E-JUST

الجامعة المصرية اليابانية للعلوم والتكنولوجيا

エジプト日本科学技術大学

Egypt – Japan University of Science and Technology

ENGINEERING GRADUATE PROGRAMS

M.Sc. & Ph.D. DEGREES BYLAWS

November,2012

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تأسست بالقرار الجمهورى رقم ١٤٩ الصادر فى ٣٠ مايو ٢٠٠٩

EGYPT- JAPAN UNIVERSITY OF SCIENCE AND TECHNOLOGY E-JUST

ENGINEERING GRADUATE PROGRAMS

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NOVEMBER 2012

NEW BORG EL-ARAB
ALEXANDRIA, EGYPT

4-DEPARTMENT OF INDUSTRIAL ENGINEERING AND SYSTEMS MANAGEMENT

ARTICLE-50

INTRODUCTION

The department of Industrial Engineering and Systems Management graduate program provides advanced analytical as well as technological knowledge in various fields of industrial engineering, manufacturing engineering, mathematics and information technology, systems design and management as well as related business aspects. This is to provide awareness of research in industrial engineering, and to encourage the development of inventiveness while searching for engineering solutions to technical problems. The program includes a number of elective courses, which permit the students to specialize in a particular area. The program offers a comprehensive and integrated framework of required skills of industrial engineers, leaders and managers that are becoming increasingly valuable to the employers and the society, especially in areas of: Operations Research, Production and Operations Planning, Plant Design, Manufacturing Systems, Ergonomics and Occupational Biomechanics, Quality Control and TQM, Reliability, System Modeling and Simulation, Project Planning and Management, Classical and Heuristic Optimization, Supply Chain Strategies and Logistics, Productivity Enhancement Methods.

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VISION

The vision of the department of Industrial Engineering and Systems Management is to be internationally recognized for leadership and excellence in teaching, research and cooperation with manufacturing and service industries with its innovative structure of interdisciplinary trends of industrial engineering, manufacturing engineering, mathematics and information, business, and, systems design and management.

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MISSION

1. To offer high quality, up-to-date, and internationally recognized educational programs where fusion of science, technology, and mathematics -as a liberal art- are supported by active researchers, a wealth of campus resources and an open minded, multi-cultural environment.
2. To nurture graduates rational thoughts, intellectual capabilities and/or engineering and design knowledge foundation, to transform them into individuals who can find and solve problems, conduct research and contribute to society.
3. To provide faculties with adequate environment to conduct strong research activities.
4. To ensure strong cooperation with local, regional and international industry and organizations.

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OBJECTIVES

1. Provides the graduate students with the required skills to be able to identify, define and implement effective solutions to realistic problems in the manufacturing and service systems by applying industrial engineering tools, contemporary knowledge and cutting-edge technologies.
2. Provide the graduate students with the skills needed to design integrated systems combining people, machines, information, energy, materials and financial resources.
3. Train to graduate student son how to ethically communicate and work effectively and efficiently as individuals and/or team members.
4. present the graduate students with the abilities to find problems, identify a research question, review literature, establish hypotheses, use research technology, collect and analyze data, interpret results, draw conclusions and recommend further research.

5. Produce research papers that will advance the state of the art in Industrial engineering and Systems Management disciplines.

ARTICLE-54

M.Sc. PROGRAM:

M.Sc. students must complete a total of at least 36 - credit hours, within the following guidelines:

- Course work of 18- credit hours, including 6- credit hours as core course, 9-credit hours as elective courses, and a 3-credit hour Laboratory/Project-Based Learning course.
- Thesis work of 18 credit hours

M.Sc. students have to pass successfully six courses with three credit hours each.

Core Courses:

IEM 521 – Project Planning and Management

IEM 531 – Operations Research

Elective courses:

The elective courses are divided into five major areas, as illustrated below. Each course weights three credit hours. Students select nine credit hours elective courses from the provided list. Students can also select, with the aid of their academic advisors, elective courses from other interdisciplinary graduate programs.

Industrial Engineering Group Courses:

IEM 501–Global IE 1

IEM 511 – Advanced Ergonomics and Human Factors Engineering

IEM 512 – Advanced Operations Management

IEM 513– Operations and Management in the Process Industry

Business Group Courses:

IEM 522 –Strategic Planning and Management

IEM 523 – Contemporary Organizational Theory and Behavior

IEM 524–Technology and Innovation Management

IEM 525–Accounting for Engineers

IEM 526–Marketing for Engineers

Mathematics and Information Group Courses:

IEM 532 – Applied Simulation Modeling and Analysis

IEM 533 – Applied Multivariable Data Analysis

IEM 534 – Advanced Soft Computing

IEM 535 – Management Information Systems

IEM 536 – Statistical Design of Experiments

Manufacturing Systems Group Courses:

IEM 541 – Manufacturing Systems Engineering

IEM 542 – Computer Aided Engineering (CAE) Methods

IEM 543 – Advanced Manufacturing Processes

Systems and Services Group Courses:

IEM 551 – Systems Engineering and Analysis

IEM 552 – Systems Thinking

IEM 553 – Total Quality Management

IEM 554 – Business Process Management

IEM 555 – Introduction and Applications of Petri Nets

Project-Based Learning Course:

Master of Science students have to participate in a teamwork project, which is based on self-learning; Students have to present innovative concepts and competitive solutions.

IEM 701 – Project Based Learning in Industrial Engineering and Systems Management.

M.Sc. Thesis:

The M.Sc. candidate should prepare and defend a Thesis based on a high-valued research work in one research topic in the fields of Industrial Engineering and Systems Management.

IEM 801- M. Sc. Thesis

ARTICLE-55

Ph.D. PROGRAM:

Ph.D. students must complete a total of at least 48 credit hours, within the following guidelines:

- Course work of 18 credit hours, including 12-credit hours courses and 6-credit hours of research seminar.
- Thesis work of 30 credit hours.

Ph.D. students have to pass successfully six courses with three credit hours each.

In addition to the following list of courses, students can also select, with the aid of their academic advisors, elective courses from other interdisciplinary graduate programs.

Industrial Engineering Group courses:

IEM 601–Global IE 2

IEM 611 – Supply Chain Network Design and Logistics

IEM 612 – Human Computer Interaction

IEM 613 – Advanced Methods in Quality Design and Control

IEM 614 – Reliability and Maintainability Engineering

Business Group courses:

IEM 621 – Innovation Theory

IEM 622 – Knowledge Management

IEM 623 – Financial Engineering

IEM 624 – International Business for Engineers

Mathematics and Information Group courses:

IEM 631 – Advanced Operations Research Methods

IEM 632 – Applied Multivariate Data Analysis

IEM 633 Stochastic Processes and Applications

Manufacturing Systems Group courses:

IEM 641 – Advanced Biomechanics

IEM 642 – Composites Engineering

IEM 643 – Tool Engineering

IEM 644 – Rapid Prototyping and Product Development

Systems and Service Group courses:

IEM 651 – Systems Theory

IEM 652 – Service Systems Engineering

IEM 653 – Service Operations and Customer Relationship Management

IEM 654 – Information Technology Services and E-Business Management

Advanced Research Seminar Courses:

Ph.D. students have to participate in one-seminar activities, which are based on self-learning, and presentations of new advanced topics in her/his discipline. The total credits of the seminar are three.

IEM 702 – Seminar on Advanced Industrial Engineering and Systems Management.

IEM 703 – Seminar on Current Trends in Industrial Engineering and Systems Management.

Ph.D. Thesis:

The Ph.D. candidate should prepare and defend a Thesis based on a high-valued research work in one research topic in the fields Industrial Engineering and Systems Management.

The Thesis should present a new contribution (s) in the respective field of research.

IEM 802- Ph.D. Thesis

4- INDUSTRIAL ENGINEERING AND SYSTEMS MANAGEMENT

IEM 501 – Global IE 1: Selected Topics in contemporary industrial engineering and systems management.

IEM 511 – Advanced Ergonomics and Human Factors Engineering: Occupational bio-mechanics – anthropometry – Work physiology – Human machine interaction – Advances in ergonomics and human factors engineering.

IEM 512 – Advanced Operations Management: Forecasting – Product and service design – Capacity planning – Process selection – Layout and location – Supply chain management –Inventory management – Aggregate planning – Materials requirement planning – Enterprise resource planning – Operations scheduling – service operations management.

IEM 513 – Operations and Management in the Process Industry: Process industry characteristics – Plant life cycle – Process planning and design – Production management – Plant maintenance – Safety management – Environmental aspects.

IEM 521 – Project Planning and Management: Project planning – Activity networks – Computer systems and programs applied – Resource allocation in project planning networks – Resource leveling - Project budgeting and cost management – Project risk management – Project execution and control – Project information management.

IEM 522 – Strategic Planning and Management: Historical development of strategic management – Developing business strategy – Successful organizational performance: vision- mission – objectives – competitiveness – Sustaining competitive Advantage – Corporate strategy.

IEM 523 – Contemporary Organizational Theory and Behavior: Individual behavior –interpersonal behavior – organizational behavior – groups and teams – Organizing and designing organizations – Organizational Change

IEM 524 – Technology and Innovation Management: Integrating technology and strategy – design of strategy – development of innovative capabilities – innovation challenges.

IEM 525 – Accounting for Engineers: Accounting Cycle – Financial Statements – Accounting Systems – Cash – Receivables – Fixed Assets – Current Liability – Allocation of cost – The balanced scorecard.

IEM 526 – Marketing for Engineers: Marketing concepts and principles – Margins and profits- product and portfolio management – Pricing strategy – Promotions – Marketing and finance – Distribution strategy.

IEM 531 – Operations Research: Linear Programming – Linear programming formulations – cases of linear programming- solution procedures - post optimality analysis – Integer Programming - non linear programming – Goal Programming.

IEM 532 – Applied Simulation Modeling and Analysis: Review of basic probability and statistics – basic simulation modeling – modeling complex systems -simulation software – building simulation models – selecting inputs distributions – output data analysis

IEM 533 – Applied Multivariable Data Analysis: Regression – Linear models and experimental design – Simple and multiple linear regression – single- and multi-factor studies – Analysis of variance – Analysis of covariance – Model selection – Diagnostics – Data analysis using statistical software.

IEM 534 – Advanced Soft Computing: Heuristics and meta-heuristics – Evolutionary algorithms – Fuzzy systems – simulated annealing – Genetic algorithms – Neural networks – Artificial neural networks – Tabu and scatter search – Ant colony optimization – Particle swarm optimization.

IEM 535 – Management Information Systems. Information systems in management – Competing with information technology – Computer hardware and software – Telecommunications and networking – e-Business systems – Enterprise business systems – e-commerce systems – Developing business and implementing business systems – Systems Analysis and Design - Security, ethics and globalization challenges.

IEM 536 – Statistical Design of Experiments : Factorial experiments – Fixed, random, mixed models – nested and nested-factorial experiments – 2^f Factorial experiments – Fractional replications – Taguchi methods.

IEM 541 – Manufacturing Systems Engineering: Concepts of manufacturing systems engineering – Manufacturing strategy – Plant and facilities layout – Lean

manufacturing and supply chain management – CAD/CAM – Operation and control of manufacturing.

IEM 542 – Computer Aided Engineering (CAE) Methods: Application of computer hardware and software to the design of products and systems – geometric modeling – engineering computational methods – overview of engineering analysis software which includes finite element analysis – manufacturing simulation – solid modeling.

IEM 543 – Advanced Manufacturing Processes: Unconventional Machining Process overview – Water Jet Machining – Ultrasonic Machining – Electro Discharge Machining – Chemical Machining, Electro-chemical Machining – Laser Beam Machining – Plasma Arc Machining and Electron Beam Machining.

IEM 551 – Systems Engineering and Analysis: The System Engineering Process – System Design Requirements – Engineering Design Methods and Tools – Design Review and Evaluation – System Engineering Program Planning – Organization for System Engineering – System Engineering Program Evaluation.

IEM 552 – Systems Thinking: Concepts and Definitions – Systems and Models – Concept of Structure – Business dynamics – Social network analysis – Continuous and Discrete state space representation – State machine and formal language – Turing machine – Goal-seeking systems representation

IEM 553 – Total Quality Management: Concept and principle of TQM – Quality management standards – Quality assurance concept – Quality improvement concept – Project approach and problem solving – Benchmarking – Quality function deployment – Quality costing – Quality improvement implementation process.

IEM 554 – Business Process Management: Business Process Analysis and Design – Technology Support for Business Processes – Workflows and Business Process Management Systems – Managing Processes Metrics and Dashboards – Process Innovation – Governing BPM Efforts – Process Management Maturity.

IEM 555 – Introduction and Applications of Petri Nets: Introduction to Petri Nets – Condition/Event Petri nets – Place/Transition (P/T) Petri Nets, analysis problems – Analysis of P/T Petri nets by reachability tree – Invariants of P/T Petri nets – Petri nets languages. Marked graphs and Free choices Petri nets, Petri nets with

inhibitors – Colored Petri nets (CPN), CPN Design, applications – Analysis of Colored Petri nets – Hierarchical Colored Petri nets and Object oriented Petri nets – Petri Nets software packages.

IEM 601 – Global IE 2: Selected Topics in contemporary industrial engineering and systems management.

IEM 611 – Supply Chain Network Design and Logistics: Understanding the supply chain – designing the supply chain network – planning demand and supply in a supply chain – Planning and managing inventories in a supply chain – Designing and Planning transportation networks.

IEM 612 – Human Computer Interaction: Study of the relationship between man and his environment – Design techniques of a specific environment – Ergonomics and interface design – Cognitive engineering – Perception and representation – Knowledge and mental models – Interface metaphors – Social and organizational aspects – Input, output and interaction -

IEM 613 – Advanced Methods in Quality Design and Control: Evolution of quality design and control – Deming, Juran and Taguchi concepts – Data characterization – HypThesis testing – Statistical Process Control – Process Capability – Design and Analysis of tolerances – Design and Analysis of Experiments – Robust design – Response Surface Methodology.

IEM 614 – Reliability and Maintainability Engineering: Reliability Engineering – Maintainability engineering – Reliability and Safety – Failure types and analysis – Maintenance types and objectives – Statistical analysis of maintenance data.

IEM 621 – Innovation Theory: Nature of Creativity: Person, Process, Product and Environment – Nature of Innovation: Making the Idea a Reality – Need for Creativity and Innovation in Organizations – Assessing self Creativity and Ability to Innovate – Enhancing self Creative and Innovative Abilities – Entrepreneurial Tools for Creativity and Innovation — Exploring the Intersection – Observation Lab – Developing and Contributing to a Creative-Innovation Team – Managing for Creativity and Innovation – Evolving a Culture of Creativity and Innovation in Organizations.

IEM 622 – Knowledge Management: Managing Knowledge – Methods and tools for knowledge management – managing and measuring intellectual capital –

management of innovation and technology – business intelligence – Information sources – KM blue prints – maintaining the system – resources and tools.

IEM 623 – Financial Engineering: Products and markets – Cash flow – credits – Financial engineering – Simple interest rates derivatives – Swap engineering – Options Engineering – Risk – market environment.

IEM 624 – International Business for Engineers: The future and challenge of globalization – Globalization and economic development – Economic, legal, and political system – Culture – Ethics and International Business – Trade between countries – Firms and international trade – Governments and the regulation of international trade – Foreign direct investment – Regional trade blocks – Bilateral agreements – Currency markets and FX rates – The international monetary system – international monetary system and the reform – Firm strategy in international business – Foreign market entry modes – Coordination and control: the challenges of international growth.

IEM 631 – Advanced Operations Research Methods: Combinatorial problems - Optimization algorithms and heuristics - Continuous and discrete optimization domains with emphasis on NP complete combinatorial problems - Game theory.

IEM 632 – Applied Multivariate Data Analysis: Multivariate analysis methods – Principal components analysis (PCA) – Factor analysis (FA) – Canonical correlation analysis (CCA) – Multivariate classification techniques – Discriminant analysis – Cluster Analysis.

IEM 633 – Stochastic Processes and Applications: Stochastic modeling and processes. Random variables, discrete and continuous Markov chains, renewal processes, queuing systems, Brownian motion, and elements of reliability and stochastic simulation. Applications to design, planning, and control of production and service systems.

IEM 641 – Advanced Biomechanics: Mechanical properties of human bones – Tissue and joint mechanics and their applications – Electric and electromechanical properties – Teeth and connective tissues – Biomechanical job analysis – Electromyography techniques in the analysis of worker fatigue and injury –

Strength testing for worker evaluation and placement – Applications of biomechanics.

IEM 642 – Composites Engineering: Mechanical and physical behavior of composites – Influence of geometry to materials properties – Functions of composites relating to applications in electronic packaging – Thermal management – Smart structures – Design and analysis of composite structures – Machining of composite materials – Performance testing, characterization and quality control of composites – New types of composite materials as well as the recent development trends.

IEM 643 – Tool Engineering: General considerations in Tool Design – Tool material and tool making practices – Design of Metal cutting tools – Single and multiple point tools form tools – Design of press working tools for shearing, bending, forming and drawing operations – Design of drill jigs and fixture for Milling, Broaching, Grinding and Turning Operation – Design of tools for joining processes – Tooling for castings – Using plastics as tool materials – Tool design for numerical control machine tools

IEM 644 – Rapid Prototyping and Product Development: Rapid Prototyping Processes – Selection of Solid Freeform Fabrication (SFF) – Applications of SFF Technologies – CAD Requirements in RP- Materials for Rapid Prototyping – Rapid Tooling Techniques – Reverse Engineering – Rapid Manufacture.

IEM 651 – Systems Theory: Definition of a system – Systemic properties – Basic problems in systems theory – Decomposition of a system – Checkland methodology – Network systems.

IEM 652 – Service Systems Engineering: Process Analysis – Service Productivity – Work Measurement – Service Facility Layout – Service Facility Location – Forecasting – Managing Waiting Lines – Simulation – Capacity Planning – Service Supply Relationships – Vehicle Routing – Inventory Management – Aggregate Planning – Service Scheduling.

IEM 653 – Service Operations and Customers relationship Management:

Service operations principles – Service Operations processes – Common Service Operations Activities – Organizing Service Operations – Technology Considerations – Implementation Considerations – Challenges and Critical

Success Factors and Risks – Overview of Customer Relationship Management (CRM) – Developing a Customer Strategy – Customer Lifecycle Management and Lifetime Value – CRM Technology – Operational CRM – Analytical CRM – Collaborative CRM – CRM Project Management – Building a Business Case for CRM.

IEM 654 – Information Technology Services and e-Business Management : Electronic Services – electronic business – electronic government – Strategic e-Business – e-Business Corporate Strategy – e-Business Business Strategy – Strategic E-Business Challenges, Strategic e-Business Applications, e-Business Architecture – e-Supply Chain Management – Building an e-Business – Trends in mobile commerce.

IEM 701 – Project Based Learning in Industrial Engineering and Systems Management: Students will participate in project-based learning activities in topics of applied nature related to the fields of specialization .

IEM 702 – Seminar on Advanced Industrial Engineering and Systems Management: Lecture given by distinguished professor in new published papers .

IEM 703 – Seminar on Current Trends in Industrial Engineering and Systems Management: Research seminars conducted by Ph.D. based on presentation of recent journals papers .

IEM 801 – M.Sc. Thesis

IEM 802 – Ph.D. Thesis

5- MATERIALS SCIENCE AND ENGINEERING

MSE 501-Chemical Change and Materials Properties: Recognize MSE nomenclature, microstructure, associate terms with the appropriate structure/phenomena, and be able to differentiate between related structures/phenomena– Calculations to quantify material properties and microstructural characteristics – Recognize the effect of composition and microstructure on material properties – Processing sequence to produce materials with specific microstructure and/or properties. Structure/property relationship of crystalline, quasicrystalline, nanocrystalline and amorphous solid –Structure and properties of polymer, ceramics and composites – Semiconductor, magnetic materials and optical materials properties, processing and applications –