Undergraduate Studies Handbook

ATHENS 2010
1st Semester

**Programming and P/C use- Basic software tools**

**Course Contents**


**Duration:** 1 Semester

**Contact Hours:** 3 hours/week, 3 hours lab

**Mathematics I**

**Course Contents**


**Duration:** 1 Semester

**Contact Hours:** 6 hours/week

**Inorganic Chemistry**

**Course Contents**


**Duration:** 1 Semester

**Contact Hours:** 3 hours/week, 5 hours lab
Design Techniques- P/C use (CAD/CAM flow charts)

Course Contents

Duration: 1 Semester

Contact Hours: 3 hours/week

Physics I

Course Contents

Duration: 1 Semester

Contact Hours: 3 hours/week, 2 hours lab

Introduction to Economics

Course Contents
Study the behavior of individual units of the economy, consumers and producers in the markets function. Analysis of market distortions and the state’s role.

Duration: 1 Semester

Contact Hours: 2 hours/week

Advanced Mathematics II

Course Contents

Duration: 1 Semester
Contact Hours: 6 hours/week

Analytical Chemistry

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week, 5 hours lab

Physical Chemistry (Chemical thermodynamics)

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week

Chemical Engineering

Course Contents

The first part of the course aims to offer an outline of the several areas involved in the Chemical Engineering Curriculum. The lectures deal mainly with the methods used in the study of physico-chemical processes. Main contents: History of chemical engineering. Introduction to plant, process and product design.

Duration: 1 Semester

Contact Hours: 3 hours/week

Physics II

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week, 2 hours lab
Macroeconomics

Course Contents

Introduction to the functioning of the broader economic system (macro level). Full report in sections: national product and income, domestic consumption and investment, economic cycles and multiplications, money and banking system, the phenomena of unemployment and inflation, views on the development and stability, open economies and the global economy, comparative and competitive advantages. References to examples of the Greek economy.

Duration: 1 Semester

Contact Hours: 2 hours/week

3rd Semester

Technical Engineering

Course Contents

Introduction to Static, Charts Axis forces, cutting forces, bending moments. Introduction to Strength of Materials, tension, compression, resolution volume in space, Biaxial tension cycle Mohr, Law Hooke, bending, moments of inertia, level of net bending Oblique pure bending, shear, bending to cutting; thin-walled beams with asymmetrical cross-section, Center Shear, Torsion, Bending Advanced, Eccentric Loading, Project Deformation, Elastic Line Kelyfoi Entities Thin Pressure Vessels.

Duration: 1 Semester

Contact Hours: 3 hours/week

Organic Chemistry I

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week, 4 hours lab

Mathematics III

Course Contents


Duration: 1 Semester

Contact Hours: 4 hours/week
Physical Chemistry II (matter structures and states)

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week, 3 hour lab

Business Administration

Course Contents

Introduction: Production operations, operations strategy. Forecasting: Short-term forecasts, intermediate-term forecasts, long-term forecasts, qualitative forecasting methods, time series and casual models, constant processes, linear trend processes, seasonal processes. Inventory management: The nature and importance of inventories, inventory-related costs, economic order quantity models, implementing inventory management systems. Design of production systems: Product design, process selection and capacity planning, facilities layout, design of work systems and organization. Operating and controlling the production system: Long, medium and short range production planning and control, quality management, maintenance and replacement. Feasibility study: Investment proposal, estimating cash flows, evaluation of investment proposal.

Duration: 1 Semester

Contact Hours: 2 hours/week

Applied Thermodynamics

Course Contents

The phase rule and Duhem's theorem for reacting systems multi reaction equilibria.

**Duration:** 1 Semester

**Contact Hours:** 3 hours/week

### 4th Semester

**Chemical Engineering Thermodynamics**

**Course Contents**

Material balances and definitions. Simple flow sheets. Combustion and excess air.
Elements of phase equilibria. Equations of state. Critical and reduced T and P.
Compressibility factor (Z). Pure gases and gas mixtures. Partial pressure. Humidity; steam tables;
drying and humidification processes. Energy balances. Definitions (work, heat, energy, enthalpy,
Enthalpy of reaction. Reactions at T, P other than standard. Enthalpy of dilution and of mixing.
Combined mass and energy balances. Distillation. Degrees of freedom. Enthalpy – concentration
and energy balances. Simple non-steady state mass balances, mixing, distillation, reaction. Simple non-
steady state energy balances, heat transfer. Simple applications and examples.

Students are required to attend a computer lab on the use of Aspen Plus. Students are required to
submit 2-3 project reports. They count 20% in final grade. Estimated time per project, about 10 hours.
A mid-term exam is optional, and counts 30% in final grade.

**Duration:** 1 Semester

**Contact Hours:** 3 hours/week

**Organic Chemistry II**

**Course Contents**

Acyclic compounds: Carbonyl compounds. Carboxylic acids. Derivatives of
carboxylic acids. Thiols and sulfides. Nitrogen compounds. Lipids. Peptides and
proteins. Carbohydrates. Detergents. Industrial polymers. Cyclic compounds:
General. Cycloalkanes. Aromatic character and substitution. Industrial aromatic
Pigments. Drugs.

**Duration:** 1 Semester

**Contact Hours:** 3 hours/week

**Transfer phenomena I- Fluid Mechanics**

**Course Contents**

Introduction to Transport Phenomena; molecular transport of momentum, heat and mass. Fluxes,
molecular transport coefficients, correlations from kinetic theory. General property balance, derivation
of differential equation for 3D transport of momentum, heat and mass. Laminar flow, examples. Exact
solutions of the Navier-Stokes equations, viscometric flows. Introduction to laminar boundary layers of
momentum, heat and mass. Mass fluxes in stationary and convected coordinates, induced velocity.
Turbulence and turbulent transport; Reynolds’ equations, eddy transport coefficients of momentum
heat and mass. The closure problem of turbulence, phenomena-logical theories (Boussinesq, Prandtl),
Reynolds’ analogies and applications. Dimensional analysis and π-theorem; inspection of the basic
differential equations analysis; physical meaning of dimensionless groups, modeling.

**Duration:** 1 Semester
Contact Hours: 4 hours/week

Physical Chemistry III (Chemical Kinetics - Electrochemistry)

Course Contents


Duration: 1 Semester

Contact Hours: 4 hours/week, 3 hours lab

Mathematics IV (Numerical Analysis - Applied Statistics)

Course Contents


Duration: 1 Semester

Contact Hours: 5 hours/week

Operations Research

Course Contents

At first an introduction to the scientific field of operations research and management science (operational research and management science). Emphasis is placed on optimization and how to design appropriate mathematical models for solving these problems. Then describe the problem of linear programming with examples from the field of engineering as on of most. Constructed a mathematical model of the problem is solved and the top graphics to make them better understand the basic concepts of the theory. Below is a description of the Simplex method which is the basic method of solving linear programming problems. Then develop the dual theory and its application in the sensitivity analysis accompanying the solving of problems. The next step is the integration of integer variables in the model and focus on how the problems of modeling (Integer Programming). The existence of integers or binary (0 or 1) variables Integer Programming significantly expands the scope of mathematical programming models. It also describes how to resolve problems integer programming (branch and bound method, etc.) and provides examples, mainly from the fields of engineering (fixed costs, logistics, etc.), introducing the student to combinatorial optimization.
Electrotechnics

Course Contents

Fundamentals Electromagnetics, electrical quantities, circuit boards, labels, Laws Kirchoff, data circuits, Energy and Power, Linear data analysis Principles of electric circuits, theorems (voltage and current division, superposition, connecting resistors in series and parallel, balanced bridges Kennelly, Millman, Thevenin, Norton, Transforming sources) Elementary transients for first order circuits, sinusoidal permanent status (using phasors, complex root, real and reactive power, theorems), three-phase circuits (balanced loads, measurement of force).

Duration: 1 Semester
Contact Hours: 3 hours/week

Unit Operations I

Course Contents

The aim of the Unit Operations I course is the study of the principles involved in the preliminary design of distillation columns, absorption and extraction towers as well as, cooling towers. The design of distillation columns is performed as an example of a stagewise process. Analytical and graphical methods are employed to calculate the number of theoretical trays in continuous and batch binary distillation. Tray and column efficiencies are discussed, while simplified methods are employed for the design of multi component distillation. Differential-contact processes are examined in the chapter of absorption. The number and height of transfer units are calculated to obtain the height of the packing material in the column. Column efficiency is also discussed. For the design of liquid-liquid batch and continuous extraction processes of non-miscible and partially miscible solvents, analytic and graphical methods are again employed. The design of cooling towers is performed as a good example of simultaneous mass and energy transfer. Design of water-air cooling tower.

Duration: 1 Semester
Contact Hours: 4 hours/week, 3 hours lab

Instrumental Chemical Analysis

Course Contents


Duration: 1 Semester
Contact Hours: 3 hours/week, 3 hours lab
Principles of Cell Biology and Biochemistry

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week

Transport Phenomena II - Heat and Mass Transfer

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week, 1 hour lab

Metal Corrosion and Protection

Course Contents


Duration: 1 Semester

Contact Hours: 2 hours/week

6th Semester

Chemical Reaction Engineering

Course Contents


**Duration:** 1 Semester

**Contact Hours:** 4 hours/week, 2 hours lab

### Environmental Science

**Course Contents**

Introduction to Environmental Science: Multidisciplinary dimension of environmental science, nature, environmental problems, information ecology, toxicology and ecotoxicology. Ecosystems and energy flow and material cycles of elements in the environment, human disturbance of the environment. Atmosphere and Air Pollution: the structure and composition of the atmosphere, the sun-earth relations, air pollutants, sources and effects of air pollution, types of air pollution, weather impact on air pollution, dispersion of pollutants in the atmosphere planetary scale atmospheric disturbances (reduction of stratospheric ozone, a phenomenon warming, acid rain, climate change). Water Environment and Water Pollution: Characterization of water, water cycle, aquatic ecosystems, water quality and uses, sources of pollution (sewage, industrial waste water), pollution of surface and groundwater, pollution, oceans, polluting parameters (organoleptic, physicochemical, undesirable substances, toxic, microbiological), eutrophication. Geosphere and Soil: Rocks, minerals, chemical processes, characteristics, soil organic matter, soil pollution sources and restoration. Solid waste and environmental pollution: types, sources, impacts on the environment, polluting aspects of waste management. Environmental Policy and Legislation - Environment and sustainable development (sustainability): Legislative framework and policies for tackling environmental pollution, environmental quality standards, economic considerations, information and citizen participation.

**Duration:** 1 Semester

**Contact Hours:** 3 hours/week, 1 hour lab

### Unit Operations II

**Course Contents**


**Duration:** 1 Semester

**Contact Hours:** 4 hours/week, 2 hours lab
Science and Engineering Biological Systems and Products (Food - Biotechnology)

Course Contents


Duration: 1 Semester

Contact Hours: 4 hours/week

Polymer Science and Engineering

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week

7th Semester

Materials Science and Engineering

Course Contents


Duration: 1 Semester

Contact Hours: 3 hours/week, 2 hours lab

Chemical Reaction Engineering

Course Contents


**Duration:** 1 Semester

**Contact Hours:** 4 hours/week, 2 hours lab

### Technology Fuels and Lubricants

#### Course Contents


**Duration:** 1 Semester

**Contact Hours:** 3 hours/week, 2 hours lab

### Advanced Inorganic Chemistry

#### Course Contents


**Duration:** 1 Semester

**Contact Hours:** 3 hours/week, 2 hours lab

### Remediation of Contaminated Areas

#### Course Contents

Environmental protection is the set of measures aimed at maintaining the physical, chemical and biological characteristics, to ensure the functioning of a hospitable habitat for all current forms of life on the planet. As for the human species in particular environmental protection extends to avoid environmental disturbances that can adversely affect the aesthetics, mental condition, fun and spiritual and physical cultivation. Drainage environment is the set of techniques designed to restore normal levels of all environmental parameters are disturbed by human activities. The selection of the required technical consolidation is not predetermined, but depends on the specific characteristics and specialized in each specific case of pollution in the region. This course is the knowledge of the principles and methods remediation of contaminated sites under legal restrictions and protect public health and safety. Furthermore, the object lesson is the plant design and project management reorganization.

**Duration:** 1 Semester

**Contact Hours:** 3 hours/week
8th Semester

Process control

Course Contents


Duration: 1 Semester

Contact Hours: 4 hours/week

Economic Analysis of Manufacturing Decisions

Course Contents

The object lesson on the concepts, methods and techniques associated with the Feasibility Study and Business Plan. Objective: To familiarize the engineer with the conditions necessary for eventual economic exploitation of technological knowledge by formulating and evaluating aproject and / or a business.

Duration: 1 Semester

Contact Hours: 3 hours/week

Environmental Engineering

Course Contents

Presentation of procedures for dealing with environmental problems and protecting the environment from anthropogenic activities. Analysis of processes and design of gas processing plants, liquid and solid waste.


Duration: 1 Semester

Contact Hours: 3 hours/week

Processes of Inorganic and Electrochemical industries

Course Contents

Physical processes in inorganic industry. Solid materials, size reduction, separation of solid / solid and dust extraction processes. Apply the cement industry.

**Duration:** 1 Semester

**Contact Hours:** 3 hours/week

### High Temperature Processes

**Course Contents**


**Duration:** 1 Semester

**Contact Hours:** 3 hours/week, 3 hours lab

### Design of Chemical Industry

**9th Semester**

**Course Contents**

The Design of Chemical Industries combines virtually all knowledge of Chemical Engineering in Mechanical guiding the formation of production units operating on financial and environmental terms. Especially in nowadays, the search for new products is becoming more common as oil and natural gas (main raw materials of our industry) runs out, leaving gaps in the markets (fuels, chemicals), and encouraging experimentation with alternative raw materials. The role of chemical engineering is to translate the available chemistry laboratories (alternative or conventional, 'Green or not, new or old) into viable products and factories ensuring efficient and cost effective solutions in each case. The course material is presented in two sections. The first introduces the general design problem and explain details about the cost and evaluation of industrial investment. Presented selection of chemical reactors, natural selection - chemical separation processes, principles of integration with parametric analysis and compensation studies, and data on plant safety.

**Duration:** 1 Semester

**Contact Hours:** 4 hours/week, 2 hours lab

### Project Management and Decision Support

**Course Contents**

A) Project Management: Basic knowledge, techniques and tools applicable to the successful completion of complex actions involving several interrelated activities, designed to create one;; units;; product or service.

Basic concepts, organizational structures, project lifecycle Planning

Structural Analysis Project Scheduling Planning Resources Project Budget

Monitor & Control Project Risk Management
B) Decision Support: Basic concepts, methodological approaches, techniques and tools for choosing the appropriate solution that will satisfy a new need or improve the existing situation

Basic concepts
Decision making under uncertainty and risk - decision trees
Decision making with multiple criteria

Duration: 1 Semester

Contact Hours: 3 hours/week

Health & Safety Facility

Course Contents

Duration: 1 Semester

Contact Hours: 3 hours/week

Processes of advanced inorganic materials

Course Contents

Duration: 1 Semester

Contact Hours: 3 hours/week, 3 hours lab

Inorganic industries (Case studies)

Course Contents
Depth articles on cutting-edge field of Inorganic and Electrochemical Industries. Indicative topics which engage with corresponding case studies are: Standardization of procedures and products, impact of manufacturing on the properties of products, waste treatment, alternative fuels, energy conservation, recovery and recycling of industrial by-products, design Inorganic Industries legislative framework for the establishment industrial plant, studies on the development of industrial space

Duration: 1 Semester

Contact Hours: 3 hours/week, 3 hours lab

Technology and Business Strategy
Course Contents

The purpose of this course is to familiarize students with the overview of policy and course of business through the development and implementation of its strategy to focus on the utilization of technology, knowledge and innovation. It also considers the creation of new enterprises based on knowledge. In the course strategy (technology and business) is treated as a dynamic process of exploitation of resources and capabilities and interaction with the wider environment.

Duration: 1 Semester

Contact Hours: 2 hours/week

10th Semester

Diploma Thesis

The diploma thesis work is conducted within the Faculty in consultation with and under the supervision of one of the faculty members. The examiner has the final responsibility for the extent and the quality of the work. The diploma thesis is performed within one of the areas listed in the course program. The diploma work is an application to and a summary of knowledge acquired during education. Therefore it constitutes the final part of the work towards graduation. The defense of the diploma thesis is accomplished in the presence of a faculty members committee.