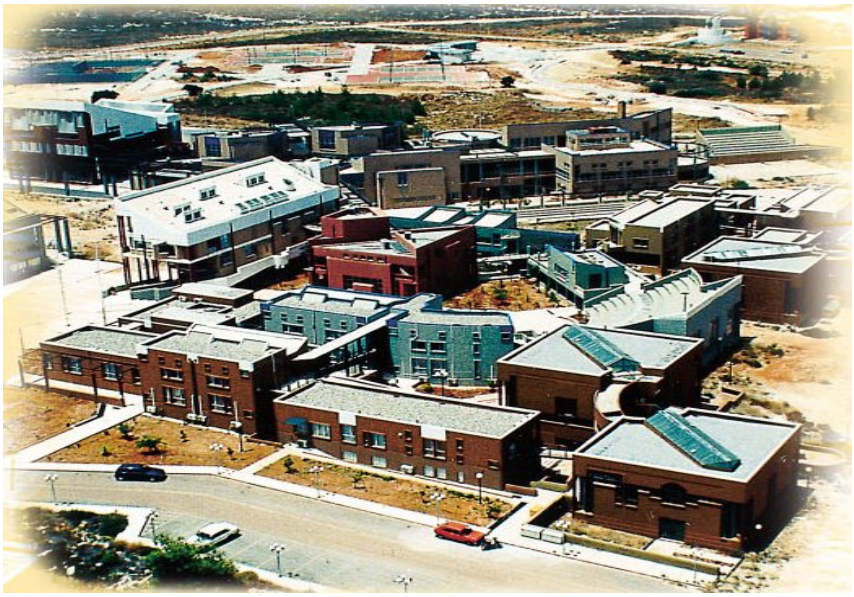
TECHNICAL UNIVERSITY OF CRETE

DEPARTMENT OF PRODUCTION ENGINEERING AND MANAGEMENT



UNDERGRADUATE PROGRAM STUDENT GUIDE

2012-2013

CHANIA 2012

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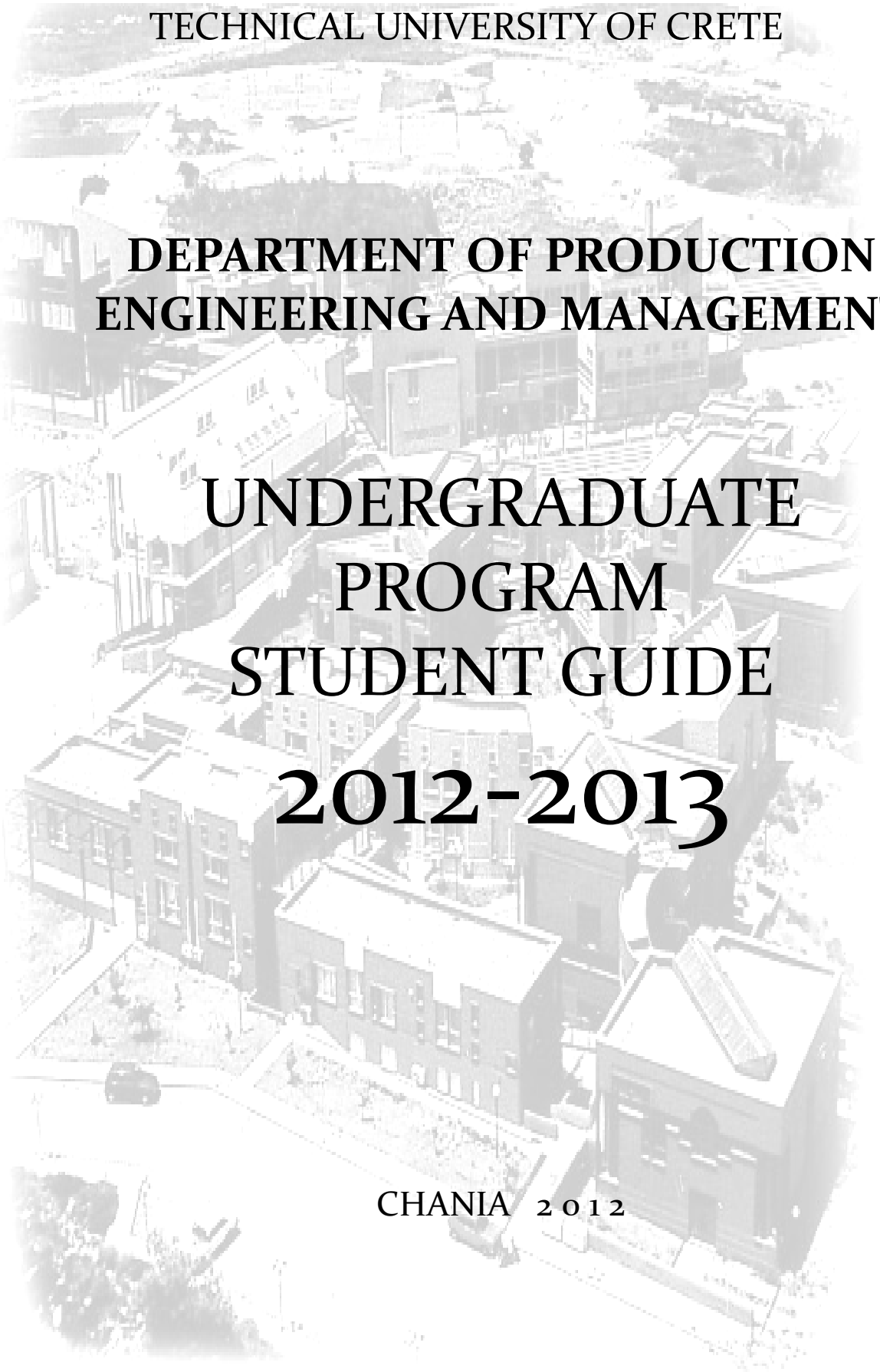

DEPARTMENT OF PRODUCTION ENGINEERING AND MANAGEMENT

UNDERGRADUATE PROGRAM STUDENT GUIDE

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CHANIA 2012

RECTORATE

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Dear Sir / Madame,

The Department of Production Engineering and Management has been created with the purpose of educating engineers with enhanced management knowledge and skills. The PEM Department (DPEM) accepted its first undergraduate students in 1984 and the first graduate students in 1986.

Production and Management Engineers, internationally known as Industrial Engineers as well, deal with design, optimization and management of complex engineering systems. Our graduates have found their way and build carriers in industry as well as service and consulting companies.

Our Department offers a five-year undergraduate program leading to a diploma, as well as three graduate study programs in the following directions: Management, Operational Research and Production Systems, that lead to Master of Science and Doctorate Degrees. Undergraduate studies are done exclusively in Greek language, with the exception of Erasmus exchange students who have the option to follow courses and seminars in English and other languages.

Updated information about our Department can be found in the web page www.dpem.tuc.gr.

On behalf of my Colleagues and the co-workers of the Department I would like to welcome you to our Department and kindly ask you to contact us for further information or proposals for changes.

With kind regards

Professor Georgios E. Stavroulakis

Head of the Department

Table of Contents

1. General Information

1.1 Mission

Education at the Department of Production Engineering and Management (DPEM) aims at the culmination of necessary skills and capabilities for the development, design and optimization of production systems. The first students were admitted in September 1984, with the then newly-established department being the first in Greece to specifically embrace this subject area.

The establishment of the department was necessitated by the following societal and economic developments:

- To maintain competitiveness at a national and international level, there is a need for effective implementation of methodologies to enhance productivity and improve production of goods and services.
- To ensure rapid adoption of innovation and new technologies and assess their potential impact on everyday life and the environment, a holistic educational approach is required that encompasses technological, economical, social and ecological aspects of production.
- To fulfill the requirement of Greek corporations for highly educated and skilled engineers that can deal successfully and efficiently not only with pure technological/engineering problems but also with their managerial and organizational facets.

The undergraduate curriculum of the DPEM comprises courses in mathematics, physics, humanities, production systems, operational research, information systems, applied economics, finance and management sciences. Students of the department have the opportunity to attend courses in universities across Europe via student exchange programs.

Graduates of the department have been successfully employed in the manufacturing and service fields. Indicative fields of employment are:

- *Production systems design and management;*
- *Information systems design, development and management;*
- *E-commerce applications development;*
- *Computer-aided product design and rapid product design;*
- *Material requirements planning;*
- *Logistics;*
- *Dynamic resource allocation;*
- *Robotics;*
- *Project management;*
- *Occupational Safety;*
- *Transportation Systems;*
- *Quality management;*
- *Financial decision and investment planning;*
- *Financial engineering and financial risk management;*
- *Artificial intelligence;*
- *Data mining and intelligent systems;*
- *Decision support systems;*
- *Environmental studies;*
- *Consumer behavior studies and technological marketing;*
- *Operational research and multi-criteria decision making.*

1.2 Personnel

The personnel of the department is divided into the following categories:

1. *Faculty members.* Faculty members have a Ph.D. and are appointed at the following ranks: Professor, Associate Professor, Assistant Professor and Lecturer.

2. *Adjunct Professors*. In addition to regular faculty members the department hires adjunct professors to support the undergraduate curriculum.
3. *Special Laboratory-Teaching Personnel (SLTP)*. SLTP members provide instruction services at the departmental laboratories.
4. *Special Technical Laboratory Personnel (STLP)*. The STLP members provide technical support services.
5. *Administrative staff*. Administrative staff provides administrative services essential to the educational and research objectives of the department.

1.3 Departmental Administrative Structure

The Head of the Department bears the administrative and financial responsibilities of the department. The General Assembly, chaired by the Head of the Department, is the main administrative instrument of the Department. The General Assembly comprises faculty members, as well as, representatives of: graduate and undergraduate students, SLTP and STLP.

Professor Georgios Stavroulakis serves as the Head of the Department and professor Anastasios Pouliezos serves as the Associate Head. **Mrs. Dimitra Havre**, oversees administrative support to the Department.

The General Assembly receives recommendations from the following committees:

A. Practical Training Committee
I. Nikolos, Assistant Professor.

B. Undergraduate Studies Committee and **Undergraduate Student Advisor**
Y. Marinakis, Lecturer.

C. Graduate Studies Committee
M. Doumpos, Assistant Professor,
D. Rovas, Assistant Professor,
A. Doulamis, Assistant Professor.

D. Standardization Committee
A. Doulamis, Assistant Professor.

E. Professional Rights Committee
E. Grigoroudis, Assistant Professor.

F. Public Relations Committee
D. Rovas, Assistant Professor.

G. ERASMUS Departmental Coordinator
F. Passiouras, Assistant Professor.

H. Library Committee (Campus-level)
I. Nikolos, Assistant Professor.

I. Information Technology Services Committee (Campus-level)
A. Doulamis, Assistant Professor.

J. Student Records
E. Grigoroudis, Assistant Professor.
Y. Marinakis, Lecturer.

K. Strategic Design Committee
N. Matsatsinis, Professor,
N. Bilalis, Professor,
M. Papageorgiou, Professor,
N. Tsourveloudis, Professor.

1.4 Departmental Divisions

The Department of Production Engineering and Management is organized into three divisions, each of them including a number of interrelated scientific fields. The Departmental divisions are:

Production Systems

Decision Sciences

Management

1.4.1. *Division of Production Systems*

The division of production systems is involved with the various aspects of the theory of production systems (systems reliability, task scheduling, analysis and optimization of production systems, power systems, etc.) as well as modern manufacturing and production technology (flexible manufacturing systems, robotics, automatic control, computer-aided design, computer-aided manufacturing, material handling, environmental technology, etc.).

Faculty Members

Antoniadis, Aristomenis
Associate Professor

Ph.D. (1989), Department of Mechanical Engineering, Aristotle University of Thessaloniki, Greece.

Diploma (1984), Department of Mechanical Engineering, Aristotle University of Thessaloniki, Greece.

Research Area: Production Systems.

Bilalis, Nikolaos
Professor

Ph.D. (1983), Department of Production Engineering, Loughborough University of Technology, United Kingdom.

M.Sc. (1979), Department of Mechanical Engineering, Aston University of Birmingham, United Kingdom.

Diploma (1978), Department of Mechanical and Electrical Engineering, National Technical University of Athens, Greece.

Research Area: Computer-Aided Design and Manufacturing.

Ioannidis, Efstratios
Assistant Professor

Ph.D. (2004), Department of Production Engineering and Management, Technical University of Crete, Greece.

M.Sc. (1997), Department of Production Engineering and Management, Technical University of Crete, Greece.

Diploma (1995), Department of Production Engineering and Management, Technical University of Crete, Greece.

Research Area: Analysis and optimization of production lines and networks

Kanellos, Fotios
Lecturer

Ph.D. (2003), Department of Electrical and Computer Engineering, National Technical University of Athens, Greece.

M.Sc. (2001), Department of Electrical and Computer Engineering, National Technical University of Athens, Greece.

Diploma (1998), Department of Electrical and Computer Engineering, National Technical University of Athens, Greece.

Research Area: Electric Networks.

Kouikoglou, Vassilis
Professor

Ph.D. (1989), Department of Production Engineering and Management, Technical University of Crete, Greece.

Diploma (1985), Department of Electrical and Computer Engineering, National Technical University of Athens, Greece.

Research Area: Production Networks.

Nikolos, Ioannis
Assistant Professor

Ph.D. (1996), Department of Mechanical Engineering,
National Technical University of Athens, Greece.

Diploma (1990), Department of Mechanical Engineering,
National Technical University of Athens, Greece.

Research Area: Thermal and Hydrodynamic Machines.

Papaefthimiou, Spyros
Assistant Professor

Ph.D. (2001), Department of Physics, University of Patras, Greece.

M.Sc. (1997), Department of Physics, University of Patras, Greece.

B.Sc. (1995), Department of Physics, University of Patras, Greece.

Research Area: Energy Management Systems and Energy Efficiency Technologies.

Phillis, Yannis
Professor

Ph.D. (1980), Department of Engineering Systems,
University of California, Los Angeles, United States of America.

M.Sc. (1978), Department of Engineering Systems,
University of California, Los Angeles, United States of America.

Diploma (1973), Department of Mechanical and Electrical Engineering,
National Technical University of Athens, Greece.

Research Area: Production and Environmental Systems.

Pouliezos, Anastasios
Professor

Ph.D. (1980), Department of Electrical Engineering,
Brunel University of London, United Kingdom.

M.Sc. (1976), Department of Computing and Control,
Imperial College of London, United Kingdom.

B.Sc. (1975), Mathematics and Computing,
Polytechnic of North London, United Kingdom.

Research Area: Control Systems.

Rovas, Dimitrios
Assistant Professor

Ph.D. (2003), Department of Mechanical Engineering,
Massachusetts Institute of Technology, United States of America.

Diploma (1998), Department of Mechanical Engineering,
National Technical University of Athens, Greece.

Research Area: Thermodynamics and Heat Transfer, Computational Science and Engineering.

Tsourveloudis, Nikolaos
Professor

Ph.D. (1995), Department of Production Engineering and Management,
Technical University of Crete, Greece.

Diploma (1990), Department of Production Engineering and Management,
Technical University of Crete, Greece.

Research Area: Manufacturing Technology.

Division Laboratories

Computer-Aided Manufacturing (CAM)
Y. Phillis (Director)

Educational and research activities of the laboratory focus on flexible manufacturing systems, production technology, computer-aided manufacturing, and environmental systems.

Industrial Systems Control Laboratory
A. Pouliezos (Director)

Educational and research activities of the laboratory focus on automatic control, fault diagnosis as well as unmanned vehicles and robots, and artificial intelligence. It is also involved in intelligent systems using neural networks, fuzzy-logic, etc for fault-diagnosis in industrial systems as well as learning control systems.

Computer-Aided Design
N. Bilalis (Director)

Educational and research activities of the laboratory focus on computer-aided product design and development, rapid product development, virtual prototyping and manufacturing, innovation management, design for disassembly, product modeling.

Intelligent Systems and Robotics Laboratory
N. Tsourveloudis (Director)

Educational and research activities of the laboratory focus on robotic systems, kinematics, sensors, unmanned robots and vehicles, autonomous navigation systems and simulation of robotic systems.

Micromachining and manufacturing modeling Laboratory
A. Antoniadis (Director)

Micromachining and Manufacturing Modeling Lab (m3) was created in 2010 in order to cover the educational and research needs in advanced manufacturing fields, and micromachining in particular. In addition, the m3 supports manufacturing subjects of mechanical engineers in general, such as Machine Elements. The m3 provides high scientific knowledge to our students, while being actively involved in research collaborations with other Universities and Research Institutions and promoting collaborations with enterprises for the resolution of practical problems. The research fields where m3 is actively involved or provides services via the Special Research Fund Account (ELKE) of the Technical University of Crete are: Microtechnologies, CAD/CAM/CAE, 3D Modeling, Finite Elements Method Analysis for Production Technologies, Reverse Engineering and specialised subjects of Bioengineering and Nanotechnology.

1.4.2. *Division of Decision Sciences*

The division of decision sciences specializes in methodologies and techniques aiming at supporting decision making as well as at the design, control and optimization of production systems, telematic applications and service provision.

Faculty Members

Doumpos, Michalis
Assistant Professor

Ph.D. (2000), Department of Production Engineering and Management, Technical University of Crete, Greece.

M.Sc. (1997), Department of Production Engineering and Management, Technical University of Crete, Greece.

Diploma (1995), Department of Production Engineering and Management, Technical University of Crete, Greece.

Research Area: Computational Methods in Operations Research.

Marinakis, Yannis
Lecturer

Ph.D. (2005), Department of Production Engineering and Management, Technical University of Crete, Greece.

M.Sc. (2001), Department of Production Engineering and Management, Technical University of Crete, Greece.

Diploma (1999), Department of Production Engineering and Management, Technical University of Crete, Greece.

Research Area: Stochastic Optimization and Applications.

Papageorgiou, Markos
Professor

Dr.-Ing. (1981), Department of Electrical Engineering, Technical University of Munich, Germany.

Dipl.-Ing. (1976), Department of Electrical Engineering, Technical University of Munich, Germany.

Research Area: Optimization, Automatic Control, Applications.

Papamichail, Ioannis
Assistant Professor

Ph.D. (2002), Department of Chemical Engineering and Chemical Technology,
Imperial College London, United Kingdom.

M.Sc. (1999), Process Systems Engineering,
Imperial College London, United Kingdom.

Diploma (1998), Department of Chemical Engineering,
National Technical University of Athens, Greece.

Research Area: Mathematical Programming and Algorithms.

Stavroulakis, Georgios
Professor

Ph.D. (1991), Department of Civil Engineering,
Aristotle University of Thessaloniki, Greece.

Diploma (1985), Department of Civil Engineering,
Aristotle University of Thessaloniki, Greece.

Habilitation (2000), Department of Civil Engineering,
Carolo-Wilhelmina Technical University, Braunschweig, Germany.

Research Area: Non-smooth mechanics and optimization.

Division Laboratories

Dynamic Systems and Simulation
M. Papageorgiou (Director)

Educational and research activities of the laboratory focus on modeling, simulation, automatic control and optimization with practical applications to transportation and traffic systems, water systems, production systems, etc.

Decision Support Systems
N. Matsatsinis (Director)

Educational and research activities of the laboratory focus on methodological research dealing with the development and/or improvement of decision-making methods and techniques as well as real-world studies on systems evaluation and decision support, operations research, multi-criteria analysis, multi-agent systems as well as logistics.

Computational Mechanics and Optimization
G. Stavroulakis (Director)

The Institute of Computational Mechanics and Optimization works on the theory and development of methods related to computational mechanics and optimization for materials and structures. Research efforts are focused on non-smooth and non-convex problems in mechanics and optimization.

1.4.3. *Division of Management*

The division of management covers a wide area of management and finance sciences including, among others, financial analysis & engineering, marketing, ergonomics, safety of work, information systems, e-commerce, artificial intelligence, quality control, etc.

Faculty Members

Doulamis, Anastasios
Assistant Professor

Ph.D. (2001), Department of Electrical and Computer Engineering,
National Technical University of Athens, Greece.

Diploma (1995), Department of Electrical and Computer Engineering,
National Technical University of Athens, Greece.

Research Area: Intelligent Methods and Database Analysis Systems.

Grigoroudis, Evangelos
Assistant Professor

Ph.D. (1999), Department of Production Engineering and Management, Technical University of Crete, Greece.

Diploma (1991), Department of Production Engineering and Management, Technical University of Crete, Greece.

Research Area: Quality Process Management.

Kontogiannis, Tom
Associate Professor

Ph.D. (1989), Department of Mechanical Engineering, Loughborough University of Technology, United Kingdom.

M.Sc. (1986), Department of Mechanical Engineering, University College London, United Kingdom.

Diploma (1983), Department of Mechanical Engineering, Aristotle University of Thessaloniki, Greece.

Research Area: Ergonomics.

Matsatsinis, Nikolaos
Professor

Ph.D. (1995), Department of Production Engineering and Management, Technical University of Crete, Greece.

B.Sc. (1980), Department of Physics, Aristotle University of Thessaloniki, Greece.

Research Area: Information Systems.

Moustakis, Vassilis
Professor

D.Sc. (1984), Department of Engineering Management, George Washington University, United States of America.

MEA (1980), Department of Engineering Management, George Washington University, United States of America.

Diploma (1978), Department of Mechanical and Aeronautical Engineering, University of Patras, Greece.

Research Area: Operations Management, Data Mining.

Pasiouras, Fotis
Assistant Professor

Ph.D. (2005), Business School, University of Coventry, United Kingdom.

MBA (2001), Master in Business Administration in Finance, University of Coventry, United Kingdom.

B.Sc. (2000), Department Economics, Aristotle University of Thessaloniki, Greece.

Research Area: Quantitative Methods in Banking and Business Administration.

Zopounidis, Constantin
Professor

Doctorat d'État (1986), Management Science, Université de Paris–Dauphine (Paris IX), France.

D.E.A. (1982), Financial Management, Université de Paris–Dauphine (PARIS IX), France.

B.Sc. (1981), Department of Business Administration, University of Macedonia, Greece.

Research Area: Financial Management, Multicriteria Decision Support, Risk Management.

Division Laboratories

Data Analysis and Forecasting

Educational and research activities of the laboratory focus on data analysis, forecasting, marketing and quality control systems.

Financial Engineering
C. Zopounidis (Director)

Educational and research activities of the laboratory focus on the development of innovative methodological tools to address financial decision making problems, the provision of specialized knowledge on topics related to financial analysis and investment planning and the development of infrastructure required for conducting high-level research on financial risk management problems. Within this framework, the research conducted in the Financial Engineering Laboratory involves the applications of multicriteria decision aid in financial management, the use of artificial intelligence techniques in financial risk assessment, as well as the design and development of multicriteria and knowledge-based decision support systems for financial decision making problems.

Management Systems
V. Moustakis (Director)

Education and research activities in: logistics (with emphasis in RFID technology, information systems, web services), health-care management, and entrepreneurial / creativity / innovation modeling, and medical / biomedical informatics.

Work Safety and Cognitive Ergonomics
T. Kontogiannis (Director)

Educational and research activities of the laboratory focus on occupational safety and cognitive ergonomics.

1.4.4. *Inter-departmental Laboratories*

The following interdepartmental laboratory also provides educational and research services to the Department:

Machine Tools Laboratory
N. Tsourveloudis (Director)

The laboratory is involved in educational and research activities in machine tools, manufacturing technology material processing, welding, drilling and milling.

Language Research and Resource Center

The Language Center at the Technical University of Crete, established in September 1997, offers a variety of autonomous language learning resources to its engineering students. Besides servicing undergraduate students in the Departments of Production Engineering and Management, Electronic and Computer Engineering, Mineral Resources Engineering, and Environmental Engineering, the Language Center offers resources to all students who are interested in developing language skills.

Drafting Center
G. Poulidakis (Director)

The Drafting Center provides educational support services in Engineering Drafting using conventional and computer-aided techniques.

1.5 Honorary Doctorates

The following honorary doctorates have been awarded by the Department in chronological order:

1. *5 May 1993*, ***Rudolf Kalman*** for contributions to the field of automatic control;
2. *3 May 1996*, ***Sir David Cox*** for contributions to the field of statistics;
3. *10 June 2002*, ***Bernard Roy*** for contributions to the field of decision support systems and multicriteria analysis;
4. *15 December 2004*, ***Mohammad Jamshidi*** for contributions to the field of automatic control;
5. *1 September 2008*, ***Pravin Varaiya*** for contributions to the field of automatic control and applications to production, communication and transportation systems;
6. *10 November 2008*, ***Roman Słowiński*** for contributions to the fields of decision support systems, rough sets and soft computing;
7. *29 May 2009*, ***Dimitri Bertsekas*** for contributions to the field of optimization and operational research.

2. Undergraduate Studies Structure and Rules

2.1 Structure

The academic year starts each year on September 1st and ends on August 31st of the following year. Each academic year has two semesters: the fall and the spring semester. Each course has a duration of one semester, is offered either in the spring or fall semester, and includes:

- lectures,
- tutorials,
- laboratory exercises,
- seminars (given by industry experts), and
- visits to production plants and companies.

The undergraduate program has a total duration of ten semesters, with the first nine semesters devoted to coursework and the final semester to a diploma thesis. Course offerings are grouped into two categories: (a) core courses, and (b) electives; successful completion of *all* required courses is one of the prerequisites for an undergraduate degree. Students should also successfully complete a specific number of elective courses.

2.2 Program Compilation

The detailed curriculum to be adopted for the next academic year is finalized at the end of each spring semester. The detailed curriculum provides the following information for each of the courses to be offered:

- title of course;
- number of lecture hours per week;
- number of tutorial hours per week;
- number of laboratory-exercise hours per week;
- credit units.

In Section 3 of this document, the detailed curriculum for the academic year 2009-2010 is presented. To aid students with course selection, a study path is also provided giving recommendations for course selection per semester. To ensure successful completion in the allotted time, to account for interdependencies between courses, and to ensure a balanced workload, students are strongly advised to follow the suggested path.

2.3 Academic Year and Semester Duration

Classroom instruction commences on the second half of September and concludes by the end of the spring semester, usually in the first half of June. The exact start and end dates of each semester, as well as the exam periods can be found in the academic calendar, available at the University web site. Each semester lasts 15 weeks: 13 weeks for classroom instruction and 2 weeks for exams. There is a break of one week between the fall and spring semesters. There are no classes on the following holidays:

Fall Semester	Spring Semester
28th October (National holiday)	Lent Monday
17th November	25th March (National Holiday)
21st November (Local holiday)	Easter break (2 weeks)
Christmas Break (2 weeks)	1st May (Labor Day)
30th January (School holiday)	1 day for student elections (determined by the student body)
	Holy Spirit Monday

2.4 Course Selection

Registration for classes takes place during the first two weeks of each semester at the Registrar's Office. Following the suggested study plan, students *typically* register for 6 or 7 courses per semester to exactly 30 credits – representing a typical workload for a full-time student that corresponds to 22-35 instruction hours per week (tutorials and lab exercises included). Students may register for more than the aforementioned number of courses, a provision necessary for students retaking classes they have not successfully completed in previous semesters. Depending on the semester of attendance certain limits apply regarding the maximum number of courses that a student may register for credit. During the registration period students are allowed to add or drop courses, but no changes are permitted after the registration period expires. Students are not allowed to participate in labs, exams, or take credit for classes they have not registered. Courses in odd-numbered semesters are offered in the fall, and courses in even-numbered semesters are offered in the spring.

2.5 Class attendance – Grading

In the beginning of each semester the instructor provides the syllabus with a course description, office hours, grading policy, and course requirements. Topics to be covered have to match closely the approved course contents contained in this student guide. Lecture and tutorial attendance is highly recommended but not mandatory. Students have to successfully complete the course requirements which might include: midterm exams, assignments, projects, laboratories, and the final exam which occurs during the final exam period.

In each academic year there are three examination periods: the first, in January, after the end of the fall semester; the second, in June, after the end of the spring semester; and the third, in September, after the end of the summer break. The exact dates for the exam periods can be found in the academic calendar, and the exam schedule is announced in advance in the department and university web-sites. The winter examination period is for courses offered in the fall semester, whereas the summer examination period is for courses offered in the spring semester. Students that miss or fail the final exam of one or more fall- or spring-semester courses, can retake the final exam in the third examination period (in September). Failure to successfully fulfill the class requirements during the two exam periods, requires students to register and retake the class in the following academic year(s).

The final grade is computed by the class instructor as an overall performance in midterm exams, assignments, projects, laboratory exercises, and the final exam. The grading policy is announced by the instructor at the beginning of each semester. The final grades are announced within a period of fifteen (15) days after the final exam and are given on a scale from zero (0) to ten (10), rounded to the nearest half (½). A grade of five (5) or higher is required for successful completion of the class. Depending on the final grade, class aptitude can be characterized according to the following table:

Final Grade	
8.50 – 10	Excellent
6.50 – 8.49	Very Good
5 – 6.49	Good
3 – 4	Moderate
0 – 1 - 2	Poor

2.6 Diploma Thesis

The diploma thesis has a duration of at least one semester. Diploma thesis topics are assigned and supervised by regular and adjunct faculty members in relevant-to-the-department subject areas. Students can start work on their diploma theses in any semester; they cannot however defend their thesis unless they have successfully completed their coursework. Upon completion, students have to take part in an oral examination. Academic performance, the quality of the work and the presentation are evaluated by the examination committee comprising three faculty members. The thesis grade is the average of the grades assigned by the three committee members.

2.7 Degree Requirements

An undergraduate degree is conferred upon successful completion of *all* the following requirements:

1. *Enrollment Residence Requirement:*
   Registration in the Department and attendance for at least 10 semesters.
2. *Required Coursework Requirement:*
   Successful completion (final grade ≥ 5) of *all* required courses, for a total of 300 credits.
3. *Elective Coursework Requirement:*
   Successful completion (final grade ≥ 5) of a certain number of required electives. Courses are grouped according to their subject areas in seven (7) groups:
   Group I: Mathematical - Physical Sciences;
   Group II: Humanities – Foreign Languages;
   Group III: Electromechanical Systems;
   Group IV: Information Systems;
   Group V: Production Systems;
   Group VI: Operations Research, and;
   Group VII: Management.
   For each group a number of elective courses are offered. Students should select and successfully complete exactly one (1) course from electives in Group II and at least: one (1) course from electives in Group III; one (1) course from electives in Group IV; one (1) course from electives in Group V; one (1) course from electives in Group VI; one (1) course from electives in Group VII.
4. *Diploma Thesis Requirement:*
   Students should successfully complete and defend their diploma thesis.

A total of 300 credits are required for the undergraduate degree. The coursework Grade Point Average (GPA) is computed as a weighted average of the grades received for each of the courses successfully completed. The weights used are available at the Registrar's office or the Greek-language version of this guide. The Diploma Grade is computed by adding the course GPA, multiplied by a coefficient of 4/5, and the diploma thesis grade, multiplied by a coefficient of 1/5. Overall academic performance is characterized according to the following table:

Diploma Grade	
5.00 – 6.49	Good
6.50 – 8.49	Very Good
8.50 – 10.00	Excellent

3. Undergraduate Curriculum

1st Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
MATH 101	1	Differential and Integral Calculus I	4	1	-	5
PHYS 101	2	Physics I	2	1	1.5	4
DPEM 101	3	Programming Methodology	2	-	3	6
DPEM 102	4	Operations Research Methodology	2	2	-	6
MECH 101	5	Computer-Aided Mechanical Drafting	2	-	2	4
MATH 201	6	Linear Algebra	3	1	-	5
TOTAL			**15**	**5**	**6.5**	**30**
SEMINARS		English I or German I	2	2		
		Microsoft Office applications	2			
		Basic internet applications	2			

2nd Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
MATH 102	1	Differential and Integral Calculus II	3	1	-	5
PHYS 102	2	Physics II	2	1	1.5	4
MECH 102	3	Engineering Mechanics – Statics	3	-	1	6
CHEM 103	4	General Chemistry	2	-	2	4
DPEM 121	5	Electric Circuits	3	-	1	5
DPEM 122	6	Algorithms and Data Structures	2	-	3	6
TOTAL			**15**	**2**	**8.5**	**30**
SEMINARS		English II or German II	2	2		
		MATLAB	2			
		Statistical Software	2			

3rd Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
MATH 203	1	Ordinary Differential Equations	3	-	-	5
DPEM 204	2	Probability for Engineers	3	-	-	5
MECH 201	3	Engineering Mechanics – Strength of materials	3	-	1	6
DPEM 202	4	Materials Science	3	-	-	4
KEP 101	5	Sociology	3	-	-	3
LANG 201	6	English III or German III	2	2	-	3
Required electives: Students should select one (1) course from the following list:						
KEP 301	1	Introduction to Philosophy and History of Science (II)	3	-	-	4
DPEM 203	2	Electronics (III)	3	-	2	4
TOTAL			**20**	**2**	**1-3**	**30**

4th Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
MATH 202	1	Numerical Analysis	3	-	1	6
DPEM 228	2	Engineering Statistics	3	-	-	5
DPEM 221	3	Linear Programming	2	2	-	6
DPEM 222	4	Engineering Management	3	1	-	6
LANG 202	5	English IV or German IV	2	2	-	3
Required electives: Students should select one (1) course from the following list:						
KEP 102	1	Political Economy (II)	3	-	-	4
KEP 202	2	History of Civilization (II)	3	-	-	4
KEP 302	3	Industrial Sociology (II)	3	-	-	4
DPEM 407	4	Game Theory (VI)	3	-	2	4
DPEM 208	5	Environmental analysis and planning (V)	3	-	-	4
TOTAL			**16**	**5**	**1-3**	**30**

5th Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
DPEM 301	1	Manufacturing Technology I	4	-	2	6
DPEM 303	2	Stochastic Processes	4	-	-	5
DPEM 305	3	Machine Elements	2	2	-	5
DPEM 224	4	Thermodynamics	2	1	-	4
DPEM 426	5	Combinatorial Optimization	3	-	2	6
Required electives: Students should select one (1) course from the following list:						
KEP 201	1	Micro-Macro Economics (II)	3	-	-	4
KEP 203	2	Art and Technology (II)	3	-	-	4
DPEM 306	3	Introduction to Artificial Intelligence (IV)	3	-	2	4
DPEM 302	4	Human Resource Management (VII)	3	1	-	4
TOTAL			**18**	**3-4**	**4-6**	**30**

6th Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
DPEM 321	1	Manufacturing Technology II	4	-	2	6
DPEM 322	2	Production Systems	4	-	-	5
DPEM 324	3	Decision Support Systems	2	-	2	5
DPEM 325	4	Non-Linear Programming	2	1	-	5
DPEM 223	5	Fluid Mechanics	3	1	-	5
Required electives: Students should select one (1) course from the following list:						
DPEM 432	1	Dynamics, Vibrations & Control of Structures (III)	2	2	-	4
DPEM 230	2	Electronic Business (IV)	2	-	2	4
DPEM 323	3	Data Analysis (VII)	2	2	-	4
DPEM 512	4	Financial Risk Management (VII)	2	1	-	4

Free Elective						
Practical Training I						
TOTAL			**17**	**2-4**	**4-6**	**30**

7th Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
DPEM 401	1	Control Systems I	4	-	2	6
DPEM 402	2	Financial Management	2	-	2	5
DPEM 405	3	Quality Control	2	2	-	5
DPEM 406	4	Marketing	3	-	2	5
DPEM 304	5	Heat Transfer	2	1	-	5
Required electives: Students should select one (1) course from the following list:						
KEP 204	1	Introduction to Legal Systems and Technical Legislation (II)	3	-	-	4
DPEM 504	2	Topics in Environmental Protection (III)	2	-	2	4
DPEM 517	3	Power System Economics (III)	3	-	-	4
DPEM 435	4	Enterprise Resource-Planning Systems (IV)	2	-	2	4
DPEM 403	5	Reliability Theory (V)	3	-	-	4
TOTAL			**15-16**	**3**	**6-8**	**30**

8th Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
DPEM 421	1	Production Networks (CAM)	4	-	2	6
DPEM 422	2	Investment Decision Analysis	2	-	2	4
DPEM 423	3	Computer-Aided Design (CAD)	3	-	2	4
DPEM 424	4	Ergonomics	3	-	3	4
DPEM 326	5	Hydrodynamic and Thermal Engines	3	-	-	4
Required electives: Students should select two (2) courses from the following list:						
DPEM 434	1	Microscale Manufacturing Technologies (III)	1	-	2	4
DPEM 425	2	Dynamic Programming (VI)	2	1	2	4
DPEM 430	3	Control Systems II (V)	3	-	2	4
DPEM 431	4	Computational Mechanics (III)	2	-	2	4
DPEM 408	5	Total Quality Management (VII)	3	-	-	4
DPEM 433	6	Small & Medium Enterprises (SMEs) and Innovation(VII)	2	-	2	4
DPEM 506	7	Strategic Planning (VII)	3	-	-	4
Free Electives						
Practical Training II						
Field Trip						
TOTAL			**18-21**	**0-1**	**11-13**	**30**

9th Semester

Course Number		Courses	Hours/Week Lecture	Tutorial	Lab	Credits
DPEM 502	1	Robotics	3	-	2	5
DPEM 409	2	Project and Production Management & Scheduling	2	-	2	5
Required electives: Students should select four (4) courses from the following list:						
DPEM 515	1	Mechatronics (V)	3	-	2	5
DPEM 516	2	Renewable Energy Sources (III)	3	-	-	5
DPEM 518	3	Business Intelligence and Knowledge Management (IV)	2	-	1	5
DPEM 501	4	Simulation (V)	4	-	2	5
DPEM 513	5	Product Design and Development (V)	2	-	2	5
DPEM 514	6	Design and Optimization in Supply Chain Management (VI)	3	-	2	5
DPEM 427	7	Financial Calculus (VII)	2	2	-	5
DPEM 505	8	Ergonomic Work Analysis (VII)	3	-	-	5
DPEM 507	9	Technological Forecasting (VII)	2	2	-	5
DPEM 510	10	Engineering Economics and Business Plan Analysis (VII)	3	-	2	5
TOTAL			**13-18**	**0-5**	**4-12**	**30**
SEMINARS		Geographic Information Systems	2	-	2	

10th Semester

Course Number	Courses	Hours/Week Lecture	Tutorial	Lab	Credits
Diploma Thesis					**30**
TOTAL		-	-	-	-
SEMINARS	Business Process Modeling	3	-	-	
	Data Mining – OLAP Systems – Data Mining for Decision Making	2	-	2	

Students should select and successfully complete exactly one (1) course from electives in Group II and at least: one (1) course from electives in Group III; one (1) course from electives in Group IV; one (1) course from electives in Group V; one (1) course from electives in Group VI; one (1) course from electives in Group VII.

Group II **Humanities - Foreign Languages** ***Select: 1 Course***	**Group III** **Electromechanical Systems** ***Select: 1 Course***	**Group IV** **Information Systems** ***Select: 1 Course***
1. Political Economy 2. Micro-Macro Economics 3. History of Civilization 4. Introduction to Philosophy and History of Science 5. Introduction to Legal Systems and Technical Legislation 6. Art and Technology 7. Industrial Sociology	1. Electronics 2. Dynamics, Vibrations & Control of Structures 3. Topics in Environmental Protection 4. Computational Mechanics 5. Renewable Energy Sources 6. Electric Economy 7. Microscale Manufacturing Technologies	1. Electronic Business 2. Introduction to Artificial Intelligence 3. Enterprise Resource Planning Systems 4. Business Intelligence and Knowledge Management
Group V **Production Systems** ***Select: 1 Course***	**Group VI** **Operations Research** ***Select: 1 Course***	**Group VII** **Management** ***Select: 1 Course***
1. Simulation 2. Reliability Theory 3. Control Systems II 4. Mechatronics 5. Product Design and Development 6. Environmental analysis and planning	1. Game Theory 2. Dynamic Programming 3. Design and Optimization in Supply Chain Management 4. Mechatronics	1. Human Resource Management 2. Data Analysis 3. Total Quality 4. Financial Calculus 5. Small & Medium Enterprises (SMEs) and Innovation 6. Ergonomic Work Analysis 7. Strategic Planning 8. Technological Forecasting 9. Engineering Economics and Business Plan Analysis 10. Financial Risk Management

4. Course Descriptions

Group I (Mathematical-Physical Sciences)

Required Courses

(MATH 101) Differential and Integral Calculus I *Credits: 5*

Functions in one real variable. Limits and continuity of functions. Derivatives. Geometric interpretation of the derivative. Function differentials. Use of derivative to study monotonicity, convexity, function extrema. Mean Value Theorem. Definite and indefinite integrals. Fundamental theorems of integral calculus. Applications of integrals (areas, volumes, moments and center of mass, work, centroid and centre of mass, Pappus' theorem, hydrostatic pressure). Exponential and logarithmic functions. Inverse functions. Methods of integration. Integration by parts. Improper integrals. Total convergence of integrals. Sequences. Series (convergence criteria). Power series and Taylor series. Indeterminate forms.

Academic Responsible: Department of Sciences

(MATH 102) Differential and Integral Calculus II *Credits: 5*

Multivariable functions. Equations of surfaces and solids. Polar, cylindrical and spherical coordinates. Parametric representation. Scalar and cross vector products. Partial derivatives of multivariate functions, gradient, divergence, curl. Fundamental theory of vector fields. Lagrange multipliers and multivariate function extrema. Path integrals, multiple integrals (double and triple) and applications to physics and geometry: volume calculation, moment of inertia, surface area. Surface integrals and applications in fluid flow. Green's theorem. Parametric representation of surfaces and applications. Stokes' theorem and applications in physics. The divergence theorem.

Academic Responsible: Department of Sciences

(MATH 201) Linear Algebra *Credits: 5*

Introduction to Linear and Matrix Algebra. Direct methods for the solution of linear systems. Pivoting strategies, condition number, error analysis, determinants. Eigenvalues and eigenvectors. Diagonalization. Iterative methods for sparse linear systems. Laboratory exercises.

Academic Responsible: Department of Sciences

(MATH 202) Numerical Analysis *Credits: 6*

Solution of algebraic equations in one variable. Interpolation and polynomial approximation. Numerical differentiation and integration. Approximation theory. Initial and Boundary Value Problems for regular equations. Laboratory exercises.

Academic Responsible: Department of Sciences

(MATH 203) Ordinary Differential Equations *Credits: 5*

Introductory concepts, initial value problems. First- and second-order ordinary differential equations, separable, homogeneous, Bernoulli, Ricati, Euler, variation of parameters, exact equations and integrating factors. Applications in problems from mechanics. Linear independence and the Wronskian. Linear differential equations with constant coefficients. Laplace transform. Homogeneous and non-homogeneous equations with constant coefficients. Linear differential equations with varying coefficients. The series solution method.

Academic Responsible: Department of Sciences

(DPEM 204) Probability for Engineers *Credits: 5*

Introduction to the theory of probabilities (definition of probability, events, elements of combinatorial analysis). Conditional probability. Random variables. Distributions. Moments and moment-generating functions. Random-variable functions. Identically-distributed random variables. Conditional random variables and distributions. Sequences of random variables. Laws of large numbers. Central limit theorem.

Academic Responsible: Nikolaos Vlassis

(DPEM 228) Engineering Statistics *Credits: 5*

Descriptive statistics (summary statistics, graphical methods for data description, numerical descriptive indices). Sampling (definition of population and sample, collection and processing of statistical data, basic statistical measures and empirical distributions). Estimation theory (unbiased estimators, Bayes estimators, maximum likelihood estimators). Confidence interval formation for estimators. Hypothesis testing. Neyman-Pearson lemma. Z-test(normal). Student's t-test. Chi-square test. F-test. Linear regression models, correlation, analysis of variance, design of experiments.

Academic Responsible: Efstratios Ioannidis

(DPEM 303) Stochastic Processes *Credits: 5*

Introduction. Definition of stochastic processes. Correlation, statistics, moments, mean square calculus, independence. Wiener process. White noise. Poisson process. Systems with stochastic inputs. Ergodicity. Markov chains. Introduction to information theory. Applications.

Academic Responsible: Yannis Phillis

(PHYS 101) Physics I *Credits: 4*

Introduction to Physics and its formalism using: (i) vector calculus, integrals and derivatives, and (ii) Generalized coordinates, Lagrange and Hamilton equations. Motion along a straight line, accelerated motion, motion in two dimensions. Newton's laws. Dynamics of rotational motion, angular frequency, angular momentum, moment of inertia. Equilibrium and elasticity, strength of materials, tensile strength, Young's modulus. Conservation laws. Kepler's laws, satellite orbits. Oscillations and mechanical waves, superposition and standing waves, resonance. Acoustics. Fluid mechanics, Bernoulli's law. Gases and ideal gas law. Basic concepts of thermodynamics, thermodynamic laws. Exercises and laboratory sessions.

Academic Responsible: Department of Sciences

(PHYS 102) Physics II *Credits: 4*

Introduction. Electrostatics. Magnetostatics. Gauss and Coulomb laws, vector and scalar fields. Electric charges and dipoles. Ampere's law. Generation of magnetic fields, motion of charged particles in electric and magnetic fields. Charges in conductors. Faraday's law, induction, self-induction, transformers, AC and DC currents. Kirchhoff's laws. Simple circuits, RC and RL circuits, resonance in circuits. Magnetic forces acting on current currying conductors. Electromagnetic waves. Energy carried by electromagnetic waves, Poynting vector. Maxwell equations. Generation and propagation of electromagnetic waves. Optics. Geometric optics, Snell's law, lenses and mirrors. Reflection, refraction, dispersion. Photons, electrons and atoms. Blackbody radiation. Theory of metals and semiconductors, free electrons, energy zones, n- and p-type semiconductors, LED diodes, photodiodes. Interaction of electromagnetic waves and light with matter. Photoelectric effect. Exercises and laboratory sessions.

Academic Responsible: Department of Sciences

(CHEM 103) General Chemistry *Credits: 4*

Structure and Properties of the Elements. Atomic and molecular orbital. Periodic Table. Ionic bond, covalent bond. Stereochemistry. Valence bond theory. Inter- molecular forces. Metallic bond. Chemical Reactions.

Chemical kinetics. Chemical equilibrium. Chemistry and environment. Solutions. Acids, bases and salts. Oxidation and reduction. Laboratory sessions: (1) Safety rules in chemical laboratories; (2) Qualitative analysis; (3) Preparation of solutions; (4) Chemical reactions. Chemical Equilibrium; (5) Electrolytes; (6) Volumetric analysis.

Academic Responsible: Department of Sciences

Group II (Humanities-Foreign Languages)

Required Courses

(KEP 101) Sociology *Credits: 3*

In this introductory course analytical and synthetic approaches are used to investigate topics related to the social framework within which human productive activity is realized. Topics covered include: society, societal positions and roles, social change, social stratification and mobility, social categories and classes, socio-political institutions, socio-economical institutions and transformations.

Academic Responsible: Department of Sciences

(LANG 201) English III or German III *Credits: 3*

English III: English III combines an independent study program in the Language Center with a series of department- and field-of-study- specific work modules. These modules focus on developing verbal, written and comprehension language skills. Students are required to register and participate in the e-class of this course as well as use the required or recommended resources of the Language Center. The final grade is determined by a series of assignments and quizzes throughout the semester and a final exam.

German III: In German III special emphasis is placed on the introduction of students to technical terminology both in verbal and written communication. In this class students are trained using articles and technical texts properly adapted to the type of exercise and their field-of-study. The goals of the class are to further enhance writing and comprehension skills developed as part of the German I and II courses. Complementary to regular lectures, students are encouraged to utilize department- and field-of-study- specific audio-visual material available at the Language Center as well as electronically-available exercises.

Academic Responsible: Department of Sciences

(LANG 202) English IV or German IV *Credits: 3*

English IV: Students in English 04 will be required to study texts and vocabulary using material related to their fields of study. Students are expected to register and participate in the e-class of the class and use the required or recommended resources of the Language Center. Assignments and quizzes in the duration of the semester in conjunction with a final exam are used to determine the student's final grade.

German IV: Students following the sequence of German courses in the Technical University of Crete have significantly developed their German language skills. The aim of this course is to further enhance language skills through complex texts and exercises, and help students reach a language competence at the level of Mittelstufe (ZMP). Complementary to regular lectures, students are encouraged to utilize department- and field-of-study-specific audio-visual material available at the Language Center as well as electronically-available exercises.

Students can register in practice groups to further enhance verbal and writing communication skills.

Academic Responsible: Department of Sciences

Group II (Humanities-Foreign Languages)

Elective Courses

(KEP 102) Political Economy *Credits: 4*

Includes an analysis of basic notional categories and relations in Political Economy, as well as a brief review of recent economic history. Particular references are made to: the theory of valuation, surplus value, pricing, the relationship between competition and distribution, the fundamental trends and incongruities of amplification, and financial crisis phenomena.

Academic Responsible: Department of Sciences

(KEP 201) Micro-Macro Economics *Credits:4*

Includes an analysis of commodity supply and demand, consumer theory and corporate theory. On a macroscopic level the issues analyzed include the income and employment determination, inflation, the role of investments, and the problems or development trends within the world economy.

Academic Responsible: Department of Sciences

(KEP 202) History of Civilization *Credits: 4*

Using as a departure point basic knowledge from individual branches of social sciences (sociology, anthropology, philosophy, political economy etc.), an analytical and synthetic approach is taken to notions and issues related the history of civilization both in general and for specific periods (Eastern despotisms, Ancient Greece, Middle Ages, Renaissance etc.). A study from a critical perspective is taken on certain theories that attempt to interpret modern civilization (behaviorism, postmodernism, etc.).

Academic Responsible: Department of Sciences

(KEP 203) Introduction to Philosophy and History of Science *Credits:4*

Science as a social-cultural phenomenon. The position and role of science in the social structure. Theoretical issues concerning knowledge, logic and the methodology of scientific research. Science throughout history. Differentiation, integration and interdisciplinarity of science. Traditions and innovations in the development of science. The subject of scientific activity. Theories, directions and approaches in the philosophy of science.

Academic Responsible: Department of Sciences

(KEP 204) Introduction to Legal Systems and Technical Legislation *Credits: 4*

Introduction to legal systems (the role of law, the legal theory of state, aspof human rights), industrial relations (introductions to the individual contract of employment, trade union rights, collective bargaining, industrial accidents and hygiene and safety at work), introduction to the law of environment protection (principles of environment protection constitutional and general law protection), introduction to the law of natural resources (principles of rights for exploration and exploitation of natural resources in the constitution and the general law).

Academic Responsible: Department of Sciences

(KEP 301) Art and Technology *Credits: 4*

Technology and Art in the social structure. Technology as objectification, as a framework for the human impact on nature and for the relations among people, as a forerunning conception-knowledge and as an instrument implicating upon nature. The particularity of the aesthetic moment. The aesthetic moment as a specific activity in the division of labor (art). Basic aesthetic categories. The social purpose of art. Art and technology in the history of civilization. Metaphysical discourse on “Appollonean” and “Dionysean” elements. The synthetic dimension of creativity.

Academic Responsible: Department of Sciences

(KEP 302) Industrial Sociology *Credits: 4*

Lectures on Sociology of Labor and Sociology of Development, with particular reference on the historical approach of production systems and on recent changes concerning industry in relation with other sectors of economic and scientific activities. Analytic and synthetic approach, at several levels (international, national, regional-local), concerning crisis and restructuring strategies, “flexible” production and labor organization, labor market, industrial relations, inter-firm relations, local production systems, research and technological development, innovations, know-how, industrial policy.

Academic Responsible: Department of Sciences

Group III (Electromechanical Systems)

Required Courses

(MECH 101) Computer-Aided Mechanical Drafting *Credits: 4*

Drawing instruments and materials. Line drawing. Dimensions. Scales. Geometric structures. Mechanical engineering drawing. Computer-aided mechanical drawing.

Academic Responsible: George Poulidakis, Aristomenis Antoniadis

(MECH 102) Engineering Mechanics – Statics *Credits: 6*

Systems of units. Statics of particles. Rigid-body analysis (equivalent systems of forces and moments, moment of a couple). Equilibrium of rigid bodies. Centre of mass. Analysis of structures. Forces in beams and cables. Friction.

Academic Responsible: Department of Sciences

(MECH 201) Engineering Mechanics – Strength of Materials *Credits: 6*

Internal forces, stresses. Strains. Stress-strain relationship. Statically indeterminate problems. Temperature effects. Shear deformation. Stress and strain distribution. Torsion. Pure bending. Asymmetric bending. Transverse loading. Transformation of stress and strain. Stresses under combined loading. Mohr's circle. Stresses in beams. Energy methods.

Academic Responsible: Department of Sciences

(DPEM 121) Electric Circuits *Credits: 5*

Electrical quantities: charge, current, potential, energy power. Elements of electric networks: resistor, inductor, capacitor, dependent and independent sources, switches. Electric network theorems: Kirchhoff's laws, voltage and current division, combination of resistors in series and parallel, principle of superposition, combination of inductors in series and parallel, combination of capacitors in series and in parallel, Kennelly's theorem, source transformations, Thévenin's and Norton's theorems, Millman theorem, symmetric circuits, nodal and loop methods. Elementary transient phenomena. Sinusoidal steady-state analysis of electric circuits: phasors, impedance, power, network theorems. Three-phase circuits: delta and star connection of three-phase windings, power, power factor correction, transformers. Simulation of electric circuits using the SPICE software.

Academic Responsible: Fotios Kanellos

(DPEM 202) Materials Science *Credits: 4*

Material properties. Molecular structure. Crystalline structure of solids. Crystal defects. Relations between the structure of materials and their mechanical, electrical and thermal properties. Material failure and strengthening mechanisms. Metals. Alloys and phase diagrams. Structure and properties of ceramics. Structure and properties of polymers. Composite materials. Effect of the environment on materials. Material selection. Financial, environmental and socials aspects in the selection and utilization of materials.

Academic Responsible: Department of Sciences

(DPEM 223) Fluid Mechanics *Credits: 5*

Introduction. Fluid properties. Hydrostatics. Hydrostatic pressure prism. Eulerian and Langragian flow description, streamlines, pathlines. Flow equations, integral and differential form. Stream function. Velocity potential. Laplace equation. Bernoulli equation. Rotational and irrotational flow fields. Newtonian fluid. Navier-Stokes equations. Euler equations. Laminar and turbulent flow. Laminar flow inside a pipe. General characteristics of pipe flow, laminar and turbulent pipe flows, Moody diagram, major and minor losses. Boundary layer characteristics, boundary layer equations, non-dimensional quantities.

Academic Responsible: Ioannis Nikolos

(DPEM 224) Thermodynamics *Credits: 4*

Introduction. Thermodynamical systems. Microscopic and macroscopic viewpoints. Measuring mass, length, time and force. Specific volume, temperature, pressure. Zeroth law of thermodynamics. Gas and steam. Ideal gas law. Volumetric properties of pure substances. Constitutive equations. Concept of Energy. Heat and Work. The First Law of Thermodynamics for open and closed systems. The Second Law of Thermodynamics. Entropy, Exergy. Thermodynamic Cycles.

Academic Responsible: Dimitrios Rovas

(DPEM 304) Heat Transfer *Credits: 5*

Introduction. Modes of heat transfer (Conduction, Convection, Radiation). Conduction: thermal conductivity, Fourier's law, heat diffusion equation, one-dimensional thermal conduction, thermal-resistance method, fins. Transient conduction, the lumped-capacitance method, transient conduction in semi-infinite solids. Convection: heat and mass transfer equations, velocity and thermal boundary layers, laminar and turbulent flow, boundary-layer equations, dimensionless parameters, internal flow in circular tubes, energy balance in tubes. Radiation: basic principles of radiative heat transfer. Numerical solution methods for heat transfer problems. Discretization, finite-difference method, finite-element method (using the MATLAB PDE toolbox). Evaporation, condensation, boiling. Heat exchangers.

Academic Responsible: Dimitrios Rovas

(DPEM 305) Machine Elements *Credits: 5*

Introduction. Review of strength of materials. Materials and manufacturing processes and design. Failure from static and dynamic loading. Fatigue. Analysis of stresses and displacements. Machine elements: joints, rivets, screws, welds, shafts, belts, spur gears. Codes and Standards. Welding. Machine-element analysis using computational methods.

Academic Responsible: Aristomenis Antoniadis

(DPEM 326) Hydrodynamic and Thermal Engines *Credits: 4*

Introduction to thermal and hydrodynamic turbomachinery. Energy equation and moment-of-momentum theorem. Velocity components and triangles. Euler equation for turbomachinery. Turbines, compressors, steam turbines, gas turbines. Analysis of centrifugal pumps, one-dimensional analysis of flow, velocity triangles, efficiencies, characteristic curves, similarity. Circuits of pumps, pump choice, parallel and serial combination of pumps, stability.

Academic Responsible: Ioannis Nikolos

(DPEM 502) Robotics *Credits: 5*

Principles of manipulation and sensing. Robot operation. Kinematic and dynamic modeling of mechanical manipulators. Workspace analysis and manipulator synthesis. Robot motion planning, programming and control. Sensor-based strategies and automatic reasoning. Robotic systems and applications.

Academic Responsible: DPEM

Group III (Electromechanical Systems)

Elective Courses

(DPEM 203) Electronics *Credits: 4*

Analog electronics: semiconductor physics, rectifying diodes, special diodes, diodes circuits and applications, bipolar junction transistor, common emitter voltage amplifiers, operational amplifiers, JFET, MOSFET. Digital electronics: digital circuit analysis and design. Binary systems: binary numbers, binary codes, binary logic.

Boole algebra. Digital logic gates. Integrated circuits. Combinational logic: adder, subtractor, comparator, coder and decoder, multiplexer. Sequential logic: flip-flops, design and analysis of flip-flop circuits, counter design. Registers, counters and memory units. Use of the SPICE software for the simulation of analog and digital electronic circuits.

Academic Responsible: Fotios Kanellos

(DPEM 432) Dynamics, Vibrations & Control of Structures *Credits: 4*

Single-degree-of-freedom linear oscillator: free vibration response, eigenfrequency, damping, forced vibration. Multiple-degree-of-freedom systems: simulation, eigenmodes, eigenfrequencies, eigenvalue analysis. Analytical dynamics: generalized coordinates, kinematic constraints, virtual work, Langrage equation, Hamilton equation. Continuous systems: axial vibrations of a bar, torsional vibrations of a bar, transverse vibrations of a beam. Applications in lumped capacity systems, and finite elements. Fundamental principles of signal processing: frequency analysis, Fourier series, Fourier transform, spectrum, applications. Structural control: problem formulation, passive and active control, application of linear-quadratic regulator.

Academic Responsible: Georgios Stavroulakis

(DPEM 434) Microscale Manufacturing Technologies *Credits: 4*

Introduction to microfabrication. Micrometrology and materials characterization. Micromolding, Micromachining, Microgrinding. Diamond microcutting tools. Laser microfabrication. Micro waterjet. Microelectrodischarge machining. Ultrasonic micromachining. Materials. Simulation of microfabrication processes.

Academic Responsible: Aristomenis Antoniadis

(DPEM 504) Topics in Environmental Protection *Credits: 4*

Basic principles of ecology, geochemical cycles. Atmospheric pollution, water pollution, waste management methodologies, statistical analysis of environmental data, wastewater treatment, solid waste management.

Academic Responsible: Konstantinos Komnitsas, MRED

(DPEM 515) Computational Mechanics *Credits: 4*

Numerical methods in structural mechanics: classical methods Rayleigh, Ritz, Galerkin, finite differences and finite elements. The finite element method: equilibrium conditions, consistency, material constitutive law, Discretization, stiffness and mass matrix, matrix assembly, solution, post processing of data. Variational principles, detailed study of finite elements for rods, beams and two-dimensional linear elasticity problems, technology of finite element programs. Related applications to heat transfer and fluid mechanics problems. Application examples using existing software.

Academic Responsible: Georgios Stavroulakis

(DPEM 516) Renewable Energy Sources *Credits: 5*

Introduction. Wind energy: energy and power in the wind, wind turbine types and configuration, power and energy from wind turbines, electrical system, grid connection of wind turbines, applications. Photovoltaic systems: solar energy characteristics, photovoltaic installations, electrical connection, application. Autonomous systems. Penetration and utilization of renewable energy sources.

Academic Responsible: Spyros Papaeftimiou

(DPEM 517) Electric Economy *Credits: 4*

Electrical energy systems: generation, transmission and consumption of electric energy, analysis and operation of electrical energy systems. Representation of power systems: single-line diagram, single-phase equivalent, per unit system. Load flow: equations, solution methodologies, models. Reliability of energy generation systems. Economical operation of thermal power plants. Probabilistic cost of electric energy production.

Academic Responsible: Fotios Kanellos

Group IV (Information Systems)

Required Courses

(DPEM 101) Programming Methodology *Credits: 6*

Introduction to computer science, evolution of computers (hardware & software), structure and operation of a computer system, architectures, operating systems. Introduction to algorithms and data structures. Development environments, programming languages, program development methodologies (pseudocode, flow charts). Constants & variables, basic data types. Assignment statements. Input/output statements. Control statements. Operands & precedence. Loops. Structured data types. User defined data types. Laboratory: Programming exercises using the C language.

Academic Responsible: Nikolaos Matsatsinis

(DPEM 122) Algorithms and Data Structures *Credits: 6*

C Programming (pointers, structures, unions, enumerations). Abstract data types, stacks, queues, lists, trees, binary trees, binary search trees. Recursive algorithms. Search and sorting algorithms, hashing. Laboratory: Programming exercises using the C language.

Academic Responsible: Ioannis Papamichail

(DPEM 324) Decision Support Systems *Credits: 5*

Introduction to Information Systems and Information Technology. Decision Theory. Multicriteria Decision Analysis. Group Decision Making. Decision Support Systems (DSS). DSS Architectures. Human-Computer Interaction. Data Base Management Systems (DBMS). Structured modeling and model-based management systems. DSS Evaluation. Intelligent Methods for Decision Support. Intelligent and multicriteria DSS. Group and Negotiation DSS. Executive information systems. Executive support systems. Data warehouses & on-line analytical processing. Distributed DSSs & web-based DSSs. Spatial DSSs. DSS Applications in: management, marketing, industry, production, finance, health, environment etc. Laboratory: Applications using DSS. DSS's Development. Case Studies.

Academic Responsible: Nikolaos Matsatsinis

Group IV (Information Systems)

Elective Courses

(DPEM 230) Electronic Business *Credits: 4*

Introduction in Electronic Commerce. Networks VAN, LAN, MAN, WAN. X400 and X435. Bar Coding. Information Technology and Electronic Commerce. Internet, intranets, extranets. Electronic Data Interchange. E-Marketing. On-line market research. eServices. E-Marketplaces. Electronic commerce & customer modeling. Electronic Commerce & Positioning. Virtual Enterprises. Workflow Management. Tele-work. Distance Learning. Electronic payment systems. Electronic documents management. E-banking. E-Democracy. E-Government. EDirectories-Libraries-Search Engines. Information retrieval and filtering. User modeling. Security-Authentication. Artificial intelligence and E-Commerce. Web-based IS. Electronic Commerce Applications. Methodologies and Environments for Electronic Commerce Applications Development. Laboratory: Electronic Commerce Applications - Market Places Development. Programming and ecommerce Applications development using Java, HTML, Active X.

Academic Responsible: Anastasios Doulamis

(DPEM 306) Introduction to Artificial Intelligence *Credits: 4*

Introduction to Artificial Intelligence. Problem Solv- ing. Knowledge Representation and Reasoning. Uncertainty and Fuzzy Knowledge. Planning. Expert Sys- tems. Machine Learning. Rough Sets. Neural Nets.

Evolutionary and Genetic Algorithms. Fuzzy Sets. Data Mining. Intelligent communication methods (natural language processing, vision, robotics). Agents: intelligent agents, multi-agent systems, applications. Laboratory.

Academic Responsible: Anastasios Doulamis

(DPEM 435) Enterprise Resource Planning Systems *Credits: 4*

Introduction to Information Systems, Enterprise resource planning systems (ERPs), Customer Relationship Management Systems (CRMs), System architectures, components, modules and technical infrastructure of ERPs, System's analysis and design, Business processes in ERPs, Business Process Reengineering, Specific ERP components (Manufacturing, Financials, Supply chain management, Warehouse Management, Distribution, Marketing, Sales, Human Resources Management, Logistics), Operations that ERP support, pros and cons of using ERPs, E-commerce and ERP, Business Intelligence and ERP, ERP and Data Warehouses – OLAP, Success factors of ERPs, Feasibility study of getting an ERP, Evaluating, selecting, installing, configuring and customizing an ERP, Production Planning through ERPs, Material requirements and resource planning (MRP I & MRP II), Demonstration of the MBS Navision ERP, MBS Navision CRM. Special issues: Enterprise Application Integration, Interoperability, Service-Oriented Computing, Web Services.

Academic Responsible: Nikolaos Matsatsinis

(DPEM 518) Business Intelligence and Knowledge Management *Credits: 5*

Introduction, Business Intelligence, Basic concepts and key features of Business Intelligence, Business Intelligence and Decision Making, Design and Development of Business Intelligence Systems, Structure, Architecture and Analysis of a Business Intelligence System, Creation, Acquisition, Processing and Sharing of data from Business Information Systems, Ontologies and Semantics, Business Intelligence Systems: Presentation and Analysis, Optimizing Business Performance with Business Intelligence Systems, Personalized Recommendation Systems and Business Intelligence. Knowledge Management, Basic concepts, Importance of Knowledge Management, Data representation (relational and OLAP), Data Mining, Structured and Unstructured Information, Knowledge capture, acquisition and elicitation, Knowledge representation methods, Transformation, Data Analysis and Reporting, Statistical Analysis Methods. Knowledge Management Systems. Design, assessment and quality assurance of Knowledge Management Systems.

Academic Responsible: Nikolaos Matsatsinis

Group V (Production Systems)

Required Courses

(DPEM 301) Manufacturing Technology I *Credits: 6*

Introduction. Mechanical behavior of materials: tension, compression, torsion, hardness, creep. Structure and manufacturing properties of metals: grains and boundaries, failure and fracture, recovery, recrystallization. Dimensional tolerances. Casting processes: solidification of metals, casting alloys, ingot casting and continuous casting, expendable and permanent mold. Cutting Processes: machine tools, chip formation, tool wear, tool materials, tool life, cutting fluids. Introduction to Computer Integrated Manufacturing (CIM). Automation, numerical control, flexibility in manufacturing. Laboratory.

Academic Responsible: Nikolaos Tsourveloudis

(DPEM 321) Manufacturing Technology II *Credits: 6*

Introduction, Deformation Processes: forging, rolling, extrusion. Sheet-Metal Forming Processes: shearing, bending, deep drawing. Powder metallurgy, sintering. Joining Processes: arc-welding with consumable and non-consumable electrode, laser and electron beam welding, friction, resistance, explosion and ultrasonic welding. Properties and processing of polymers and plastics. Laboratory.

Academic Responsible: Nikolaos Tsourveloudis

(DPEM 322) Production Systems *Credits: 5*

Introduction. Inventory systems with static, dynamic and stochastic demand. Discounted orders. Production planning, forecasting methods, moving average, minimum squared error. ARMA models. Scheduling jobs in one and two machines. Required precedence among jobs. Sequence-dependent set-up times.

Academic Responsible: DPEM

(DPEM 401) Control Systems I *Credits: 6*

Mathematical concepts : input signals, Laplace transforms, complex functions. System description : transfer functions, block diagrams, state equations. Time response, stability, steady-state error, PID controller design, application examples.

Academic Responsible: Anastasios Pouliezos

(DPEM 421) Production Networks (CAM) *Credits: 6*

Introduction to queuing theory, birth-death models, M|M|1, M|M|m, M|M|m|K|N systems. Non birth-death Markovian models. Erlang distribution. Batch arrivals/service. Advanced models M|G|1, M|G|m, G|G|1, G|G|m. Advanced models for the analysis of production lines. Introduction to flexible manufacturing systems (FMS) – analytical tools and control issues.

Academic Responsible: Yannis Phillis

(DPEM 405) Quality Control *Credits: 5*

Introduction to quality and quality improvement methods. Concept and techniques for quality control. Basic categories of statistical quality control. Introduction to statistics. Acceptance sampling. Single, double and multiple sampling plans. Sequential sampling plans. Other acceptance sampling techniques. Introduction to statistical process control and control charts. Control charts for variables and attributes. Other statistical process quality-control techniques.

Academic Responsible: Evangelos Grigoroudis

(DPEM 423) Computer-Aided Design (CAD) *Credits: 4*

Introduction to Computer-Aided Design (CAD). CAD and the design process. Three-dimensional geometric modeling systems. Wire frame, surface, solid and parametric modeling. Representation of curves and surfaces (Ferguson, Bezier, B-Splines, NURBS). Solid modeling Systems. Constructive solid geometry CSG, boundary representation (B-Rep). Data transfer between CAD systems, IGES, STEP. Collaborative engineering, product life-cycle management.

Academic Responsible: Nikolaos Bilalis

Group V (Production Systems)

Elective Courses

(DPEM 403) Reliability Theory *Credits: 4*

The mathematics of reliability: Boolean algebra, probability and random variables, the Laplace transform, stochastic processes. Structure function and reliability evaluation methods for series, parallel, bridge, k-out-of-n, and general structures. Markovian repairable systems. Periodic maintenance and replacement. Markovian replacement decision processes.

Academic Responsible: Vassilis Kouikoglou

(DPEM 430) Control Systems II *Credits: 4*

Introduction to multivariable control systems. Time response of multi-input, multi-output systems. Controllability, observability. Stability. Control of multi-input, multi-output systems. Eigenvalue placement, robustness.

Academic Responsible: Anastasios Pouliezos

(DPEM 431) Mechatronics *Credits: 5*

Introduction and examples. Simulation of engineering systems. System dynamics and oscillations. Types and simulation of sensors and actuators. Processing of measurement data. Intelligent control (hierarchical control, hybrid control, fuzzy, neural and fuzzy-neural control). Dynamical system diagnostics. Applications.

Academic Responsible: Georgios Stavroulakis

(DPEM 501) Simulation *Credits: 5*

Simulation of production and queuing systems, discrete event modeling, random variate generators, statistical techniques for performance estimation and comparison of alternative systems, variance reduction techniques, introduction to perturbation analysis and optimization of queuing systems.

Academic Responsible: Vassilis Kouikoglou

(DPEM 513) Product Design and Development *Credits: 5*

The Importance of new products. Organizational issues in New Product Development (NPD). Concurrent Engineering. NPD planning. Customer needs. Product specification. Concept generation and testing. Product Architecture. Industrial Design. Prototype development and testing. Rapid prototyping and tooling. Virtual prototyping.

Academic Responsible: Nikolaos Bilalis

(DPEM 208)Environmental analysis and planning *Credits: 4*

Description and methodological study of Life Cycle Analysis: goal and scope definition, life cycle inventory analysis, life cycle impact assessment, interpretation of results. Design and evaluation of products based on the methodology of Ecological Efficiency. Definition and evaluation criteria of eco-efficiency indicators. Evaluation of the ecological and energy cost of products throughout their lifecycle. Design and development of products and services based on their environmental footprint. Methodology, tools and benefits of ecological design. Ecological and energy labelling of products. Environmental Management Systems. European legislation and international standards and regulations for environmental issues and energy planning and management. Combined environmental, energy and economic evaluation of energy systems.

Academic Responsible: Spyros Papaefthymiou

Group VI (Operations Research)

Required Courses

(DPEM 102) Operations Research Methodology *Credits: 6*

Methodological framework of operations research. Introduction to graph theory with applications to project management. Inventory control. Wilson's model and extensions. Introduction to linear programming. Multiple-criteria decision making, Case studies.

Academic Responsible: Michael Doumpos

(DPEM 221) Linear Programming *Credits: 6*

Modeling of linear programming (LP) problems. The geometry of LP. The Simplex method: theory and the tableau implementation. Duality theory. The dual Simplex method. Sensitivity analysis. Parametric programming. Robustness analysis. Integer programming. Special LP problems: transportation problem, assignment problem. Introduction to multi-objective programming. Case studies.

Academic Responsible: Michael Doumpos

(DPEM 325) Non-linear Programming *Credits: 5*

Mathematical Background. Unconstrained Optimization: Conditions for local minima, *ad-hoc* methods, algorithmic properties, quadratic models, descent methods and stability. Newton-like methods. Conjugate-gradient methods. Constrained optimization: Elimination and other transformations, Lagrange multipliers, first-order conditions, second-order conditions, convex optimization problems. Quadratic Programming. Linearly constrained optimization, penalty functions, multiplier penalty functions. Sequential Quadratic Programming. Nonlinear elimination and feasible direction methods. Global optimization.

Academic Responsible: Markos Papageorgiou

(DPEM 409) Project and Production Management & Scheduling *Credits:5*

Introduction to project management and scheduling. Mathematical tools. Optimal time-scheduling with and without constraints. Resource allocation scheduling, time-cost relationship. Taxonomy of production systems. Production Process Selection and Scheduling. Layout planning, layout algorithms. CPM, PERT methods.

Academic Responsible: Ioannis Papamichail

(DPEM 426) Combinatorial Optimization *Credits:6*

Mathematical models and applications of combinatorial optimization. Differences between linear and integer programming. Graphs and networks. Data structures for graphs and networks. Graph search. Shortest paths and discrete dynamic programming. Minimal spanning trees and greedy algorithms. Flow problems. Problem and algorithm complexity. Linear and Lagrangian relaxation. The branch-and-bound method. Local search. Heuristic and meta-heuristic algorithms. Approximation algorithms.

Academic Responsible: Yannis Marinakis

Group VI (Operations Research)

Elective Courses

(DPEM 407) Game Theory *Credits: 4*

Introduction, Games with two players. Zero-sum games. Pure and mixed strategies. Matrix and bi-matrix games. Equilibria and saddle points. Minmax theorem. Solution of matrix games using linear programming. Solution of Bi-matrix Games using nonlinear programming. Nash equilibriums and Pareto points. Hierarchical games. Stackelberg equilibria and disequilibria. Bi-level programming. Application to microeconomics: Cournot duopoly. Application to traffic planning: traffic assignment problem.

Academic Responsible: Yannis Marinakis

(DPEM 425) Dynamic Programming *Credits: 4*

Discrete and continuous dynamic systems. The principle of optimality. Combinatorial problems. Optimal control problems. Dynamic programming algorithm. Applications to selected discrete and continuous optimal control problems. Discrete and continuous Linear-Quadratic control. Stochastic optimal control problems. Stochastic dynamic programming algorithm. Applications to selected stochastic optimal control problems. Stochastic Linear-Quadratic control.

Academic Responsible: Markos Papageorgiou

(DPEM 514) Design and Optimization in Supply Chain Management *Credits: 5*

Role of supply chain management. Planning demand and supply in a supply chain. Applications and mathematical modeling. Algorithmic complexity. Traveling salesman problem, bin packing problem. Transportation and distribution of products in supply chain. Network design problem. Distribution channels. Route selection. Fleet-size problems. Vehicle-routing problem. Variants of the vehicle-routing problem (time windows, multi-commodity, dial-a-ride, pickup and delivery prob- lems). Vehicle scheduling problem. Ship routing problem. Inventory routing problem: single-period inventory routing problem, multi-period inventory

routing problem, infinite horizon inventory routing problem. Location problems. Covering problems. P-center and P-median problems. Capacitated and uncapacitated facility problems. Location routing problem. Integrated logistics. E-Supply chain management. Case studies (modeling, development and solution methodologies).

Academic Responsible: Yannis Marinakis

Group VII (Management)

Required Courses

(DPEM 222) Engineering Management *Credits: 6*

Introduction to system thinking. Management processes: planning, organizing, directing and controlling. Principles of management problem solving. Discussion of case studies.

Academic Responsible: Vassilis Moustakis

(DPEM 402) Financial Management *Credits: 5*

The operation of a firm and its goals. The evolution of financial management. Credit system. Basic financial statements: Balance sheet, net income statement. Working capital. Financial ratios. Financial analysis methodologies. Profitability. Financial leverage. Industrial and financial risks. Break-even point analysis. Sources and uses of funds. Financial forecasting methods. Corporate financing: self-financing, share capital increases, loans, leasing. Case studies.

Academic Responsible: Constantin Zopounidis

(DPEM 406) Marketing *Credits: 5*

Marketing: definition, marketing environment. Development of a competitive advantage in marketing. Marketing strategies. Market research. Market segmentation. Consumers, factors affecting consumer behavior. Life-cycle of products. Functions to express product life-cycle. Sales forecasting. Product policy and strategy. Adoption and distribution of new products. Pricing and distribution policy. Product promotion, advertising, personalized sales. Management in marketing.

Academic Responsible: DPEM

(DPEM 422) Investment Decision Analysis *Credits: 4*

Financial Mathematics. Investment decision under certainty. Net present value, payback method, accounting rate of return, index of profitability, internal rate of return, advanced capital budgeting techniques. Investment decision under uncertainty. Uncertainty and risk. Risk-adjusted discount-rate method, certainty equivalent method, statistical decision method, decision tree method, simulation analysis. Portfolio selection and management. Risk and return. Market model. Capital asset pricing model. Arbitrage pricing theory. Case studies.

Academic Responsible: Constantin Zopounidis

(DPEM 424) Ergonomics *Credits: 4*

The development of ergonomics. Man-machine systems. Ergonomic work analysis. Noise-vibration. Lighting conditions. Visual perception. Design of displays and controls. Thermal environment. Application of anthropometrics and biomechanics. Workstation design. Circadian rhythms and shift work. Manual skills and mental activities. Human information processing. Fault-diagnosis, decision-making and planning. Workload analysis. Human-computer interaction. Human reliability. Work organization. Case studies.

Academic Responsible: Tom Kontogiannis

Group VII (Management)

Elective Courses

(DPEM 302) Human Resource Management *Credits: 4*

Leadership, creativity and innovation. Group formation and dynamics. The entrepreneurial function. Job design, performance appraisal, salary policy, career development. Discussion of case studies.

Academic Responsible: Vassilis Moustakis

(DPEM 323) Data Analysis *Credits: 4*

Introduction. Basic concepts. Time-series analysis. Regression analysis. Principal component analysis. Simple and multiple correspondence analysis. Factor analysis. Discriminant analysis. Cluster analysis. Q-analysis. Conjoint analysis. Hierarchical analysis. Forecasting. Forecasting techniques. Technology forecasting. Applications and case studies.

Academic Responsible: DPEM

(DPEM 408) Total Quality Management *Credits: 4*

Introduction to quality (definitions, history and importance, dimensions). Principles of Total Quality Management (TQM). TQM as a new culture. Quality management philosophies (Deming, Juran, Crosby, Ishikawa, Taguchi, Feigenbaum). Customer-satisfaction and customer-relationship management. Quality awards (Deming, EFQM, Malcolm Baldridge). Benchmarking. Tools for TQM (quality improvement, SPC, QFD, Taguchi techniques, etc.). Quality standards and quality assurance systems. Cost of quality.

Academic Responsible: Evangelos Grigoroudis

(DPEM 427) Financial Calculus *Credits: 5*

Introduction to financial markets. Elementary concepts of portfolio management. Portfolio optimization methods. Bond pricing. Duration and convexity. Bond portfolio optimization. Bond management strategies. Options. Option valuation models (binomial model, the Black and Scholes model). Futures. Value at risk (VaR): definitions and estimation techniques. VaR optimization.

Academic Responsible: Michael Doumpos

(DPEM 433) Small & Medium Enterprises (SMEs) and Innovation *Credits: 4*

Establishment and operation of SMEs. Classification of SMEs. Management accounting. Corporate and tax legislation for SMEs. Cost accounting for SMEs. Financing of SMEs and development of business plans.

Academic Responsible: Constantin Zopounidis, Nikolaos Matsatsinis, Evangelos Grigoroudis

(DPEM 505) Ergonomic Work Analysis *Credits: 5*

Man-machine systems. The systems design process. Models of human performance. Human information processing. Data recording and analysis methods. Task analysis techniques for manual skills and mental activities. Human reliability approaches. Sociotechnical systems. Case studies.

Academic Responsible: Tom Kontogiannis

(DPEM 506) Strategic Planning *Credits: 4*

Concept, definition and role of strategic planning. The strategic planning process: Specification of strategies, types of objectives, assessment of the external environment, internal analysis, generation of alternative strategies, strategy implementation, strategic control. Pro-forma statements, predefined costs, analysis of deviations. The balanced scorecard approach. Applications of strategic planning in firms and organizations.

Academic Responsible: Fotios Pasiouras

(DPEM 507) Technological Forecasting *Credits: 5*

Definitions. Technique, technology and culture. Polynomial models, binomial models. Coleman, Logistic, Bass and other models. Distributions: normal, lognormal, Weibull and Gompertz. New models: NSRL, GRM I and II. Non-linear regression analysis. Applications to technological and other time-series.

Academic Responsible: DPEM

(DPEM 510) Engineering Economics and Business Plan Analysis *Credits: 5*

Life-cycle costing. Cost estimation: volume-based costing and activity based costing. Benefit/cost as-

sessment in engineering planning. Business plan modeling. Overview of real-world examples.

Academic Responsible: Vassilis Moustakis

(DPEM 512) Financial Risk Management *Credits: 5*

Definition and important of risk in financial management. Types of financial risks. Traditional methodologies for financial risk assessment: univariate statistical analysis, optimization. New methodologies for financial risk assessment: multivariate statistical analysis, multicriteria decision aid, rough sets, intelligent decision support systems. Case studies.

Academic Responsible: Fotios Pasiouras

5. Contact Information

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