

Multi-disciplinary Master of Science in “Natural Gas Technology”

Introduction

M. Sc. in Natural Gas Technology is a multi-disciplinary master implemented under the supervision of the Mining Studies and Research Center at the Faculty of Engineering, Cairo University, where-by a steering committee is formed, for running the master, with the membership of the Faculty Vice dean for post graduate affairs, the Director of the Mining Studies and Research Center, representatives of the concerned Faculty departments and representatives of the Natural Gas industry and relevant holding and associated companies.

Distinction

Considering the permanent and continuing approach of the companies operating in the field of NG industry to develop and keep up with the latest and most recent technologies, the Master in “*Natural Gas Technology*” resembles an ideal model seeking a permanent link between the scientific research and the industrial sector through an apparent win-win deal. The Master in “*Natural Gas Technology*” is primarily concerned in applied research, which focuses on developing practical solutions to the problems facing the companies operating in NG industry through its various stages. Consequently, this master achieves sound benefits to all elements of the scientific research process: the student or researcher, the supervisor, the institution or college and finally the industrial firm or company.

The Curriculum Structure

The first year of the program study (M. Sc. Preparatory year) consists of six courses, four of which are compulsory and two are voluntary. These six courses are equivalent to 18 credit hours distributed among two semesters. Besides, a thesis equivalent to 18 credit hours is to be submitted during the course of the study as a partial fulfillment of the M. Sc. degree requirements. Thesis should focus on one of the real problems facing the companies operating in the field of NG technology. A systemic approach for solving the problem is to be introduced and analyzed under scrutiny, taking into consideration the technical, environmental and economical aspects involved. The scientific research presented in the thesis is conducted under the supervision of one (or two) Faculty staff together with a specialist from the company staff.

Program Admission Requirements

- a- In order to register for M. Sc. Degree in “Natural Gas Technology” the student should have attained the Postgraduate interdisciplinary Diploma entitled "Natural Gas Engineering" from the Faculty of Engineering – Cairo University with a minimum general rate of appreciation "Good".
- b- Registered students should dedicate at least two days per week for attending the M. Sc. courses.

Graduate Attributes

A graduate of the Master Program “Natural Gas Technology” should be able to:

1. Demonstrate knowledge in the methodology of scientific research and utilization of different resources to solve problems in NG technology.
2. Apply and utilize the analytical methodology in the field of “Natural Gas Technology”
3. Apply specialized knowledge and integrate it with relevant professional knowledge in NG technology.
4. Demonstrate awareness of current problems and modern perspectives in the field of “Natural Gas Technology”.
5. Identify industrial problems facing NG technology and find an appropriate solution.
6. Master satisfactory range of professional skills and adopt the suitable technological tools as adequate for the profession of NG technology.
7. Communicate effectively and demonstrate leadership skills in the area of NG industry.
8. Demonstrate decision making skills.
9. Deploy available resources in NG technology & relevant industries effectively.
10. Exhibit awareness of his role in community development and saving the environment.
11. Reflect commitment to integrity, credibility and ethics in NG profession.
12. Develop academically and professionally and demonstrate capabilities of continuous learning.

Program Courses

1. Compulsory Courses

NGT600 Gas Reservoir Technology

Development of Gas Fields and Gas Reservoir Management, Horizontal Gas well technology, Design of Gas pipelines, Gas Gathering line systems, Underground storage of natural gases, Surface facilities and corrosion problems, Field case studies, ethics and legislation, technical writing, field visit

NGT601 Power Systems

Analysis, control, specification and installation of power systems, Different parts of electrical systems will be considered such as generators, motors, transmission lines and cables. The student should be able to chose and specify the proper element. Introduction to a few advanced software packages simulation and calculations of the various parts of the power system. Ethics and legislation, technical writing, field visit

NGT602 Natural Gas Processing

Recent Trends in Dehydration of NG by Adsorption in Fixed Bed Adsorption Units, Recent Trends in sweetening of NG by Membranes through Gas Permeation Separation Technique & Hybrid Techniques, Recent Trends in NGL Recovery, Ethics and legislation, technical writing, field visit

NGT603 Fires and Explosions

Fundamentals of fires and explosions, Fire dynamics, Explosions wave theories, Explosion in confined and semi-confined spaces, Fire and explosion protection strategies, Methods and means of fire fitting and safety, Ethics and legislation, technical writing, field visit

2. Voluntary Courses: The student chooses 2 of the courses listed below

NGT604 Gas well Technology

Inflow performance in gas and gas condensate wells, Gas well stimulation methods, Gas well test analysis, ethics and legislation, technical writing, field visit

NGT605 Gas Transportation and underground storage

Design of gas pipeline, Gathering line systems, Gas underground storage systems, ethics and legislation, technical writing, field visit

NGT606 Selective Topics in Gas Reservoir Engineering

Selective topics in Gas Reservoir Engineering, ethics and legislation, technical writing, field visit

NGT607 Corrosion and Corrosion Control

Electrochemical theory of corrosion, Mechanisms of: active corrosion, galvanic corrosion, passivity, localized corrosion (including pitting corrosion, crevice corrosion, inter-granular corrosion), electrochemical reduction reactions, and environmentally assisted cracking (including stress corrosion cracking, corrosion fatigue, hydrogen-assisted cracking, and fretting corrosion), Methods of corrosion mitigation (including cathodic protection, coatings, inhibitors, passivators), Influence of material's chemical composition and microstructure on corrosion behavior, Testing of material's susceptibilities to different modes of corrosion, Monitoring of corrosion of engineered structures, Case studies of corrosion failures, ethics and legislation, technical writing, field visit

NGT608 System Simulation

Similarities between different energy domains, studying and training in a graph oriented systematic system modeling and simulation, numerical solution of mathematical equations, especially a set of ordinary differential equations (ODEs), Matlab as a tool for mathematical formulation, simulation and solution presentation, examples and problems from electrical, mechanical, hydraulic, thermal and thermodynamic systems; energy system design and analyses, source and response analyses, introduction to optimization , introduction to a few advanced software packages for field calculation and system simulation, ethics and legislation, technical writing, field visit.

NGT609 Programmable Logic Control and SCADA7*

Introduction to digital systems, Logic gates and logic design, Construction of the PLC, Programming of PLC, Applications of PLC, Introduction to Supervisory control and data acquisition SCADA systems, Functions of SCADA systems, Data collection, Data processing and data logging, Mimic diagram, Applications of SCADA, ethics and legislation, technical writing, field visit

NGT610 Electromechanical Energy Conversion

Principles of electromechanical energy conversion, Electric generators, Emergency generator units, Distributed generation, DC motors, Induction motors, Special machines, Mechanical load analysis, Motor selection, ethics and legislation, technical writing, field visit

NGT611 Selective Topics in Electrical Engineering

Selective topics in Electrical Engineering, ethics and legislation, technical writing, field visit

NGT612 Advanced Petrochemicals

Case Study on one of the Local Petrochemical industries, the case study should include: Recent Technology, Raw materials, Project management, Feasibility study, Environmental impact, Major engineering problems, Safety measures, Applications, Licensors, Utilities, Market survey, ethics and legislation, technical writing, field visit

NGT613 Environmental Engineering

Environmental aspects and pollution, Industrial contaminants, Hazardous wastes, Waste management, Waste water treatment, Economics of waste treatment, Environmental impact assessment, Self Monitoring, Treatability, ethics and legislation, technical writing, field visit

NGT614 Selective Topics in Chemical Engineering

Selective topics in Chemical Engineering, ethics and legislation, technical writing, field visit

NGT615 Environmental & Economical Aspects of NG Systems

Thermo fluid, Properties of NG, Gas Release and Plume models, NG as replacement of conventional fuels, Combustion in NG systems (Air fuel equipment, Chemistry of NG combustion, Heat release rates & Flame characteristics), Air pollutants formation and their characteristics, Air pollution control & Monitoring devices, Fuel-Air cloud & Hazardous impacts, ethics and legislation, technical writing, field visit

NGT616 Failure Modes & Fault tree Analysis

Introduction to operation and performance of NG-facilities, Off performance and modes of early failures, Failure modes, Failure Diagnostics, Fault tree, Fault tree analysis, Failure predicates & Monitory systems, ethics and legislation, technical writing, field visit

NGT617 Advanced Measuring Techniques & Control Systems

Electrical circuits, Transformation of non electrical signals into electrical and electronics signals, Signal quality & signal processing and data storage facilities, Data acquisition, Hot wire anemometry, Optical techniques (LDA, PIV, LST, LAT), Gas chromatography, On line gas analysis, Common applications (Velocity, Temperature, Pressure, Force, Power, Thickness, Level, Density), Introduction to control principle, Pneumatic and hydraulic systems, Electrical control & Monitoring devices characteristics, ethics and legislation, technical writing, field visit

NGT618 Safety & Risk Control Technology

Principle of safety measures, Hazardous sources classification & identification, Hazardous materials classification & identification, Handling & storage of hazardous materials, Fluid flow energy & mass transfer, Mode of operation of hazardous sources, Work permits & work habits, Protection & mitigation

measures of chemical and thermal hazards (PPE, Detection devices & systems, Fighting devices & systems), ethics and legislation, technical writing, field visit

NGT619 Selective Topics in Mechanical Engineering

Selective topics in Mechanical Engineering, ethics and legislation, technical writing, field visit

Teaching and Learning Methods

- Lectures
- Practical classes
- Guided Self-reading
- Mini-Research Projects
- Interactive discussions
- Case studies
- Site visits

Assessment Methods

- Written Examination
- Coursework submission
- Short tests
- Oral presentations
- Individual project reports
- Final Dissertation