accumulation). Fundamentals of reservoir characteristics and fluid properties. Exploration methods and tools, covering well logging methods and interpretation of well logs for the purpose of formation evaluation. Reserves Estimates and Resource Classification. Drive mechanisms and recovery methods (covering primary, secondary and tertiary recovery). Introduction to well testing including Pressure Transient Testing. Practical understanding of oil and gas reservoir fluids behavior and PVT analysis. Reservoir modeling.

### **GOP\_03: Industrial Catalytic Processes (7.5 ECTS)**

This course covers the fundamentals of catalytic science: mechanisms and kinetics of catalytic reactions, catalyst synthesis by classical and advanced techniques, characterization of physico-chemical (textural, structural, etc) and mechanical properties of supports and catalysts, catalytic reactor design (rate data analysis, selection of reactors in laboratory and plants etc), and catalyst deactivation (changes in properties of catalysts after deactivation, methods for prevention of deactivation and deactivation rate estimation).

### **GOP\_04: Drilling & Production Engineering (7.5 ECTS)**

Introduction to petroleum drilling systems, drilling rig components, drilling fluids, pressure loss calculations, casing, well cementing, and directional drilling. Overview of oil and gas production facilities; engineering design and operation of wells and processing equipment; well flow performance concepts; completion equipment; production logging; artificial lift; production optimization

### **GOP\_05: Storage and Transportation of Oil & Gas (7.5 ECTS)**

Pipeline industry overview, types of pipelines pipe manufacture and coating; Fundamentals of pipeline design, pumps and compressors, prime movers; Construction practices and equipment; Welding techniques and equipment, operation and control; Metering and storage, maintenance and repair, inspection and rehabilitation; Pipeline regulation, gas gathering systems; Petroleum

shipping: oil tankers (classification, general layout, construction, engines, bunkers, exploitation, navigation and maintenance); LNG plants

Track1: Petroleum Engineering. Choose 4 out of 5 modules

**GOP\_06: Offshore Technology (7.5 ECTS)**

Survey activities, Environmental and geotechnical assessment, Seabed geotechnics, Oceanographic data, Survey vessels; Drilling of offshore wells, Drilling rigs, vessels and processes; Managing offshore operations, The role of the Offshore Installations Manager, Platform supply vessels and their operation, Specialist vessels, Floating LNG (FLNG) and Floating Storage and Regasification Units (FSRUs); Offshore safety requirements, Offshore safety incidents, Safety case regulations, Certification, verification and classification, Environmental issues, Environmental legislation, Oil spills, Produced water discharges, Gas flaring, Environmental Impact Assessments (EIAs), Decommissioning.

**GOP\_07: Reservoir simulation (7.5 ECTS)**

Solution of reservoir and production engineering problems using reservoir simulation software (Petrel, Eclipse...), using data commonly available in industry. Emphasis on reservoir description, reservoir model design and calibration, production forecasting and optimization. Mathematical description and physical understanding of the underlying equations. To learn about carrying out a simple reservoir simulation study (data input, history matching and production forecast with a black-oil model).

**GOP\_8: Well Testing (7.5 ECTS)**

Analysis of well performance under varied reservoir conditions including evaluation of university, pseudo-state and unsteady state flow, well testing methods used to determine well and reservoir parameters; applications to conventional and unconventional wells producing gas and/or liquids; fundamentals of preparing and operating well test equipment to monitor, measure and gather samples for evaluating well performance.

**GOP\_9: EOR and Reservoir Characterization (7.5 ECTS)**

Basics and principles of enhanced oil recovery; EOR methods used in the industry: steam flooding, hydrocarbon gas injection, polymer flooding and surfactant flooding; determine the displacement performance, general geologic and fluid interpretation and its impact on recovery. Reservoir rock and fluid property evaluation by statistical methods and their spatial variations; application of geostatistics to reservoir characterization.

**GOP 10: Sustainable Oil & Gas Production (7.5 ECTS)**

This course aims to present the environmental impacts of extraction, production, distribution and storage of products issued from oil and gas industry. Management strategies needed in such industry for protection of the ecosystem based on regulations will also be addressed. An emphasis on risk management and emergency responses to incidents constitutes an essential part of this course.

Track2: Gas and Oil Processing. Choose 4 out of 5 modules

**GOP\_11: Petrochemical synthesis (7.5 ECTS)**

Raw materials used for organic and petrochemical synthesis, unit processes in organic chemical synthesis based on acetylene, ethylene, propylene, butadiene, petroleum aromatics, etc.; Synthesis applications of organic reactions: sulfonation, nitration, halogenation, oxidation, intermediate organic compounds.

Production of chemicals from hydrocarbons; Alkylation of benzene with olefins, Alkylation of phenols with olefins; Oxidation of hydrocarbons, Hydration of olefins and saponification of alkyl chlorides, Synthesis based on CO and acetylene, Synthetic detergents from petroleum; Production of Inorganic chemical from petroleum.

**GOP\_12: Advanced process design (7.5 ECTS)**

Model and design reaction systems using a combination of theoretical knowledge and computational tools and techniques. Application of optimisation techniques for parameter estimation. Conceptual design methods for multiphase reactors. Selection of appropriate reactor types. Process modeling, instrumentation and control methodologies. Critical assessment of model predictions with respect to reality.

Process simulation via PRO II software

Homogeneous Reactors

Non Homogeneous Reactors (A voir avec Mines St. Etienne)

**GOP\_13: Polymer engineering (7.5 ECTS)**

Polymer synthesis and characterization. Dependence of properties on molecular structure & microstructure. Polymer rheology. Forming techniques and applications. Mechanical properties, degradation and failure modes. Have a general overview of the different polymer processing techniques: extrusion, injection, blow molding..., and get an experimental feeling on the proper control of such processes. Understand the methodology for selection of materials and processing technology for the development of a final product.

**GOP\_14: Refining processes (7.5 ECTS)**

This course presents the following topics: The atmospheric and vacuum crude oil distillation units, the light end units, the catalytic reforming process, the fluid catalytic cracking process, the distillate hydro- cracking process, the hydro-treating processes, the refinery gas treating processes, upgrading residues, and the handling of hazardous materials and safety.

**GOP\_15: Chemistry and Technology of Lubricants (7.5 ECTS)**

1- Principles of Lubrication, lubrication regimes: hydrodynamic lubrication, hydrostatic lubrication, elasto-hydrodynamic lubrication, mixed and boundary lubrication 2- Basic classes of lubricants and the selection of lubricant type based on the specific requirements, problems, particular components and complexities of machine 3- Properties of the lubricating oils: viscosity, compatibility, corrosion, deterioration, contamination 4- Aqueous lubricants: type, properties, chemistry and applications 5- Greases: type, properties, chemistry and applications 6- Solid and gas lubricants: type, properties, chemistry and applications 7- Lubricant additives:

type, properties, chemistry and applications 8- Green and nano-lubricants: type, properties, chemistry and applications 9- Self-lubricating coatings: type, properties, coating techniques and tribological applications 10- Automotive, aero and marine lubrication and lubricants 11- Lubricant testing and specifications: bench tests, specification 12-Lubricant use, handling, storage, disposal, recycling, health and safety 13- Definition of tribology and its multidisciplinary nature, the structural and technological importance of tribology 14- System description and classification of tribological problems and tribological processes 15- Analysis of contacts in the tribological system, the processes of friction, wear and damage, tribological materials.

**Internship (5 ECTS)**

**Master Thesis (25 ECTS)**