TECHNICAL UNIVERSITY OF CRETE

Dept. of Production Engineering & Management

GRADUATE STUDENT HANDBOOK

M.S. and Ph.D. Programs in
Engineering Management
Operations Research
Production Engineering

Academic year 2011 – 2012

INTRODUCTION

The Department of Production Engineering and Management at the Technical University of Crete offers graduate-level programs leading to M.S. and Ph.D. degrees in the following areas:

- Engineering Management
- Operations Research
- Production Engineering

APPLICATION

Applicants seeking admission to an M.S. program should have a bachelor's or diploma degree in engineering or science. Applicants seeking admission to a Ph.D. program should have a bachelor's or diploma degree and an M.S. degree. All degrees must be approved by DOATAP (ΔΟΑΤΑΠ) - an academic standards committee of the Greek Ministry of Education, Lifelong Learning and Religious Affairs (e-mail: information_dep@doatap.gr, http://www.doatap.gr/en/index.php, phones: +30 210 5281000).

Admission is based upon evaluation by the Graduate Affairs Committee (GAC) of previous academic achievements as evaluated by grades on all courses attended, exposure to areas in engineering management, operations research and production engineering, research work, publications, diploma projects and theses, grants, and letters of recommendation.

To be eligible for admission to a Ph.D. program, it is desirable that the applicants have a minimum grade point average of 8.0 (out of 10) in an M.S. program. Applications may be submitted at any time throughout the academic year. The application should include:

(1) The completed application form for a Ph.D. program specifying the faculty advisor and the subject to the project
(2) Transcripts of degree certifications and grades on all courses attended
(3) At least two letters of recommendation
(4) A doctoral thesis proposal approved by the faculty advisor.

Applicants can submit item (4) within *six months* after their admission.

Applications for admission to an M.S. program are received once a year. The application package should include:

- Application for M.S. program admission
- Degree certifications and grades on all courses attended, and
- At least two letters of recommendation.

Applicants are also encouraged to submit reprints of published papers, if any, a statement of research interests and a detailed resume.

ACADEMIC EVALUATION

Students are expected to attend classes regularly. Course instructors base the final evaluation upon class participation, homework, projects, midterm and final examinations. The grading scale ranges between 0 and 10 (outstanding performance). The minimum passing grade is 6.

A minimum grade point average of 7.5 is required toward an M.S. degree. Students with a grade point average less than 7.5 as well as students that fail in a total of three attempts to pass one or more courses will be dismissed.

M.S. DEGREE

The minimum duration of the M.S. program is three (3) academic semesters for the full-time program and five (5) semesters for the part-time program. The maximum duration of the M.S. program is three academic years. Each course is assigned 7.5 credits, according to the European Credit Transfer System (ECTS). To fulfill the requirements for an M.S. degree, a student must earn a minimum of 90 ECTS credits (8 courses and a M.S. thesis, which corresponds to 30 ECTS credits).

Courses are classified as mandatory core courses and elective courses. Full-time students should enroll in at least four (4) courses per semester, including two (2) mandatory and two (2) elective courses. Part-time students should enroll in at least two (2) courses per semester (one mandatory and one elective course). Requests for enrollment in a course offered by another department or another university, as well as requests for part-time or exception of attendance should be submitted for consideration by the GAC not later than *two (2) weeks before the beginning of the corresponding semester*.

Students with undergraduate degrees in fields other than management, operations research and production engineering may be required to attend undergraduate courses to acquire the necessary background. Students should pass all the undergraduate courses within the first year of their studies in the M.S. program.

The M.S. thesis project is elaborated under the supervision of a faculty advisor, the research advisor. The thesis advisor suggests a three-member examining committee and the title of the thesis, to be approved by the General Assembly of the Department at least three months before the scheduled thesis examination. The M.S. examining committee will consist of a minimum of 2 regular faculty members of the Department and at most 1 regular faculty member of another department or university.

The candidate must submit an electronic copy of the thesis to the members of the examining committee, at least 10 days prior to the scheduled examination date.

The oral M.S. thesis examination must be passed in a maximum of two attempts. The thesis evaluation is based upon the quality of research orientation, literature review and methodology, the usefulness of results, and the overall written and oral presentation.

Ph.D. DEGREE

The Ph.D. degree requirements are as follows:

- Successful completion of a number of courses (*at least two*), specified by the General Assembly of the Department. The specification of the courses depends on the candidate's background on the Ph.D. program he or she has enrolled.
- Elaboration of a Ph.D. research project, supervised by a faculty advisor.
- Preparation of annual reports on the progress of the Ph.D. project and the research and other activities of the candidate.
- Oral Ph.D. dissertation defense.

The maximum duration of the Ph.D. program is 6 years and the minimum is 3 years. The oral dissertation defense can be scheduled six semesters after the approval of the doctoral thesis proposal by the General Assembly of the Department. The maximum period between the candidate’s admission to the Ph.D. program and the oral dissertation defense date is 11 semesters.

At the beginning of the academic year (September) that follows three semesters after the specification of the Ph.D. topic, the candidate submits an initial written report to the GAC. The report should include the following: (i) research objectives, (ii) contributions and importance of the Ph.D., (iii) literature review, (iv) methodology, (v) expected results, (vi) time schedule for the completion of the research, (vii) research and teaching activities of the candidate. After this initial report, the candidate prepares and submits similar reports on an annual basis.

The members of the advisory committee evaluate the progress of the candidate's research work. When the work is completed successfully, the candidate should (i) request in writing to the General Assembly of the Department to set up the examining committee and the examination date and (ii) submit seven copies of his/her thesis to the Secretary of the department at least 30 days prior to the scheduled examination date.

The examining committee consists of the members of the candidate's advisory committee and four (4) other regular faculty members whose areas of research are relative to the subject of the thesis (overall, the examining committee consists of seven (7) regular faculty members). At least two (2) members of the examining committee should be from the Department.

The oral Ph.D. dissertation defense must be passed in a maximum of two attempts. The thesis evaluation is based upon the originality of the subject, the contribution to the advancement of science, and the oral presentation. The candidate is qualified for the Ph.D. degree if at least five (5) members of the committee approve the dissertation.

COURSE INFORMATION

Core courses are identified separately in each graduate program. Students must earn credits on core courses, subject area elective courses and general elective courses as indicated below.

OPERATIONS RESEARCH

Core courses

Winter semester

Natural and Artificial Intelligence
(Markos Papageorgiou, 2011-2012**)**
Philosophical background, Evolution theory, Biological neural networks, Biological control systems, Artificial knowledge representation, Artificial learning, Expert systems, Artificial life.

Advanced Telematics in Road Transportation
(Markos Papageorgiou, 2012-2013**)**
Intelligent transportation systems, Microscopic transportation models and simulation tools, Macroscopic transportation models, Macroscopic model validation, Modeling of urban road networks, Traffic assignment, Modeling of traffic networks, Macroscopic modeling of corridor traffic, Macroscopic simulation tools, Fuel consumption models, Measurement devices for traffic flow variables, Real-time estimation of traffic variables, Kalman filters, State estimation, Automatic incident detection, Origin-destination matrix estimation, Freeway traffic control, Ramp metering, Freeway network control, Route guidance, Road traffic control, Research projects overview, Automated highway systems.

Advanced Topics in Computational Mechanics
(Georgios Stavroulakis, 2011-2012**)**
Numerical methods in engineering (partial differential equations, elements of numerical approximation, finite and boundary elements), Review of linear finite element analysis, Special topics on linear analysis of structures (anisotropic materials, three-dimensional elements, plates in bending, discs, shells), Nonlinear analysis (geometric and material nonlinearity), Relevant topics (thermal effects, coupled field problems, finance), Programming the finite element method, Application and computing examples and homeworks (with the use of open source codes mainly within MATLAB).

Advanced Non-linear Programming
(Ioannis Papamichail, 2011-2012**)**
Convex analysis (Convex sets - Convex functions), Non-linear optimization, Non-linear programming applications, Mixed integer linear and non-linear programming, Global optimization of non-linear programming problems, Deterministic approaches, Convex relaxation of functions, Applications.

Spring semester

Optimal Structural Design of Materials and Structures
(Georgios Stavroulakis, 2011-2012**)**
Elements of numerical optimization and related fields (neural networks, genetic optimization), Parametric modeling, Formulation of optimal structural design problems, Computational methods, Topology optimization of materials and structures, Coupled field problems and applications.

Nonsmooth Mechanics and Optimization
(Georgios Stavroulakis, 2012-2013**)**
Convex and nonconvex functions and sets, Differentiability and nonsmooth functions, Convex analysis and extensions, Applications on nonsmooth analysis and optimization (linear and nonlinear complementarity problems), Application examples on mechanics and structural analysis (contact problems, friction, plasticity, damage), Optimal design, Identification and structural control, Relevant topics (network flow, financial modeling).

Evolutionary Algorithms and Optimization of Large Scale Systems
(Yannis Marinakis, 2011-2012**)**
Simple heuristic algorithms, Local search algorithms, Memetic algorithms, Reduced search algorithms, Simulated annealing, Genetic algorithms, Evolutionary algorithms, Applications of neural networks in optimization, Randomized search algorithms, Scatter search, Swarm intelligence, Ant colony

optimization, Bee colony optimization, Parallel algorithms, Lagrangian relaxation, Column generation, Decomposition algorithms, Frank-Wolfe method, Dantzig-Wolfe decomposition, Benders decomposition, Kornai-Liptak decomposition, Case studies.

Multicriteria Decision Systems
(Michael Doumpos, 2011-2012**)**
Preference modeling. Consistent family of criteria. Multiattribute utility theory. Sensitivity analysis. Outranking relations. Multiobjective linear programming. Multicriteria simplex method. Multicriteria parametric programming. Interactive techniques. Goal programming. Preference disaggregation analysis. Evaluation of ordinal regression and classification models.

Elective courses

Winter semester

Distributed Artificial Intelligence and Multi-Agents Systems
(Nikolaos Matsatsinis, 2011-2012**)**
Introduction. DAI & MAS Survey. Knowledge Management & MAS Learning. MAS Planning. Coordination, Cooperation and Negotiations. Argumentation. Decision Making in Agent-based Systems. Automated Decision Making and Negotiations. Intelligent Decision Systems. Ontology and Intelligent Agents. Holonic Systems. MAS Organization. Task allocation. Recommendation Agents. MAS Communication & Communication Languages. MAS Development Methodologies. MAS Development Platforms. Mobile Agents. MAS Analysis, Design and Development. MAS Applications.

Advanced Queueing Systems
(Efstratios Ioannidis, 2011-2012**)**
Discrete and continuous time Markov chains. Useful distributions. Basic principles of queueing systems. Linear difference equations and differential equations. Elementary queueing systems and extensions. Non-exponential systems. Systems with multiple servers. Combinations of make-to-stock with make-to-order systems. Job scheduling. Production lines.

Fuzzy Sets and Systems
(Nikos Tsourveloudis, 2011-2012**)**
The goal of this course is to provide an introduction to fuzzy sets theory and logic. The following topics will be addressed: Definitions and basic operations with fuzzy sets, Fuzzy relations and the extension principle, Linguistic variables, Operations and fuzzy IF-THEN rules, Approximate reasoning, Fuzzy knowledge-based systems, Fuzzy-neurofuzzy control, Decision making, MATLAB's fuzzy logic toolbox™.

Modeling and Verification of Man Machine Systems
(Tom Kontogiannis, 2011-2012**)**
Workflow modeling in manufacturing systems, ergonomic factors that influence human reliability and system safety, procedural and object-oriented modeling of workflows and system processes (IDEF and UML), system modeling with Petri Nets, system verification with reachability trees and incidence matrices, fundamental Petri Net models in manufacturing, Petri Net controllers of manufacturing systems, Coloured Petri Nets (CPN) and functional programming (Standard ML), verification of IDEF and UML diagrams with Petri Net models, simulation of workflows and manufacturing processes with CPNs, applications of CPNs to human workload, risk analysis and accident analysis.

Spring semester

Optimal Control
(Anastasios Pouliezos, 2011-2012**)**
Basic concepts, Introduction to calculus of variations, Optimal control, Pontryagin's maximum principle, Minimum time/fuel/energy problems, Case studies, Numerical methods.

Production Scheduling
(Vassilis Kouikoglou, 2011-2012**)**
Single-machine, parallel-machines, Flow-shop and job-shop scheduling, Overview of dynamic programming and branch-and-bound methods, Kuhn-Tucker conditions, Flow and routing control of complex production systems, Stability.

Computational Methods for Engineers
(Dimitrios Rovas, 2011-2012**)**
Introduction to computational methods: machine representation of numbers, stability of numerical methods, relation between consistency, stability and convergence. Numerical Linear Algebra: Direct and iterative methods for the solution of linear systems, numerical computation of eigenvalues and eigenvectors. Functions and functionals: Solution of non-linear equations, polynomial interpolation (interpolation error, approximation with Spline and Bezier curves), numerical integration (formulas for integration in 1, 2 and 3 dimensions). Function approximation with generalized Fourier, Gaussian, Chebyshev and Legendre series, integration and interpolation. Integral Transforms. Introduction to the numerical solution of partial differential equations. Applications and programming exercises (using MATLAB).

Advanced Issues in Information and Decision Systems
(Nikolaos Matsatsinis, 2011-2012**)**
Introduction. Decision Theory. Group Decision Making & Negotiations. Multi-Criteria Group Decision Making. Social Choice Theory. Structured Modeling & Model-based Management Systems. Intelligent Decision Systems. IS & DSS Evaluation. Information Filtering & Retrieval. User Modeling. Consumer Modeling. Adaptive and Personalization Methods. Workflow Management and Virtual Enterprises. Web-pages Evaluation. Information Systems Management. Advanced IS & DSS (Group Decision Support Systems, Multicriteria DSS, Executive Support Systems, Spatial DSS, Distributed DSS, …). DSS Applications in Marketing, Finance, Production, Management, Health, etc.

Special Topics in Machine Learning
(Anastasios Doulamis, 2011-2012**)**
Design of learning systems, Decision trees (representation, learning algorithms, information entropy and gain), Probabilistic learning (maximum likelihood estimation, Bayesian classifiers, Bayesian erros, Nearest neighbor algorithms), Discriminative classifiers and regression models (kernel-based regression), Neural networks (feedforward networks, learning vector quantization, self organized maps), Generalization issues, Hidden Markov models and Bayesian networks, On-line learning, Semi-supervised learning, Applications.

ENGINEERING MANAGEMENT

Core courses

Winter semester

Multicriteria Analysis and Financial Decisions
(Constantin Zopounidis, 2011-2012**)**
Basic concepts and characteristics of multicriteria analysis, Procedures for multicriteria aggregation, Multicriteria character of financial problems, Applications of multicriteria analysis in financial management, Venture capital investment, Financial analysis, Bankruptcy risk, Credit granting, Country risk, Financial planning, Mergers and acquisitions, Portfolio management, Multicriteria decision support systems, Case studies.

Service Quality and Customer Satisfaction
(Evangelos Grigoroudis, 2011-2012**)**
Introduction to service quality (principles and definitions), Methodology for applied total quality management practices in services, Alternative methodological approaches (Servqual, Servperf, Oliver, Fornell and Kano models Structural equation models MUSA method), Customer value management, Quality awards and satisfaction barometers, Customer satisfaction surveys, Employee satisfaction, Customer loyalty, Advanced topics on service quality, Applications and studies.

Spring semester

Advanced Issues in Information and Decision Systems
(Nikolaos Matsatsinis, 2011-2012**)**
Introduction. Decision Theory. Group Decision Making & Negotiations. Multi-Criteria Group Decision Making. Social Choice Theory. Structured Modeling & Model-based Management Systems. Intelligent Decision Systems. IS & DSS Evaluation. Information Filtering & Retrieval. User Modeling. Consumer

Modeling. Adaptive and Personalization Methods. Workflow Management and Virtual Enterprises. Web-pages Evaluation. Information Systems Management. Advanced IS & DSS (Group Decision Support Systems, Multicriteria DSS, Executive Support Systems, Spatial DSS, Distributed DSS, …). DSS Applications in Marketing, Finance, Production, Management, Health, etc.

Management Problem Solving
(Vassilis Moustakis, 2011-2012**)**
Methodology and decision making and problem solving framework, Fundamental concepts and models: symptom, cause, problem, model, and planning and control of solutions, Knowledge management and the learning organization, Prototypical problem representations: functional, supply-chain, introduction of new technology and management of innovation in the workplace, Quantitative analysis support methods: Statistics, factor analysis, machine learning, and decision making under uncertainty, Projects and analysis of prototype case studies.

Elective courses

Winter semester

Modeling and Verification of Man Machine Systems
(Tom Kontogiannis, 2011-2012**)**
Workflow modeling in manufacturing systems, ergonomic factors that influence human reliability and system safety, procedural and object-oriented modeling of workflows and system processes (IDEF and UML), system modeling with Petri Nets, system verification with reachability trees and incidence matrices, fundamental Petri Net models in manufacturing, Petri Net controllers of manufacturing systems, Coloured Petri Nets (CPN) and functional programming (Standard ML), verification of IDEF and UML diagrams with Petri Net models, simulation of workflows and manufacturing processes with CPNs, applications of CPNs to human workload, risk analysis and accident analysis.

Distributed Artificial Intelligence and Multi-Agents Systems
(Nikolaos Matsatsinis, 2011-2012**)**
Architectures, Technical life, cooperation, Distributed artificial intelligence historical background, Blackboard systems, Intelligent agents, Software agents, Multiagent interaction, User interfaces, Multiagent systems and societies of agents, Distributed problem solving and planning, Negotiation, Distributed rational decision making, Formal methods in DAI: Logic-based representation and reasoning, Industrial and practical applications of DAI.

Fuzzy Sets and Systems
(Nikos Tsourveloudis, 2011-2012**)**
The goal of this course is to provide an introduction to fuzzy sets theory and logic. The following topics will be addressed: Definitions and basic operations with fuzzy sets, Fuzzy relations and the extension principle, Linguistic variables, Operations and fuzzy IF-THEN rules, Approximate reasoning, Fuzzy knowledge-based systems, Fuzzy-neurofuzzy control, Decision making, MATLAB's fuzzy logic toolbox™.

Special Topics on Computer Aided Design
(Nikolaos Bilalis, 2011-2012**)**
Life cycle management, Review of CAD systems, Concurrent engineering, Quality Function Deployment, Product data management, Rapid prototyping and rapid tooling systems, Virtual prototype and manufacture, Work teams organisation for new product development, Design for manufacture, Design for Assembly, Data exchange between CAD systems, IGES and STEP.

Pollution Prevention
(Yannis Phillis)
The concept of sustainability (who is interested in sustainability, difficulties in achieving sustainability, what is sustainability), Introduction to fuzzy logic, Sustainability indicators (some examples, human system, (economy, health, education, policies, ecosystem, air, water, land, biodiversity), Fuzzy measurement (analysis, decision making), Macroscale pollution prevention (industrial ecology, life cycle assessment), Mesoscale pollution prevention (waste audits, emission inventories, flowsheet analysis, mass exchange network synthesis).

Spring semester

Quantitative Methods in Banking Risk Management
(Fotios Pasiouras, 2011-2012**)**
Introduction to the operation of the banking system, Financial statements and financial analysis of banks, Bankruptcy risk, Credit risk, Market risk, Operational risk, Liquidity risk, Interest rate risk, Exchange risk, Portfolio risk, Derivatives, Regulatory framework.

Special Topics in Machine Learning
(Anastasios Doulamis, 2011-2012**)**
Design of learning systems, Decision trees (representation, learning algorithms, information entropy and gain), Probabilistic learning (maximum likelihood estimation, Bayesian classifiers, Bayesian erros, Nearest neighbor algorithms), Discriminative classifiers and regression models (kernel-based regression), Neural networks (feedforward networks, learning vector quantization, self organized maps), Generalization issues, Hidden Markov models and Bayesian networks, On-line learning, Semi-supervised learning, Applications.

Production Scheduling
(Vassilis Kouikoglou, 2011-2012**)**
Single-machine, parallel-machines, Flow-shop and job-shop scheduling, Overview of dynamic programming and branch-and-bound methods, Kuhn-Tucker conditions, Flow and routing control of complex production systems, Stability.

Evolutionary Algorithms and Optimization of Large Scale Systems
(Yannis Marinakis, 2011-2012**)**
Simple heuristic algorithms, Local search algorithms, Memetic algorithms, Reduced search algorithms, Simulated annealing, Genetic algorithms, Evolutionary algorithms, Applications of neural networks in optimization, Randomized search algorithms, Scatter search, Swarm intelligence, Ant colony optimization, Bee colony optimization, Parallel algorithms, Lagrangian relaxation, Column generation, Decomposition algorithms, Frank-Wolfe method, Dantzig-Wolfe decomposition, Benders decomposition, Kornai-Liptak decomposition, Case studies.

Multicriteria Decision Systems
(Michael Doumpos, 2011-2012**)**
Preference modeling. Consistent family of criteria. Multiattribute utility theory. Sensitivity analysis. Outranking relations. Multiobjective linear programming. Multicriteria simplex method. Multicriteria parametric programming. Interactive techniques. Goal programming. Preference disaggregation analysis. Evaluation of ordinal regression and classification models.

PRODUCTION ENGINEERING

Core courses

Winter semester

Special Topics on Computer Aided Design
(Nikolaos Bilalis, 2011-2012**)**
Life cycle management, Review of CAD systems, Concurrent engineering, Quality Function Deployment, Product data management, Rapid prototyping and rapid tooling systems, Virtual prototype and manufacture, Work teams organisation for new product development, Design for manufacture, Design for Assembly, Data exchange between CAD systems, IGES and STEP.

Systems Development and Products Design Using Intelligent Optimization Methods
(Ioannis Nikolos, 2011-2012**)**
Introduction, Geometry definition using parametric curves and surfaces, Introduction to Evolutionary Algorithms (EA), Types of EAs, Structure and special characteristics of EAs, Methods for enhancing the convergence rate (special operators, parallel processing, meta-models), Multi-objective EAs for design optimization, Artificial Neural Networks (ANN), EAs combined with ANN in design optimization, Case studies.

Spring semester

Production Scheduling
(Vassilis Kouikoglou, 2011-2012**)**
Single-machine, parallel-machines, Flow-shop and job-shop scheduling, Overview of dynamic programming and branch-and-bound methods, Kuhn-Tucker conditions, Flow and routing control of complex production systems, Stability.

Computational Methods for Engineers
(Dimitrios Rovas, 2011-2012**)**
Introduction to computational methods: machine representation of numbers, stability of numerical methods, relation between consistency, stability and convergence. Numerical Linear Algebra: Direct and iterative methods for the solution of linear systems, numerical computation of eigenvalues and eigenvectors. Functions and functionals: Solution of non-linear equations, polynomial interpolation (interpolation error, approximation with Spline and Bezier curves), numerical integration (formulas for integration in 1, 2 and 3 dimensions). Function approximation with generalized Fourier, Gaussian, Chebyshev and Legendre series, integration and interpolation. Integral Transforms. Introduction to the numerical solution of partial differential equations. Applications and programming exercises (using MATLAB).

Elective courses

Winter semester

Advanced Queueing Systems
(Efstratios Ioannidis, 2011-2012**)**
Discrete and continuous time Markov chains. Useful distributions. Basic principles of queueing systems. Linear difference equations and differential equations. Elementary queueing systems and extensions. Non-exponential systems. Systems with multiple servers. Combinations of make-to-stock with make-to-order systems. Job scheduling. Production lines.

Pollution Prevention
(Yannis Phillis)
The concept of sustainability (who is interested in sustainability, difficulties in achieving sustainability, what is sustainability), Introduction to fuzzy logic, Sustainability indicators (some examples, human system, (economy, health, education, policies, ecosystem, air, water, land, biodiversity), Fuzzy measurement (analysis, decision making), Macroscale pollution prevention (industrial ecology, life cycle assessment), Mesoscale pollution prevention (waste audits, emission inventories, flowsheet analysis, mass exchange network synthesis).

Fuzzy Sets and Systems
(Nikos Tsourveloudis, 2011-2012**)**
The goal of this course is to provide an introduction to fuzzy sets theory and logic. The following topics will be addressed: Definitions and basic operations with fuzzy sets, Fuzzy relations and the extension principle, Linguistic variables, Operations and fuzzy IF-THEN rules, Approximate reasoning, Fuzzy knowledge-based systems, Fuzzy-neurofuzzy control, Decision making, MATLAB's fuzzy logic toolbox™.

Manufacturing Modeling & Simulation by CAD/CAE Systems
(Aristomenis Antoniadis, 2011-2012**)**
Analytical and Numerical simulation methods for manufacturing processes. Manufacturing simulation software. FEM applications for cutting and forming operations. Software development using programming languages like FORTRAN, VB, C++. Manufacturing simulation using CAD systems. Cutting tools design. Optimization of cutting processes based on minimization of tool wear and machined surface integrity. Simulation based on specific measurements.

Advanced Topics in Computational Mechanics
(Georgios Stavroulakis, 2011-2012**)**
Numerical methods in engineering (partial differential equations, elements of numerical approximation, finite and boundary elements), Review of linear finite element analysis, Special topics on linear analysis of structures (anisotropic materials, three-dimensional elements, plates in bending, discs, shells), Nonlinear analysis (geometric and material nonlinearity), Relevant topics (thermal effects, coupled field problems, finance), Programming the finite element method, Application and computing examples and homeworks (with the use of open source codes mainly within MATLAB).

Spring semester

Optimal Control
(Anastasios Pouliezos, 2011-2012**)**
Basic concepts, Introduction to calculus of variations, Optimal control, Pontryagin's maximum principle, Minimum time/fuel/energy problems, Case studies, Numerical methods.

Numerical Methods for Fluid Mechanics and Heat Transfer
(Ioannis Nikolos, Dimitrios Rovas, 2011-2012**)**
Elliptic, parabolic, hyperbolic partial differential equations for steady and unsteady problems. Overview of discretization methodologies for equations arising in fluid mechanics and heat transfer. Discretization errors, stability, convergence. Fourier analysis and von Neumann stability. The finite volume method (for structured and unstructured grids). The finite difference method.

Optimal Structural Design of Materials and Structures
(Georgios Stavroulakis, 2011-2012**)**
Elements of numerical optimization and related fields (neural networks, genetic optimization), Parametric modeling, Formulation of optimal structural design problems, Computational methods, Topology optimization of materials and structures, Coupled field problems and applications.

Nonsmooth Mechanics and Optimization
(Georgios Stavroulakis, 2012-2013**)**
Convex and nonconvex functions and sets, Differentiability and nonsmooth functions, Convex analysis and extensions, Applications on nonsmooth analysis and optimization (linear and nonlinear complementarity problems), Application examples on mechanics and structural analysis (contact problems, friction, plasticity, damage), Optimal design, Identification and structural control, Relevant topics (network flow, financial modeling).

LIST OF GRADUATE COURSES

	Winter semester	Spring semester
Core courses	Advanced Telematics in Road Transportation (*) Natural and Artificial Intelligence (**) Advanced Topics in Computational Mechanics Advanced Non-linear Programming	Nonsmooth Mechanics and Optimization (*) Optimal Structural Design of Materials and Structures (**) Evolutionary Algorithms & Opt. of Large Scale Systems Multicriteria Decision Systems
Elective courses	Distributed Artificial Intelligence and Multi-Agents Systems Fuzzy Sets and Systems Modeling and Verification of Man Machine Systems Advanced Queueing Systems	Production Scheduling Computational Methods for Engineers Optimal Control Advanced Issues in Information and Decision Systems Special Topics on Machine Learning

	ENGINEERING MANAGEMENT	
	Winter semester	**Spring semester**
Core courses	Multicriteria Analysis and Financial Decisions Service Quality and Customer Satisfaction	Advanced Issues in Information and Decision Systems Management Problem Solving
Elective courses	Modeling and Verification of Man Machine Systems Distributed Artificial Intelligence and Multi-Agents Systems Fuzzy Sets and Systems Special Topics on Computer Aided Design	Quantitative Methods in Banking Risk Management Special Topics on Machine Learning Production Scheduling Evolutionary Algorithms & Opt. of Large Scale Systems Multicriteria Decision Systems

	PRODUCTION ENGINEERING	
	Winter semester	**Spring semester**
Core courses	Special Topics on Computer Aided Design Systems Devel. & Products Design Using Int. Opt. Methods	Production Scheduling Computational Methods for Engineers
Elective courses	Pollution Prevention Fuzzy Sets and Systems Manuf. Modeling & Simulation by CAD/CAE systems Advanced Queueing Systems Advanced Topics in Computational Mechanics	Numerical Methods for Fluid Mechanics & Heat Transfer Algorithms for Robotic Problems Optimal Control Nonsmooth Mechanics and Optimization (*) Optimal Structural Design of Materials and Structures (**)

(*) Courses not offered in the academic year 2011–2012

(**) Courses not offered in the academic year 2012–2013

Full-time students in Engineering Management and Production Engineering should enroll in two core courses and two elective courses in each semester (30 ETCS credits). Full-time students in Operations Research should enroll in four courses in each semester (30 ECTS credits), including at least two core courses.

Part-time students in Engineering Management and Production Engineering should enroll in one core course and one elective course in each semester (15 ETCS credits). Part-time students in Operations Research should enroll in two courses in each semester (15 ECTS credits), including at least one core course.

The M.S. thesis corresponds to 30 ECTS credits and it is undertaken during the 3rd or 5th semester (for full and part-time students, respectively).

FACULTY

DIVISION OF DECISION SCIENCE

Michael Doumpos, Assistant Professor; Operations Research
Yannis Marinakis, Lecturer, Evolutionary and Metaheuristic Algorithms, Stochastic Optimization
Markos Papageorgiou, Professor; Dynamic Systems, Automatic Control, Optimization.
Ioannis Papamichail, Assistant Professor; Mathematical Programming and Algorithms
Georgios Stavroulakis, Professor; Computational Mechanics, Non-smooth Optimization

DIVISION OF MANAGEMENT

Evangelos Grigoroudis, Assistant Professor; Management of Quality Processes
Anastassios Doulamis, Assistant Professor; Intelligent Methods-Data Base Analysis Systems
Tom Kontogiannis, Associate Professor; Industrial Safety, Work Organization, Ergonomics.
Nikolaos Matsatsinis, Professor; Information Systems, Decision Support Systems, Artificial Intelligence.
Vassilis Moustakis, Associate Professor; Management, Expert Systems.
Fotios Pasiouras, Assistant Professor, Quantitative Methods in Management.
Constantin Zopounidis, Professor; Financial Management, Multicriteria Support Systems for Financial Decisions

DIVISION OF PRODUCTION SYSTEMS

Aristomenis Antoniadis, Associate Professor; Production Systems.
Nikolaos Bilalis, Professor; CAD/CAM.
Efstratios Ioannidis, Associate Professor; Production Networks.
Vassilis Kouikoglou, Professor; Production Networks, Simulation.
Ioannis Nikolos, Assistant, Thermal and Hydrodynamic Machines.
Nikos Tsourveloudis, Associate Professor, Production Technology, Fuzzy Logic.
Yannis Phillis, Professor; Production Networks, Stochastic Processes.
Anastasios Pouliezos, Professor; Automatic Control.
Dimitrios Rovas, Assistant Professor; Heat Transfer.

INFORMATION

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