Study Plan
Faculty of Engineering and Technology
MASTER in MAINTENANCE ENGINEERING and QUALITY MANAGEMENT
(Thesis Track)

Plan Number			2015

First: GENERAL RULES & CONDITIONS:

1. This plan conforms to the valid regulations of the programs of graduate studies.
2. Areas of specialty of admission in this program:
   - The first priority: Industrial Engineering
   - The second priority: Mechanical Engineering
   - The third priority: Mechatronics Engineering
   - The forth priority: Biomedical Engineering
   - The fifth priority: Electrical Engineering
   - The sixth priority: Chemical Engineering
   - The seventh priority: Civil Engineering
   - The eighth priority: Computer Engineering
   - The ninth priority: Architectural Engineering
3. Admission policy: first policy.

Second: SPECIAL CONDITIONS:

- None.

Third: STUDY PLAN: Studying 33 credit hours as follows:

1. Obligatory Courses: 15 credit hours:

Course No.	Course Title	Credit Hours.	Theory	Prac.	Prerequisite
0936702	Applied Engineering Statistics	3	0	-	0936702
0906751	Scientific Research Methodology	3	0	-	0906751
0906763	Quality Control and Reliability	3	0	0936702	0906763
0906753	Maintenance Management and Organization	3	0		0906753
0906757	Continuous improvement and Lean Six-Sigma	3	0	0906763	0906757

2. Elective Courses: 6 credit hours from the following:

Course No.	Course Title	Credit Hours.	Theory	Prac.	Prerequisite
0936705	Human Factors in Industrial Engineering	3	0	-	0936705
0936708	Systems Simulation	3	0	-	0936708
0936711	Project Management and Network Models	3	0	-	0936711
0906728	Industrial Health and Safety Engineering	3	0	-	0906728
0906755	Maintenance Methods and Techniques	3	0	-	0906755
0906756	Maintenance Information Systems	3	0	-	0906756
0906758	Maintenance Technology	3	0	-	0906758
0906759	Technical Diagnosis	3	0	-	0906759
0906760	Empirical Modeling and Process Characterization	3	0	-	0906760
0906761	Life Cycle Assessment	3	0	-	0906761
0906762	Special Topics in Maintenance Engineering and Quality Management	3	0	-	0906762

3. Thesis: 9 credit hours (0906799).

Course Descriptions
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0936702 Applied Engineering Statistics 3 credit hours
Advanced topics on probability theory, theory of statistical inference, estimation, sampling distribution, tests of hypothesis, linear and non - linear regression. Analysis of variance and design of experiments. Case studies.

0936705 Human Factors in Industrial Engineering 3 credit hours
The course introduces the application of human physical and mental processing to motion and time study for the optimization of man-machine systems. Design of commonly used prediction and training systems under random and constant demands. The statistical distribution of the population concerning manual skills. The impact of ambient working conditions on working productivity, comfort and satisfaction. Application of cognitive ergonomics including human machine interaction, manual control and the impact of automation on operator skills and attitude.

0936708 Systems Simulation 3 credit hours
Introduction to discrete systems simulation using computer modeling to optimize system design. The concepts of queuing theory, random number generators, transactions and facilities. Case studies and projects on discrete event system simulation.

0936711 Project Management and Network Models 3 credit hours
CPM and PERT. Project scheduling under limited resources condition. Project accounting, project management. Network models: maximum flow, minimum cost networks, minimum cost networks large networks, and their decomposition. Applications in wide range of fields, such as construction, large product development and manufacturing.

0906728 Industrial Health and Safety Engineering 3 credit hours
Concepts and Definitions. Industrial Hazards, Hazard Classification Schemes, Hazard Control, Hazard Analysis. Developing Hazard Control Programs.

0906751 Scientific Research Methodology 3 credit hours
In this course students learn how to carry out different stages of scientific research starting from the formulation of research idea and finishing by a write up and presentation of a technical report. The course is in the form of lectures taught by faculty and invited speakers in which various types of research and different case studies in the advanced fields of maintenance engineering and management. As a part of the course, students will undertake at least one small research project under the supervision of faculty members to learn how to define the problem and complete the literature review using various resources including the Engineering Index Journal list and other relevant internet sources. Additionally students will gain knowledge on using appropriate analytical and

experimental methods in their projects. The general structure of their project reports will indicatively include the following sections: Abstract, Introduction, Analysis, and Description of the experiment, Experimental procedure, Results, Discussion and Conclusions, Recommendations and, finally, References.

0906763 Quality Control and Reliability 3 credit hours

The course objective is to present the students with quality engineering in light of designing, managing, controlling, and improving the quality of products, processes and systems. Specifically, the following topics will be covered: The role and position of quality and reliability, quality costs, the concept of loss function, statistical process control, and control-chart based process analysis, gage and process capability, and acceptance sampling. Also, reliability mathematics and models, design for reliability, maintainability analysis, availability, and hazard analysis will be covered.

0906753 Maintenance Management and Organization 3 credit hours

The course focuses on teaching students on how to set up a company management policy in order to be able to participate in its definition as far as maintenance is concerned, formulate the maintenance policy within a company, formulate the maintenance goals, understand the different maintenance strategies and how to choose the right strategy, and to specify the requirements for the maintenance activities. Moreover, computerized maintenance management systems (CMMS) are discussed. Specifically, maintenance information systems for planning, work order, technical/economic analysis, and technical documentation are addressed. Also, the course will cover topics in maintenance economics and costing, LCC/LCP techniques/methods, Logistics support, material and store handling, and methods for spare parts calculations.

0906754 Reliability Performance of Production Plants 3 credit hours

Within this course the student will learn how to guide, control and develop the availability performance activities, in order to assure the performance of the production, the quality of the products, the safety regulations and the environment conditions. Specifically, the following topics will be covered in detail: Reliability, Maintainability, Availability, and Risk Analysis.

0906755 Maintenance Methods and Techniques 3 credit hours

This course covers the theories and methods that are used to optimize the mix between corrective maintenance, preventive maintenance (predetermined or condition-based) and modifications. The following topics will be covered in detail: The theory of failure patterns, types of wear and tear, improvement techniques (aiming at reducing failure rates and down times), preventive and condition based maintenance, methods and techniques for inspection (condition-based maintenance), condition monitoring techniques, methods of life extension, and measurement methods and control systems.

0906756 Maintenance Information Systems 3 credit hours

In this course the student will learn about the different methods and systems that can be used in the decision making process, to be able assure that the maintenance activities are cost-effective and are supporting the company profit. Also, will address issues such as how to specify the system requirements and how to develop and use the information systems for planning, control, feedback analysis and improvements. Specifically, the course will cover in detail Maintenance Management Information Systems (key-figures,

guidance tables and so on), different types of information systems and be able to combine these (e.g., the customer requirements on maintenance, the efficiency of the plant equipment and the machinery, the different contracts for the maintenance performance), Maintenance Information Systems (for planning, work order, technical/economic analysis, etc.), Technical documentation/information systems, Technical process control systems, and expert systems.

0906757 Continuous Improvement and Lean Six-Sigma 3 credit hours

This course introduces the fundamental Lean Six Sigma principles that underlay modern continuous improvement approaches for industry, government and other organizations. The following topics will be covered in the course: Lean thinking, value stream mapping, how Lean Methods and Six Sigma are integrated into a single process improvement initiative to achieve higher quality and greater process speed, the five step DMAIC model to improve processes, and lean six-sigma tools and techniques.

0906758 Maintenance Technology 3 credit hours

The students will be familiarized with the typical organizational structures of larger companies, and especially with the role and position of maintenance activities therein, the maintenance strategies and technologies, and the prevalent methods such as e.g. TPM, RCM. The students obtain the fundamental knowledge to manage the maintenance department or maintenance group in a company, to change or adapt the company organizational structure to the changes in the company manufacturing processes. Moreover, the students will learn the maintenance of technical resources and systems, the position of maintenance activity in the company organizational chart, maintenance tree structure (corrective, preventive – planned, condition-based, predictive, and proactive), availability, reliability, maintainability of technical resources and systems, criteria for the selection of maintenance strategy, technology and method.

0906759 Technical Diagnosis 3 credit hours

The Technical diagnostics course acquaints the students with the importance, technology and economic feasibility of the maintenance process using technical diagnostics. The students will first be familiarized with operational reliability, maintainability and availability of production systems. Specifically, the students will learn about the types and sources of damage, primary and secondary losses, the critical points in production devices, and master the necessary technology for planned maintenance and for condition-based maintenance. The basic course goal is to acquaint the students with the condition monitoring systems, and with pre-processing and processing of signals, carrying the indication about a fault occurrence.

0906760 Empirical Modeling and Process Characterization 3 credit hours

The aim of the course is to define the basic elements of empirical modeling and characterization of states of technical systems and processes. The students will learn about the methods of analysis, data processing for the empirical characterization processes, methods of selection, extraction and fusion, of informative features. Moreover, the course will cover the following topics: methods of empirical modeling (parametric and nonparametric), analysis, characterization and modeling of the real engineering products, systems and processes, practical examples of direct and indirect process

characterization, and fundamentals of statistical analysis and process characterization methods.

0906761 Life Cycle Assessment 3 credit hours

The course will cover the following topics: Life cycle approach, ISO104040 scopes & definitions, Process flow diagram, Processes flow charts; material balances, Processes flow charts: energy balances, Life cycle costing, Life cycle impact assessment, Industrial specific case studies, Life cycle analysis tools

0906762 Special Topics in Maintenance Engineering and Quality Management 3 credit hours

Selected topics of special interest in Maintenance Engineering and/or Quality Management are covered. The course is designed to give the students an opportunity to pursue special studies not offered in other courses.