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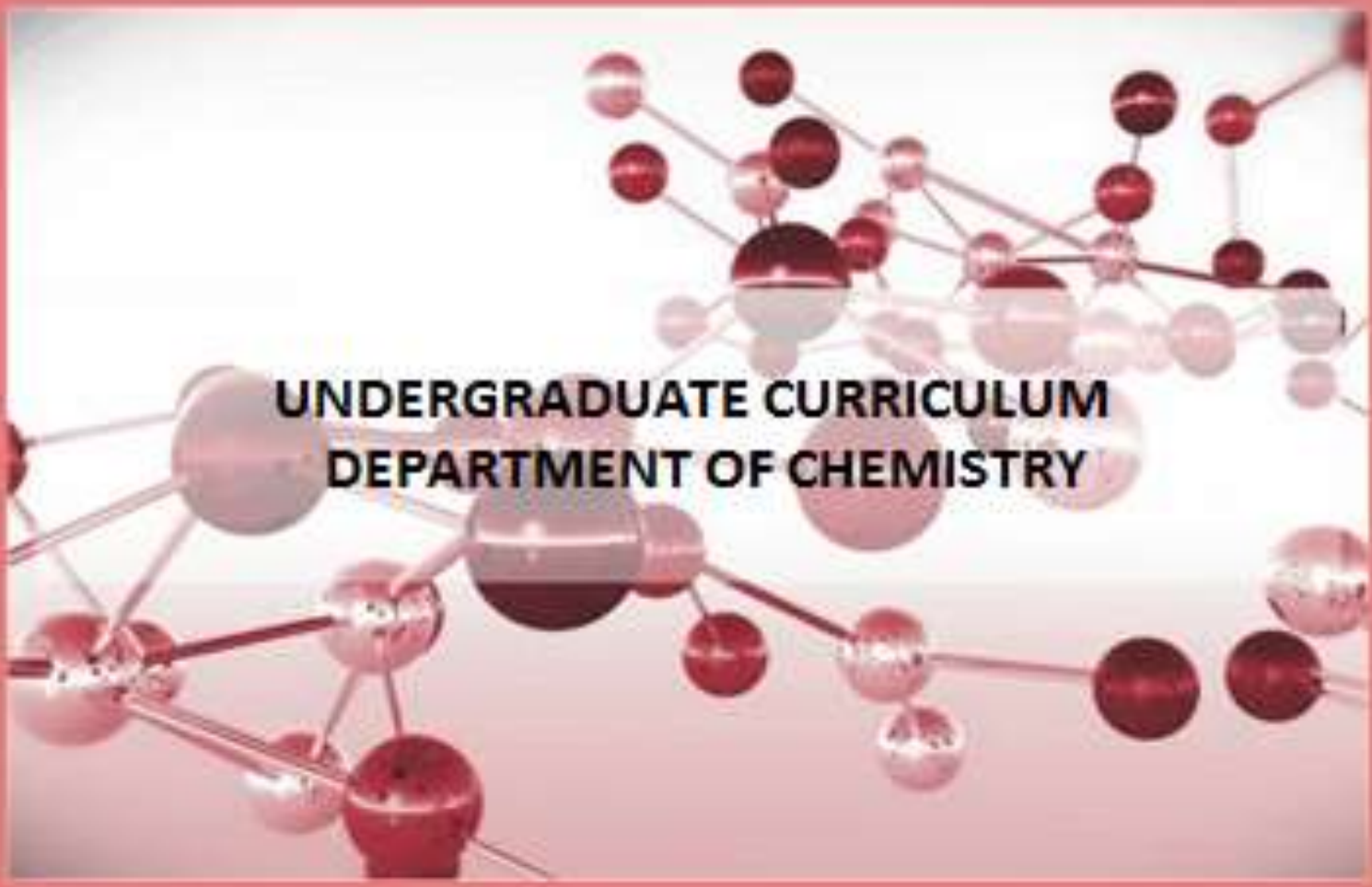

UNDERGRADUATE CURRICULUM
DEPARTMENT OF CHEMISTRY

2017-2018

NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS
UNDERGRADUATE CURRICULUM
DEPARTMENT OF CHEMISTRY

CHAPTER 3

ADMINISTRATIVE ORGANIZATION OF THE CHEMISTRY DEPARTMENT

3.1 Department of Chemistry Administration

The main functional academic unit is the Department. The Chemistry Department covers the scientific subject area of Chemistry and grants degrees which may have concentrations or specializations. Departments corresponding to related sciences constitute a School. The Department of Chemistry, together with the Departments of Physics, Mathematics, Biology, Geology and Geoenvironment, Informatics and Telecommunications and History and Philosophy of the Sciences, constitute the School of Sciences.

The governing bodies of the Department of Chemistry, as for all the public University Departments in Greece, are: The Assembly, the Administrative Council, the Chair and the Vice Chair. The Vice chair substitutes for the Chair in her/his absence.

The governing bodies of the Department are elected, and their responsibilities are given by the provisions of the Law 4485/2017 as amended and as in force.

3.2 Department of Chemistry Divisions

Each Department is divided into Divisions. Each Division coordinates the teaching of a portion of the Department's subject matter related to a specific scientific area. The governing bodies of the Division are the Assembly and the Director.

The Assembly of the Division is comprised of the Division Faculty members, one (1) undergraduate student representative and one (1) graduate student representative. The Assembly elects the Division Director, coordinates the work of the Division in the context of decisions of the Department Assembly, submits proposals to the Department Assembly regarding the curriculum, distributes Division funds to the various teaching and research activities, elects Directors of the Division's Laboratories, makes decisions regarding the distribution of teaching responsibilities to the Division's Faculty members and generally processes any issue of interest to the Division.

The Director of the Division calls for the Assembly, drafts the agenda, presides over its work and ensures the implementation of its decisions.

With the decisions of the Assembly of the Department of Chemistry (21-4-83, 25-4-83, 28-4-83 και 9-6-83 sessions), the Department was divided into the following Divisions (ΦΕΚ 316 τ.Β'/21-5-84):

Division I: Theoretical Chemistry – Physical Chemistry – Inorganic Analysis – Instrumental Analysis – Instrumentation – Chemical Mechanics (Applied Physical Chemistry)

Division II: Organic Chemistry – Organic Chemical Technology – Food Chemistry – Biochemistry – Clinical Chemistry.

Division III: Inorganic Chemistry – Inorganic Chemical Technology – Environmental Chemistry

3.3 The Department of Chemistry Building

The Department of Chemistry is located in the Eastern part of the Natural Sciences building complex in the University Campus in Zografou. The Departments of Biology, Geology and Geoenvironment and Pharmacy are also located in the same building complex. The Chemistry Department is located in the northwest section of the complex. The building facilities of the campus and a brief architectural layout of the Department of Chemistry are included below.

The main entrance to Department is on the northern side of the building. A second entrance is located on the western side at the second floor level. The Department internally linked with the other Departments of the complex by a network of corridors.

The Department of Chemistry Secretariat is located in the same building complex (Secretariat Corridor, 4th floor)

The Department Laboratories are located as follows:

1. Inorganic Chemistry Laboratory: A, B, C and D Wings, 2nd floor (tel. 210 7274348)

2. Organic Chemistry Laboratory: A, B, C and D Wings, 3rd floor (tel. 210 7274473)

3. Physical Chemistry Laboratory: D and E Wings, 5th floor (tel. 210 7274535)

4. Food Chemistry Laboratory: A, B, C Wings, ground floor (tel. 210 7274476)

5. Industrial Chemistry Laboratory: A, B, and C Wings, 1st floor (tel. 210 7274328)

6. Analytical Chemistry Laboratory: C, D, and E Wings, 4th floor (tel. 210 7274557)

7. Biochemistry Laboratory: B and D Wings, ground floor (tel. 210 7274265)

8. Environmental Chemistry Laboratory: E Wing, 3rd floor (tel. 210 7274274)

Department of Chemistry lectures and examinations are carried out in the areas below:

1. Auditorium A15 336 places (entrance: 2nd and 3rd floor)
2. Auditorium ΦΜ3 384 places (entrance: 3rd and 4th floor)
3. Classroom A1 108 places (E Wing, 2nd floor)
4. Classroom A2 126 places (E Wing, 2nd floor)
5. Inorganic Chemistry Classroom 120 places (ΑΝΟΧ, D Wing, 2nd floor)
6. Organic Chemistry Classroom 76 places (ΟΡΓΧ, C Wing, 3rd floor)
7. Analytical Chemistry Classroom 136 places (ΑΝΑΧ, D Wing , 4th floor)
8. Physical Chemistry Classroom "Th. Giannakopoulos" 72 places (ΦΧ, D Wing, 5th floor)
9. Environmental Chemistry Classroom 48 places (ΧΠΕΡ, E Wing, 3rd floor)

Other areas: Natural Science Library-Reading room

Café (3rd floor)

Cafeteria (School of Philosophy)

Medical office (School of Philosophy and in the Natural Sciences building across from the Dean's office, 4th floor)

3.4 Internet connections in the Department of Chemistry

The Department of Chemistry has internet connection, and the Department website is http://www.chem.uoa.gr. The activity of the Department is posted on the site and is open to the public. The Department webpages contain information (text, maps, figures and photos) regarding the following:

The history of the University of Athens and of the Chemistry Department, the University Campus and Chemistry Department buildings, Department Administration and Laboratories, the Faculty members and infrastructure of each Laboratory as well as detailed information regarding Faculty curriculum vitae and research interests and Graduate studies programs.

The Department webpages also include the following:

Departmental Announcements. Educational material for many courses as well as the electronic links to corresponding course webpages. Informatics and educational material regarding Chemistry, links to the Natural Sciences Library, Chemical databases as well as websites from other Departments of Chemistry and Research Institutes worldwide (conferences, scientific results, current issues in Chemistry, etc.)

3.5 Other Useful Information

Access to the Department of Chemistry – bus lines.

Access to the University campus is possible with the Athens City buses no. 220 (Akadimia – Ano Ilisia), 221 (Akadimia-Panepistimiopolis –Ano Ilisia), 224 (Kaisariani – El. Venizelou), 230 (Acropolis – Zografou), 235 (Akadimia – Zografou), 250 (Evaggelismos metro station – Panepistimiopolis), 608 (Galatsi – Cemetery Zografou) and E90 (Pireus – Panepistimiopolis express). The 608 bus is the closest to the Chemistry Department, but the 250 and E90 busses run inside the campus and stop exactly opposite the main entrance to the Chemistry Department. More information is available from calling the bus line phone assistance number 185 and from the specific website for transport in Athens: http://www.oasa.gr.

Department Secretariat

The Department of Chemistry Secretariat is open to students Monday, Wednesday and Friday 11am - 2pm. Students are recommended to regularly consult the Department website (http://www.chem.uoa.gr) for information regarding their transcript as well as Department announcements.

Course Attendance

Regarding lecture and laboratory attendance, the scheduled hours must be observed.

Announcements for Students

Announcements for students are posted on specific message boards located in each Laboratory as well as outside the A15 Auditorium. In addition, course announcements are posted on the corresponding course webpage. The electronic

addresses for course webpages are provided in section 5.2 (Course contents) of this Curriculum guide.

Scientific seminars

Scientific seminars are usually given every two weeks in Classroom A2 (2nd floor). The seminars are open to all members of the Chemistry Department (staff, undergraduate and graduate students) and to scientists from related fields. Speakers are members of Chemistry departments or other departments or research institutes. The seminar program is posted on the Department website, http://www.chem.uoa.gr under the heading: Conferences -Seminars → Seminars.

3.6 Staff of the Department

3.6.1 Elected Administration

Chair: Mitsopoulou Ch., Professor

Vice Chair: Thomaidis N., Professor

Technical Administrator: Papaefstathiou I., Associate Professor

Assistant Technical Administrator: Tsekouras A., Assistant Professor

Director of Division I: Koutselos A., Associate Professor

Director of Division II: Pitsikalis M.., Professor

Director of Division III: Dasenakis M., Professor

Laboratory Directors:

Laboratory of Inorganic Chemistry: Mitsopoulou Ch., Professor (tel. 210 7274 452)

Laboratory of Organic Chemistry: Kokotos G., Professor (tel. 210 7274462)

Laboratory of Physical Chemistry: Koutselos A., Associate Professor (tel. 210 7274536)

Laboratory of Industrial Chemistry: Iatrou E., Professor (tel. 7274768, 7274440)

Laboratory of Analytical Chemistry: Calokerinos A., Professor (tel. 210 7274316)

Laboratory of Food Chemistry: Markaki P., Associate Professor (tel. 219 7274489)

Laboratory of Environmental Chemistry: Dasenakis M., Professor (tel. 210 7274269)

Laboratory of Biochemistry:

3.6.2 Secretariat Staff

Secretary of the Department: Satratzemi G. (tel. 210 7274947)

Administrative staff: Lazaridou M. (tel. 2107274939)

Nikolaou G. (tel. 210 7274088)

Economou S. (tel. 210 7274386)

Spentzari Ir. (tel. 210 7274098)

3.6.3 Staff per Division

DIVISION I: [Theoretical Chemistry – Physical Chemistry – Inorganic Analysis – Instrumental Analysis – Instrumentation – Chemical Engineering (Applied Physical Chemistry)]

Professors	Laboratory Teaching Staff (EDIP)
Calokerinos A.	Dousikou M.
Lianidou E.	Bizani E.
Economou A.	Polydorou Ch.
Thomaidis N.	
Associate Professors	Technical Staff (ETEP)
Archontaki E.	Meligkonis V.
Koutselos A.	Charalambous P.
Bakeas Ev.	
Souliotis G.	Computer Lab (SSATES) Administrator
	Kapsalis A.
Assistant Professors	
Kalemos A.	Administrative Staff
Papakondylis A.	Gkika A.
Tsekouras A.	

DIVISION II: [Organic Chemistry – Organic Chemical Technology – Food Chemistry – Biochemistry – Clinical Chemistry]

Professors	Scientific Associate
Kokotos G.	Hatziyiannakou A.
Iatrou E.	
Mavromoustakos Th.	Technical Staff (ETEP)
Mouteveli – Minakaki P.	Vraimakis S.
Pitsikalis M.	Papathanassiou K.
Associate Professors	Laboratory Teaching Staff (EDIP)
Gimisis A.	Vasilopoulou F.
Georgiadis D.	Mores A.

Zabetakis I.

Liouni M.

Markaki P.

Papadogiannakis G.

Paschalidou A.

Sakki E.

Laboratory Technician

Stain J.-K.

Assistant Professors

Vasiliou S.

Vougioukalakis G.

Kokotos Ch.

Magrioti V.

Proestos Ch.

Sakellariou G.

Hatzichristidi M.

TOMEAS III: [Inorganic Chemistry – Inorganic Chemical Technology – Environmental Chemistry]

Professors

Dasenakis E.

Mitsopoulou Ch.

Associate Professors

Koinis S.

Kyritsis P.

Methenitis K.

Papaefstathiou I.

Petrou A.

Assistant Professors

Paraskevopoulou P.

Chryssanthopoulos A.

Filippopoulos A.

Psaroudakis N.

Efthymiadou E.

Laboratory Teaching Staff (EDIP)

Karavoltsos S.

Botsou F.

Paraskevopoulou V.

Roulia M-E.

Sakellari A.

Stathopoulou E.

Laboratory Technician

Mantzara V.

Fountis I.

Administrative Staff

Mariolakou P.

3.7 Former Chairs and Vice-Chairs of Chemistry Department

Academic Year	Chair	Vice-Chair
1982-1983	Dilari Irini	
1983-1985	Pnevmatikakis Georgios	
1985-1986	Pnevmatikakis Georgios	
1986-1987	Galanos Dimitrios	Stelakatos Gerasimos
1987-1989	Galanos Dimitrios	Hatzichristidis Nikolaos
1989-1991	Galanos Dimitrios	Hatzichristidis Nikolaos
1991-1993	Hatzichristidis Nikolaos	Efstathiou Konstantinos
1993-1995	Hatzichristidis Nikolaos	Efstathiou Konstantinos
1995-1997	Efstathiou Konstantinos	Tzougraki Chryssa
1997-1999	Efstathiou Konstantinos	Tzougraki Chryssa
1999-2001	Hatzichristidis Nikolaos	Koupparis Michael
2001-2003	Hatzichristidis Nikolaos	Siskos Panagiotis
2003-2005	Mertis Konstantinos	Calokerinos Antonis
2005-2007	Hatzichristidis Nikolaos	Skoullos Michael
2007-2009	Hatzichristidis Nikolaos	Calokerinos Antonis
2009-2011	Calokerinos Antonis	Mouteveli-Minakaki Panagiota
2011-2013	Calokerinos Antonis	Mouteveli-Minakaki Panagiota
2013-2015	Kokotos Georgios	Economou Anastasios
2015-2017	Kokotos Georgios	Economou Anastasios

3.8 Emeritus Professors of Chemistry Department

Name	Discipline
Valavanidis Athanasios	Professor of Organic Chemistry
Vyras Kyriakos	Professor of Physical Chemistry
Giotakis Athanasios	Professor of Organic Chemistry
Dimopoulos Konstantinos	Professor of Biochemistry
Efstathiou Konstantinos	Professor of Analytical Chemistry
Ignatiadou-Ragoussi Valentini	Professor of Organic Chemistry
Ioannou-Amarantidou Pinelopi	Professor of Analytical Chemistry
Mavridis Aristidis	Professor of Physical Chemistry
Mertis Konstantinos	Professor of Inorganic Chemistry
Samios Ioannis	Professor of Physical Chemistry
Siafaka - Kapadai Athanasia	Professor of Biochemistry
Skoullos Michael	Professor of Environmental Chemistry
Tzougraki Chryssa	Professor of Organic Chemistry
Ferderigos Nikolaos	Professor of Organic Chemistry
Hatzichristidis Nikolaos	Professor of Industrial Chemistry

CHAPTER 4

STUDIES IN THE DEPARTMENT OF CHEMISTRY

4.1 Organization of Studies

Every academic year is divided into winter and spring semesters. The courses in the University of Athens Department of Chemistry curriculum are either required or elective and distributed over eight (8) semesters. The 1st, 3rd, 5th and 7th semesters of the curriculum are taught during the winter semester, while the 2nd, 4th, 6th and 8th semesters are taught during the spring semester.

Students in the Department of Chemistry are instructed through lecture courses, tutorials, laboratory courses and by carrying out an undergraduate thesis.

4.1.1 Required Courses

Required courses are those courses which all students in the Chemistry Department must follow and pass.

Attendance in lecture courses is only the academic responsibility of each student, but is not mandatory and student absences are not recorded. However, systematically attending lectures is absolutely appropriate for students' proper theoretical preparation and for their success on the course examination.

The examinations are given by the instructor/s at the end of the semester on predetermined material. The examinations can be written or oral. Course grades are on a scale of 1-10, with 5 being the lowest passing grade. In the case a student does not pass, she/he has the possibility to take a supplementary examination. If the student fails to pass the supplementary examination, then she/he must re-register for the course in the next semester.

4.1.2 Elective Courses

Elective courses are those courses from which each student must choose in order to fulfill the necessary number of courses for their undergraduate degree as well as at least the minimum number of ECTS. Each student can choose freely from these courses based on her/his interests.

With regard to examinations and grading, the same policy applies as for the required courses. In the case a student does not pass, she/he can re-register for the class in the next semester or register for a different elective course.

4.1.3 Laboratory courses/exercises

Many of the required and elective courses are accompanied by student laboratory exercises in specially equipped areas with specialized instrumentation (Laboratories). The content of the laboratory exercises corresponds to either the current course or to a course from the previous semester. The following applies to the student laboratory exercises:

a) The exercise is required, and for practical reasons (limited number of laboratory places or instruments with relation to the number students required to carry out the exercise), participation in the laboratories takes place during specific time periods.

b) Each student's responsibilities in the laboratory are fulfilled upon the successful completion of all the exercises required by the laboratory course program. In the case of student absence or failure to successfully complete an exercise/s, the exercise/s must be performed or repeated, after consultation with the laboratory's supervisor, in a subsequent laboratory period or the same, if possible.

c) Upon completing the laboratory, each student receives a laboratory grade. The specific nature of each laboratory course determines the way in which the grade is determined. Generally, the following criteria are taken into consideration:

i. Student performance, active participation and skills, successful execution of the exercises, lab report quality and completeness.

ii. The results of written and oral examination on topics which include current and previous exercises.

iii. The results of mid-term examinations. Only students who have successfully completed the exercises covered may participate in the mid-terms. In the case that a student does not pass the mid-term, she/he can take a supplementary examination as determined by each Laboratory.

Those students who must repeat one segment of the course (they have passed either the written examination or the laboratory part of the course in a previous semester) will be tested on the remaining segment.

4.1.4 Tutorials

Tutorials are not separate courses, but supplement many required and elective courses. Laboratory tutorials can take place during laboratory course hours, depending on the topic.

The purpose of tutorials is student comprehension and review of the material covered in a course, by means of additional explanation and exercises. Attendance of tutorials is especially useful and necessary, but is only the academic responsibility of each student. However, attendance of laboratory tutorials is required since the topics are directly related to laboratory practices and safety.

4.1.5 Undergraduate Thesis

The regulations regarding the Undergraduate Thesis are the subject of Chapter 7.

4.2 Degree Requirements

4.2.1 Teaching and ECTS (European Credit Transfer System) credits

Teaching credits: The teaching credits (t.c.) for a course are calculated as follows:

t.c. = 1x (lecture hours/week) + 0.5x (laboratory hours/week)

Teaching credits are used in calculating the final grade of the undergraduate degree.

ECTS credits: ECTS credits are based on the European Credit Transfer System and aid in the educational cooperation between European Universities (for more information, see http://www.auth.gr/ects).

The ECTS credits of each course are determined by decisions of the Department Assembly and generally depend on the corresponding teaching credits. From the 2010-2011 academic year and thereafter, an undergraduate degree is obtained only after the successful completion of a specific number of required and elective courses which correspond to a minimum number of ECTS credits.

4.2.2 General Requirements

In order to obtain a Degree in Chemistry, students must fulfill the following for requirements:

[1] Students must register for, follow and pass all of required courses and laboratories in the curriculum.

[2] Students must register for, follow and pass a specific number of elective courses in the curriculum.

[3] Students must carry out and present an Undergraduate Thesis

[4] The total number of ECTS credits, from required and elective course and the undergraduate thesis, is at least 240, including a minimum number of elective courses which a student needs to pass.

Students who have fulfilled all the above the criteria may obtain their degree as long as they have completed at least 7 semesters of study.

4.2.3 Required Course Lists

For those students who entered the Chemistry Department up to and including the 2011-12 academic year, the complete list of required courses and their corresponding teaching and ECTS units are given below:

1. Physics I (4 t.c., 6 ECTS)
2. Physics II (4 t.c., 6 ECTS)
3. Math I (4 t.c., 6 ECTS)
4. Math II (4 t.c., 6 ECTS)
5. Math III (3 t.c., 4 ECTS)
6. General and Inorganic Chemistry I (+ laboratory) (7 t.c., 10 ECTS)
7. Inorganic Chemistry II (+ laboratory) (6 t.c., 9 ECTS)
8. Inorganic Chemistry III (+ laboratory) (6 t.c., 9 ECTS)
9. Analytical Chemistry (+ laboratory) (9 t.c., 13 ECTS)
10. Instrumental Analysis I (+ laboratory) (5 t.c., 7 ECTS)
11. Instrumental Analysis II (+ laboratory) (5 t.c., 7 ECTS)
12. Physical Chemistry I (4 t.c., 6 ECTS)
13. Physical Chemistry II (+ laboratory) (6,5 t.c., 10 ECTS)
14. Physical Chemistry III (+ laboratory) (6,5 t.c., 10 ECTS)
15. Environmental Chemistry (4 t.c., 6 ECTS)
16. Organic Chemistry I (4 t.c., 6 ECTS)
17. Organic Chemistry II (+ laboratory) (10 t.c., 15 ECTS)
18. Organic Chemistry III (+ laboratory) (9 t.c., 13 ECTS)
19. Industrial Chemistry (4 t.c., 6 ECTS)
20. Spectroscopy* (+ laboratory) (5 t.c., 7 ECTS)
21. Food Chemistry (4 t.c., 6 ECTS)
22. Biochemistry I (4 t.c., 6 ECTS)
23. Numerical Methods and Programming (5 t.c., 7 ECTS)**

* *This course was renamed as Spectroscopy in Inorganic Chemistry in the 2014-15 academic year.* ** *Prerequisite for examination in the Numerical Methods and Programming course (3rd semester) is the successful completion of the 1st semester laboratory course "Learning to Use Computers".*

For those students who entered the Chemistry Department in the 2012-13 and 2013-14 academic years. Some of the required course of the previous program are now divided into "lecture" and "laboratory" courses. The complete list of required courses and their corresponding teaching and ECTS units are given below:

1. Physics I (4 t.c., 6 ECTS)
2. Physics II (4 t.c., 6 ECTS)
3. Math I (4 t.c., 6 ECTS)
4. Math II (4 t.c., 6 ECTS)
5. Math III (3 t.c., 4 ECTS)
6. General and Inorganic Chemistry I (4 t.c., 6 ECTS)
7. General and Inorganic Chemistry I Laboratory (3 t.c., 4 ECTS)
8. Inorganic Chemistry II (4 t.c., 5 ECTS)
9. Inorganic Chemistry II Laboratory (2 t.c., 4 ECTS)
10. Inorganic Chemistry III (4 t.c., 5 ECTS)
11. Inorganic Chemistry III Laboratory (2 t.c., 4 ECTS)
12. Analytical Chemistry (+ laboratory) (9 t.c., 13 ECTS)
13. Instrumental Analysis I (+ laboratory) (5 t.c., 7 ECTS)
14. Instrumental Analysis II (+ laboratory) (5 t.c., 7 ECTS)
15. Physical Chemistry I (4 t.c., 6 ECTS)
16. Physical Chemistry II (3,5 t.c., 6,5 ECTS)
17. Physical Chemistry II Laboratory (3 t.c., 3,5 ECTS)
18. Physical Chemistry III (3,5 t.c., 6,5 ECTS)
19. Physical Chemistry III Laboratory (3 t.c., 3.5 ECTS)
20. Environmental Chemistry (4 t.c., 6 ECTS)
21. Organic Chemistry I (4 t.c., 6 ECTS)
22. Organic Chemistry II (5 t.c., 8 ECTS)
23. Organic Chemistry II Laboratory (5 t.c., 7 ECTS)
24. Organic Chemistry III (4 t.c., 6 ECTS)
25. Organic Chemistry III Laboratory (5 t.c., 7 ECTS)
26. Industrial Chemistry (4 t.c., 6 ECTS)
27. Spectroscopy in Inorganic Chemistry (3 t.c., 4 ECTS)
28. Spectroscopy in Inorganic Chemistry Laboratory (2 t.c., 3 ECTS)
29. Food Chemistry (4 t.c., 6 ECTS)
30. Biochemistry I (4 t.c., 6 ECTS)
31. Numerical Methods and Programming (5 t.c., 7 ECTS)*

* *Prerequisite for examination in the Numerical Methods and Programming course (3rd semester) is the successful completion of the 1st semester laboratory course "Learning to Use Computers".*

For those students who entered the Chemistry Department in the 2014-15 academic year (and thereafter).

The "Math III" course is eliminated and now merged with "Math I", the "Numerical Methods and Programming" course is now an elective, while the "Learning to Use Computers" course has been modified and renamed as "Introduction to Computers and Applications in Chemistry" and is required. The complete list of required courses and their corresponding teaching and ECTS units are given below:

1. Physics I (4 t.c., 6 ECTS)
2. Physics II (4 t.c., 6 ECTS)
3. Math I (6 t.c., 10 ECTS)
4. Math II (4 t.c., 6 ECTS)
5. General and Inorganic Chemistry I (4 t.c., 6 ECTS)
6. General and Inorganic Chemistry I (3 t.c., 4 ECTS)
7. Inorganic Chemistry II (4 t.c., 5 ECTS)
8. Inorganic Chemistry II Laboratory (2 t.c., 4 ECTS)
9. Inorganic Chemistry III (4 t.c., 5
15. Physical Chemistry II (3,5 t.c., 6,5 ECTS)
16. Physical Chemistry II Laboratory (3 t.c., 3,5 ECTS)
17. Physical Chemistry III (3,5 t.c., 6,5 ECTS)
18. Physical Chemistry III Laboratory (3 t.c., 3,5 ECTS)
19. Environmental Chemistry (4 t.c., 6 ECTS)
20. Organic Chemistry I (4 t.c., 6 ECTS)
21. Organic Chemistry II (5 t.c., 8 ECTS)
22. Organic Chemistry II Laboratory (5 t.c., 7 ECTS)
23. Organic Chemistry III (4 t.c., 6 ECTS)
24. Organic Chemistry III Laboratory (5 t.c., 7

ECTS)
10. Inorganic Chemistry III Laboratory (2 t.c., 4 ECTS)
11. Analytical Chemistry (+ laboratory) (9 t.c., 13 ECTS)
12. Instrumental Analysis I (+ laboratory) (5 t.c., 7 ECTS)
13. Instrumental Analysis II (+ laboratory) (5 t.c., 7 ECTS)
14. Physical Chemistry I (4 t.c., 6 ECTS)
ECTS)
25. Industrial Chemistry (4 t.c., 6 ECTS)
26. Spectroscopy in Inorganic Chemistry (3 t.c., 4 ECTS)
27. Spectroscopy in Inorganic Chemistry Laboratory (2 t.c., 3 ECTS)
28. Food Chemistry (4 t.c., 6 ECTS)
29. Biochemistry I (4 t.c., 6 ECTS)
30. Introduction to Computers and Applications in Chemistry (3 t.c. 5 ECTS)

4.2.4 Elective Courses by Subject Area

The complete list of elective courses according to their subject area and their corresponding teaching and ECTS units are given below:

Analytical Chemistry

Chemical instrumentation-Microcomputers (+ laboratory) (4 t.c., 6 ECTS credits)

Current Analytical Techniquies (3 t.c., 4 ECTS credits)

Quality control and Quality Assurance – Accreditation (3 t.c., 4 ECTS credits)

Inorganic Chemistry

Organometallic Chemistry (+ laboratory) (4 t.c., 6 ECTS credits)

Inorganic Chemical Technology (3 t.c., 4 ECTS credits)

Group Theory – Photochemistry and Applications (4 t.c., 6 ECTS credits)

Special Issues in Inorganic Chemistry (4 t.c., 6 ECTS credits)

Industrial Chemistry

Wine and Alcoholic Beverage Chemistry and Technology (+ laboratory) (4,5 t.c., 7 ECTS credits)

Industrial Chemical Processes (+ laboratory) (4,5 t.c., 7 ECTS credits)

Petroleum and Petrochemical Chemistry and Technology Chemistry (+ laboratory) (4 t.c., 6 ECTS credits)

Viticulture*

Biochemistry

Biochemistry II (+laboratory) (5,5 t.c., 8 ECTS credits) (See announcement on the Department website for the 2016-17 academic year)

Special topics in Biochemistry (4 t.c., 6 ECTS credits) (Will not be taught in the 2016-17 academic year)

Clinical Chemistry

Clinical Chemistry (+ laboratory) (4 t.c., 6 ECTS credits)

Toxicology – Ecotoxicology (3 t.c., 4 ECTS credits) (also belongs to the Environmental Chemistry subject area)

Organic Chemistry

Organic Compound Spectroscopy and Molecular Modeling (4 t.c., 6 ECTS credits)

Medicinal Chemistry (3 t.c., 4 ECTS credits)

Topics in Bioorganic Chemistry (4 t.c., 6 ECTS credits)

Contemporary Methods in Organic Synthesis (4 t.c., 6 ECTS credits)

Polymers

Polymer Science (+ laboratory) (4,5 t.c., 7 ECTS credits)

Special Topics in Polymers (+laboratory) (4,5 t.c., 7 ECTS credits)

Polymers: Materials for New Applications (3 t.c., 4 ECTS credits)

Physical Chemistry

Physical Chemistry IV (4 t.c., 6 ECTS credits)

Radiochemistry (+ laboratory) (4 t.c., 6 ECTS credits)

Molecular Spectroscopy (3 t.c., 4 ECTS credits)

Chemical Kinetics (4 t.c., 6 ECTS credits)

Environmental Chemistry

Atmospheric Chemistry (+ laboratory) (4 t.c., 6 ECTS credits)

Chemical oceanography (+ laboratory) (4 t.c., 6 ECTS credits)

Environmental Management and Technology (+ laboratory) (4 t.c., 6 ECTS credits)

Toxicology – Ecotoxicology (3 t.c., 4 ECTS credits) (also belongs to the Clinical Chemistry subject area)

Chemistry and Education

Teaching Chemistry (4 t.c., 6 ECTS credits)

Psychology of Learning - Cognitive Psychology *

Introduction to Pedagogy*

History of Natural Sciences*

Food Chemistry

Assessing Food Quality and Food Safety (+ laboratory) (6 t.c., 9 ECTS credits)

Food Microbiology (+ laboratory) (6 t.c., 9 ECTS credits)

Food Technology (+ laboratory) (3,5 t.c., 5 ECTS credits)

* No ECTS credits are earned for these courses, and thus these courses cannot be included in the minimum number of courses necessary to obtain a degree. The grades for these courses are not included in the final degree grade.

The Materials Science course does not belong to a specific subject area, but regards several concentrations in the Department.

The Economics and Business Administration course is a subject that concerns many areas of interest for Chemists, and in addition belongs to the courses in the Oenological Education Program which also grants the relevant certificate.

Clarifications regarding the subject areas:

- Students may choose as many courses as they wish from each subject area.
- Concentration certificates regarding the subject areas followed by each student are not given.
- The student transcript indicates the courses that the student successfully passed in order to obtain her/his degree.
- At the beginning of each semester, students must register for the courses that they intend to follow and during that semester and for which they will take the examination at the end of the semester. The registration declaration is submitted online via the website: http://my-studies.uoa.gr on strictly specified dates.

4.2.5 Specific Conditions

The conditions to be met by a student in order to obtain a degree are those defined by the program in the academic year in which the student entered the Department.

[1] For those students who entered the Department before and including the 2009-10 academic year, the following are necessary to earn a degree:

a) Students must pass the 23 required courses with a total of 181 ECTS credits.

b) Students must complete an Undergraduate Thesis, which has 12 ECTS credits.

c) Students must pass at least 9 elective courses with a total of at least 47 ECTS credits.

d) Students must pass the "Learning to Use Computers" course.

[2] For those students who entered the Department in the 2010-11 and the 2011-12 academic years, the following are necessary to earn a degree:

a) Students must pass the 23 required courses with a total of 181 ECTS credits.

b) Students must complete an Undergraduate Thesis, which has 12 ECTS credits.

c) Students must pass at least 9 elective courses with a total of at least 47 ECTS credits.

d) Students must earn a total number of at least 240 ECTS credits.

e) Students must pass the "Learning to Use Computers" course.

[3] For those students who entered the Department in the 2012-13 and the 2013-14 academic years, the following are necessary to earn a degree:

a) Students must pass the 23 required lecture courses and the 8 required laboratory courses for a total of 181 ECTS credits.

b) Students must complete an Undergraduate Thesis, which has 12 ECTS credits.

c) Students must pass at least 9 elective courses with a total of at least 47 ECTS credits.

d) Students must earn a total number of at least 240 ECTS credits.

e) Students must pass the "Learning to Use Computers" course.

[4] For those students who entered the Department in the 2014-15 academic year and thereafter, the following are necessary to earn a degree:

a) Students must pass the 22 required lecture courses and the 8 required laboratory courses for a total of 179 ECTS credits.

b) Students must complete an Undergraduate Thesis, which has 14 ECTS credits.

c) Students must pass at least 9 elective courses with a total of at least 47 ECTS credits.

d) Students must earn a total number of at least 240 ECTS credits.

4.8 Calculation of the Degree Grade

Students' degree grade is calculated by taking into consideration the grades from all the courses required to obtain the degree as well as the Undergraduate Thesis grade. The grade for each course is multiplied by a coefficient, or course coefficient, and the sum of the individual products is divided by the sum of the coefficients of all these courses.

Course coefficients range between 1.0 and 2.0 and are calculated as follows:

- Courses with 1 or 2 teaching credits have a coefficient of 1.
- Courses with 3 or 4 teaching credits have a coefficient of 1.5
- Courses with more than 4 teaching credits as well as the Undergraduate Thesis have a coefficient of 2.
- In those courses with both lectures laboratories, the coefficients are calculated as follows:

  The Lecture course has a coefficient of 1.2 or 1.3, and the Laboratory course has a coefficient of 0.7 or 0.8.

If a student has received grades for more courses than those prescribed by the Curriculum as the minimum number of teaching credits necessary to earn a degree, then the student may choose a number of elective courses whose grades will not be included in the degree grade providing that the number of teaching

units in the remaining courses is at least equal to the number required to earn a degree.

The degree grade is rounded to two decimal points (on a scale of 5-10) and is qualified as: "Good" (5 to 6,49), "Very Good" (6,50-8,49) and "Excellent" (8,50-10).

From the 2015-2016 academic year, students in their 7th semester and thereafter can re-take examinations for up to a maximum of 3 courses (required and/or elective) of their choice in order to improve their grade point average. In order to re-take an examination, students must register for these courses in the Secretariat, and will take the examination in the exam period immediately following. The highest grade will be considered when calculating the degree grade.

CHAPTER 5

UNDERGRADUATE CURRICULUM

5.1 Indicative Curriculum

The indicative curriculum is a proposed series of courses for each semester of study. The strict adherence to the proposed series is not required, however significant deviation from the order of courses will have an impact on the smooth course continuity and will lead to student difficulties. It should be noted that the lecture and laboratory course schedule is based on the indicative curriculum.

Students are recommended to register for courses according to the indicative curriculum, especially regarding the required courses. Students are required to register for elective courses only after having passed any relative prerequisite courses. Students who have delayed their studies and are behind in the indicative curriculum are suggested to choose courses from earlier semesters.

The indicative course and laboratory curriculum may be modified each year, either to a small or large degree, after Department Assembly decision. Relevant proposals are suggested by the Undergraduate Studies Committee.

The new curriculum of the Department of Chemistry is presented below. For each course, the following information is provided:

(α) A three- or four-digit course code, where the first number (1-8) corresponds to the semester in which the course is taught (with the exception of a few courses which were moved to another semester). The second number refers to the Division within the Chemistry Department responsible for the course (for courses taught by other Departments, this number is 0). The third and fourth numbers differentiate the course from other courses of the same semester and Division.

(β) The Course title.

(γ) Two numbers separated by a dash (-). The first corresponds to the number of lecture hours per week, while the secong refers to the number of laboratory hours per week.

(δ) The ECTS credits which apply for those students who entered the Department after the 2012-13 academic year.

New Curriculum (for students entering the Department in the 2014-2015 academic years and there after)

1st SEMESTER

Required courses	h[a]	ECTS credits[b]
104 Math I[(c)]	6-0	10
101 Physics I	4-0	6
133Θ General and Inorganic Chemistry I	5-0	6
133Π General and Inorganic Chemistry I Laboratory	0-4	4
113 Computer Use and Applications	2-2	5

2nd SEMESTER

Required courses	h	ECTS credits
205 Math II	4-0	6
201 Physics II	4-0	6
232Θ Inorganic Chemistry II	4-0	5
232Π Inorganic Chemistry II Laboratory	0-4	4
213 Analytical Chemistry	5-8	13

3rd SEMESTER

Required courses	h	ECTS credits
323 Organic Chemistry I	4-0	6
332Θ Spectroscopy in Inorganic Chemistry	3-0	4
332Π Spectroscopy in Inorganic Chemistry Laboratory	0-4	3
313 Instrumental Analysis	4-2	7
Elective courses		
302 Numerical Methods and Programming	4-2	7
501 Modern Topics in Cell Biology	3-0	4

4th SEMESTER

Required courses	h	ECTS credits
414 Physical ChemistryI	4-0	6
422Θ Organic Chemistry II	5-0	8
433Θ Inorganic Chemistry III	4-0	5
433Π Inorganic Chemistry III Laboratory	0-4	4
415 Instrumental Analysis II	4-2	7

5th SEMESTER

Required courses	h	ECTS credits
514Θ Physical Chemistry II	4-0	6,5
514Π Physical Chemistry II Laboratory	0-5	3,5
526Θ Organic Chemistry III	4-0	6
422Π Organic Chemistry II Laboratory	0-10	7
528 Industrial Chemistry	4-0	6
Elective courses		

6th SEMESTER

Required courses	h	ECTS credits
614Θ Physical Chemistry III	4-0	6,5
614Π Physical Chemistry III Laboratory	0-5	3,5
632 Environmental Chemistry	4-0	6
626 Food Chemistry	4-0	6
627 Biochemistry I	4-0	6
526Π Organic Chemistry III Laboratory	0-10	7
Elective courses		

533 Group Theory-Photochemistry and its Applications	4-0	6	633 Organometallic Chemistry	4-0	6
529 Financial and Business Administration	3-0	4	628 Polymer Science	3-3	7
502 Psychology of Learning-Cognitive Psychology	3-0	4[d]	6210 Spectroscopy of Organic Compounds and Molecular Modeling [e]	4-0	6
			602 History of the Natural Sciences	3-0	4[d]
			603 Introduction to Pedagogy	3-0	4[d]
			515 Chemical Instrumentation – Microcomputers	3-2	6

7th SEMESTER

Only Elective courses	h	ECTS credits
739 Special Topics in Inorganic Chemistry	4-0	6
715 Modern Analytical Methods	3-0	4
717 Physical Chemistry IV	4-0	6
818 Radiochemistry	3-2	6
7216 Medicinal Chemistry	3-0	4
7219 Food Quality Control and Safety	3-6	9
7220 Food Microbiology	3-6	9
738 Chemical Oceanography	3-2	6
737 Atmospheric Chemistry	3-2	6
7211 Wine and Alcoholic Beverage Chemistry and Technology	3-3	7
7222 Special Topics in Polymers	3-3	7
7213 Biochemistry II[f]	3-5	8
7214 Clinical Chemistry	3-2	6
8210 Industrial Chemical Processes	3-3	7
719 Molecular Spectroscopy	3-0	4
703 Materials Chemistry	4-0	6
Undergraduate Thesis		7

8th SEMESTER

Only Elective courses	h	ECTS credits
838 Inorganic Chemistry Technology	3-0	4
816 Quality Control and Assurance - Accreditation	3-0	4
8213 Topics in Bioorganic Chemistry	4-0	6
718 Chemical Kinetics	4-0	6
8218 Food Technology	2-3	5
8121 Toxicology - Ecotoxicology	3-0	4
836 Environmental Management and Technology	3-2	6
8212 Special Topics in Biochemistry[e]	4-0	6
8211 Petroleum and Petrochemical Technology	3-2	6
8221 Modern Methods in Organic Synthesis	4-0	6
803 Viticulture	3-0	4[d]
720 Polymers: Materials for New Applications	3-0	4
701 Teaching Chemistry	4-0	6
Undergraduate Thesis (continued)		7

(a) The first number refers to lecture hours/week and the second refers to laboratory hours/week. (b) Credit Units (c) This course is the combination of the Math I and II courses from the previous curricular programs. (d) The credit units for these courses are not included in the number of credit units required for degree completion. (e) This course will not be offered in the 2017-2018 academic year. (f) Information regarding these coursed for the 2017-2018 academic year will be posted on the Department website.

5.2 Lecture and Laboratory Course Contents

5.2.1 Division I – Lectures and Laboratories

Analytical Chemistry Courses

213. ANALYTICAL CHEMISTRY (required 5 lecture hours/week -6 laboratory hours/week, 13 ECTS credits credits)

Lectures: Mondays 9-10am (A15), Tuesdays 9-11am (A15) and Fridays 9am-12pm (ΦΜ3)

Laboratory: Tuesdays 11am-3pm and Fridays 12-4pm (ANAX)

Instructors: A. Calokerinos, E. Bizani, M. Dousikou

Course website: http://eclass.uoa.gr/courses/CHEM164

Course Content: Introduction to Analytical Chemistry, Solutions, Concentration units. Errors and Statistical Treatment of Analytical results. Equilibria of weak acids and bases. Water ionization, pH. Volumetric analysis, titration errors. Acid-base titrations. Oxidation – reduction equilibria, redox titrations. Equilibria of insoluble compounds, solubility product. Gravimetric analysis, Precipitation titrations. Complex formation and equilibria. Complexation titrations. Titrations in non-aqueous solutions. Application of volumetric analysis, Organic analysis.

Laboratory instructors: A. Calokerinos, E. Bizani, M. Dousikou, A. Economou

Laboratory course: Introduction to qualitative analysis of cations and anions. Characteristic reactions of selected cations and anions. Qualitative analysis of solids and alloys. Introduction to quantitative analysis. Primary and secondary standard solutions. Applications of acid-base titrations, redox titrations, precipitation titrations and complexometric titrations. Organic analysis.

Course materials in Greek: 1) e-book "Analytical Chemistry", A. Calokerinos, 2) "Fundamentals of Analytical Chemistry", Skoog, West, Holler, Crouch

313. INSTRUMENTAL ANALYSIS I (required, 4 lecture hours/week, 2 laboratory hours/week, 7 ECTS credits)

Lectures: Wednesdays 9-11am (A2) and Thursdays 10am-12pm (ANAX)

Laboratory: Tuesdays 12pm-4pm and Fridays 12pm-4pm (ANAX). Students are divided in 6 groups, and each student carries out one 4-hour exercise every 2 weeks.

Instructors: E. Bakeas, A. Economou

Course website: http://eclass.uoa.gr/courses/CHEM100

Prerequisites: Analytical Chemistry (213).

Content: Introduction to instrumental analysis. Methods of quantification (calibration plots, standard additions, internal standard). Method of least squares. Electrochemical cells (galvanic, electrolytic. Potentiometry (reference electrodes , indicator electrodes, membrane electrodes). Ion selective electrodes. pH measurements. Applications to inorganic and inorganic analysis. Electrolytic techniques. Electrode polarization. Electrogravimetric analysis. Coulometry. Voltammetry (polarography, stripping techniques, cyclic voltammetry). Amperometry (amperometric titrations, flow detectors). Introduction to

separations. Separation errors. Two-phase equilibria. Extraction. Craig extraction. Specific reagents for separations by extraction. Solid phase extraction. Ion-exchange resins. Introduction to chromatography, basic principles and terminology. Gas chromatography, instrumentation and applications.

Laboratory course: Electrogravimetric and coulometric determinations, applications of ion selective electrodes, potentiometric titrations, polarographic analysis, stripping voltammetry, extraction, gas chromatographic analysis

Grading policy: One examination (theoretical and practical questions). The Laboratory grade counts for 30% of the final grade.

Course materials in Greek: 1) "Fundamentals of Analytical Chemistry", Skoog, West, Holler, Crouch 2) Instrumental Analysis Th.P. Chatziioannou, M. Koupparis

415. INSTRUMENTAL ANALYSIS II (required 4 lecture hours/week, 2 laboratory hours/week, 7 ECTS credits credits)

Lectures: Mondays 9-11am, Wednesdays 11am-1pm and Thursdays 11am-12pm (ΦΜ3)

Laboratory: Mondays 11am-3pm, Tuesdays 1-5pm and Fridays 1-5pm (ANAX). Students are divided into 6 groups and each students carries out one 4-hour exercise every 2 weeks.

Instructor: N. Thomaidis

Course webpage: http://eclass.uoa.gr/courses/CHEM213/

Prerequisites: "Analytical Chemistry" (213).

Lecture course content: Spectrometric techniques. Introduction to optical methods of analysis. Molecular absorption spectrometry, ultraviolet and visible spectrometry and applications. Lambert-Beer's law, photometric error. Spectrometric titrations. Molecular Luminescence Spectrometry (molecular fluorescence, phosphorescence, chemiluminescence). Atomic Absorption Spectrometry. Atomic Emission Spectrometry (Flame Atomic Emission Spectrometry, Inductively Coupled Plasma–Atomic Emission Spectrometry). Atomic and molecular mass spectrometry (MS, ICP-MS, LC-MS, GC-MS). Theory of chromatographic separations. Liquid Chromatography, instrumentation (chromatographic columns, detectors). Liquid Chromatographic techniques: HPLC, Ion Chromatography, Size Exclusion chromatography. Supercritical fluid chromatography and extraction. Kinetic and enzymatic analytical methods.

Laboratory course content: Spectrometric determination of manganese in steel. Flame emission spectrometric determination of alkali and alkaline earth elements. Determination of zinc in insulin preparations by atomic absorption spectrometry. Determination of quinine in tonic water by Fluorescence. Determination of analgesics in pharmaceutical formulations by high performance liquid chromatography (HPLC). Kinetic determination of lactate dehydrogenase (LDH) activity.

Grading policy: See Instrumental Analysis I.

Course materials in Greek: 1) "Principles of Instrumental Analysis", Skoog, Holler, Crouch, 2) "Instrumental Analysis, Th.P. Chatziioannou, M. Koupparis.

515. CHEMICAL INSTRUMENTATION (elective 3 lecture hours/week-2 laboratory hours/week, 6 ECTS credits.)

Lectures: Mondays 12-1pm, Fridays 9-10am and 4-5pm (ANAX)

Laboratory: Fridays 10am-12pm (ANAX)

Instructors: A. Economou, C. Polydorou

Course website: http://eclass.uoa.gr/courses/CHEM215

Prerequisites: Instrumental Analysis I (313).

Course content: Measurement domains. Systems, units. Unit quality characteristics (input, output, transfer). Transducers. Semiconductors (diodes, transistors and basic circuits). Solid state optical (photoresistors, photovoltaic cells, photodiodes, array detectors, CCD). Analogue circuits. Operational amplifiers, potentiostats, galvanostats. Operational amplifier circuits with various transducers (temperature, pressure, optical). Piezolectric transducers. Digital circuits (Bool theorems, gates, decoders, time circuits, counters). Digital-to-analogue and analogue-to-digital converters. Typical digital measurement instruments. Signals and noise. Types of noise and noise measurments. Spectral (Fourier) signal representation. Filters (low-pass, high-pass, band-pass). Lock-in amplifier and boxcar integrator. Software methods for noise reduction. Structure and operation of microprocessors. Machine language. Computer peripherals. Computer interfacing to measurement and automation systems. Examples of control programmes.

Laboratory course content: Measurement of input and output impedance of various units. Operational amplifier circuits (followers and adding amplifiers), potentiostat and galvanostat. R-C filters. Thermistor applications. Applications of logarithmic amplifier. Basic computer interfacing to measurement systems.

Course materials in Greek: "Chemical Instrumentation – Microcomputers", K. Efstathiou 2) "Principles of Instrumental Analysis", Skoog, Holler, Crouch

715. CURRENT ANALYTICAL TECHNIQUES (elective 3 hours/week, 4 ECTS credits credits)

Lectures: Fridays 9am-12pm 9 ANAX)

Instructors: A. Calokerinos, E. Bakeas, N. Thomaidis, A. Economou

Course website: https://eclass.uoa.gr/courses/CHEM165/

Prerequisites: Instrumental Analysis I (313), Instrumental Analysis II (415)

Course content: Current chromatographic techniques, selected spectroscopic techniques (ICP, XRF, etc), Non-destructive analytical techniques, hyphenated analytical techniques, thermal analytical techniques, mass spectroscopy.

Course materials in Greek : Instructors' notes

816. QUALITY CONTROL AND QUALITY ASSURANCE – ACCREDITATION (elective 3 hours/week, 4 ECTS credits)

Lectures: Tuesdays 9am-12pm (ANAX)

Instructors: E. Bakeas, N. Thomaidis

Course website: http://eclass.uoa.gr/courses/CHEM226/

Prerequisites: (1) Instrumental Analysis I (313), (2) Instrumental Analysis II (415).

Course content: Introduction in quality systems (ISO, EN). Quality assurance in testing and calibration laboratories. Laboratory Accreditation Regulations and

Criteria (ISO 17025). Calibration and control of analytical instruments and devices. Development of Analytical Methods. Validation and verification of analytical methods. Uncertainty estimation. Traceability of measurements. Chemical Metrology. Sampling and Applications. Laboratory accreditation - procedural guidelines. Case Studies.

Course materials in Greek: Instructors' notes.

7214. CLINICAL CHEMSITRY (elective 3 lecture hours/week – 2 laboratory hours/week, 6 ECTS credits credits)

Lectures: Thursdays 3-6pm (ANAX)

Laboratory: Thursdays 10am-1pm 9ANAX)

Instructor: E. Lianidou

Course website: https://eclass.uoa.gr/courses/CHEM118

Prerequisites: Analytical Chemistry (213), Instrumental Analysis I (313), Instrumental Analysis II (415), Biochemistry I (627)

Course content: Basic principles of laboratory practice in Clinical Chemistry. Biological specimen collection. Statistical concepts in Clinical Chemistry: determination of reference limits and estimation of reference range values. Assurance of quality control in the clinical lab. Automation in Clinical Chemistry. Biochemical Analyzers. Basic principles of electrophoretic techniques in Clinical Chemistry. Basic principles and applications of immunoassays. Enzymes in Clinical Chemistry. Basic principles of Clinical Enzymology. Proteins in serum. Electrolytes and blood gases. Cardiac function: Lipids, lipoproteins, apolipoproteins, and other cardiac factors. Endocrinology, hormones and assessment of thyroid function. Diabetes Mellitus. Assessment of kidney function. Assessment of liver function. Tumor markers. Therapeutic drug monitoring. Introduction to Molecular Diagnostics. Polymerase Chain Reaction (PCR). Real time PCR, quantitative PCR, RT-PCR, ARMS-PCR, multiplex PCR. DNA Sequencing, next generation DNA sequencing technologies. Mutation analysis. Molecular tumor biomarkers. Companion diagnostic tests.

Laboratory course content: Safety rules in the clinical chemistry lab. Handling of clinical specimens. Isolation of plasma and serum from whole blood. Serum deproteinization. Enzymatic determination of Glucose in plasma, serum and whole blood. Enzymatic determination of urea in plasma and serum. Protein electrophoresis in serum. Biochemical analyzers (visit to a Hospital Clinical Chemistry laboratories). Immunoassays (ELISA). Isolation of DNA from whole blood. PCR amplification of BRCA1: Detection of 5382insC mutation in blood. Agarose gel electrophoresis of PCR products. Real time PCR.

Grading policy: One exam on the lecture and laboratory material. The Laboratory grade counts for 25% of the final grade.

Course materials in Greek: 1) "Clinical Chemistry:, William Marschall 2) "Clinical Biochemistry", Gow A., R. Cowan, D. O' Reilly, M. Stewart, J. Shepherd, Parisianou Publ. 3) Instructor's notes

Physical Chemistry Courses

414. PHYSICAL CHEMISTRY I (required 4 hours/week, 6 ECTS credits)

Lectures: Tuesdays and Thursdays 9-11am (ΦΜ3)

Instructor: A. Tsekouras

Course webpage: (α) http://jupiter.chem.uoa.gr/pchem/courses/414/

(β) http://eclass.uoa.gr/courses/CHEM105

Course content:Thermodynamic systems. Internal energy. Work. Heat. Laws of Thermodynamics: Zero-th, 1st, 2nd, 3rd. Equilibrium conditions. Fundamental equations. Equations of state. Maxwell equations and applications. Phase equilibria in one-component systems: chemical potentialdependence on pressure and temperature, Clausius-Clapeyron equation. Phase equilibria in multi-component systems: Colligative properties, Raoult's law, Henry's law.

Course materials in Greek: 1) "Physical Chemistry. Basic Consideration", Katsanou. Papazisis Publ.. 2) " Physical Chemistry", P. W. Atkins and J. de Paola, University of Crete Publ.

514Θ. PHYSICAL CHEMISTRY II (required, 4 hours/week, 6.5 ECTS credits credits)

Lectures: Wednesdays 1 - 3 pm and Fridays 12 pm - 2 pm (ΦΜ3)

Instructor: A. Koutselos

Course webpage: http://eclass.uoa.gr/courses/CHEM198/

Course content: Random motion. Statistical description of the mechanical problems. Statistical
ensembles. Thermal interaction between macroscopic systems. Connection with classical thermodynamics. Distribution functions. Fluctuations. Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Equipartition theorem. Black body radiation. Systems of interacting particles. Kinetic theory of gases. Chemical kinetics.

Course materials in Greek: "Physical Chemistry", P. W. Atkins and J. de Paola University Publications of Crete.

514Π. PHYSICAL CHEMISTRY II LABORATORY (required, 5 hours/week, 3.5 ECTS credits)

Laboratory: Tuesdays 8am-12pm, Thursdays 2-6pm and Fridays 8am-12pm (ΦΧ)
Students are divided into 3 groups.

Laboratory tutorial: Thursdays 1-2pm (ΦΜ3)

Instructors: A. Tsekouras, G. Souliotis, A. Kalemos, A. Koutselos, A. Papkondylis

Course content: Thermodynamic properties of gases (Joule-Thomson coefficient). Phase equilibria (mutual solubility of liquids, partition coefficient, enthalpy of vaporization). Interphase equilibria (surface tension, physisorption). Solutions (partial molar volume, ionic strength, activity coefficient, molar mass determination via ebullioscopy), boiling point diagrams (azeotrope systems), thermochemistry (enthalpy of neutralization reaction).

614Θ. PHYSICAL CHEMISTRY III (required 4, 6.5 ECTS credits credits)

Lectures: Tuesdays 11-1pm, Thursdays 12-2pm (ΦΜ3)

Instructor: A. Papakondylis

Course Website: http://jupiter.chem.uoa.gr/pchem/courses/614/

Course content: The need for a quantum interpretation of the matter. Schrödinger equation and its application to systems that are solved exactly. Mathematical foundations of quantum theory, operators and theorems. Angular momentum, spin, the Pauli principle. Coupling of angular momenta. H atom. Approximate methods. Many electron atoms. Chemical bond.

Course materials in Greek: "Molecular Quantum Chemistry", P.W. Atkins

614 Π. PHYSICAL CHEMISTRY III LABORATORY (required 5, 3.5 ECTS credits credits)

Laboratory sessions: Mondays 8am-12pm, Thursadays 3-7pm, Fridays 8am-12:00pm

Lectures: Thursdays 2-3pm

Instrutors: A. Kalemos, A. Papakondylis, A. Koutselos, G. Souliotis, A. Tsekouras

Course content: Electrochemical equilibrium (galvanic cells, standard reduction potential, activity coefficient, thermodynamics of galvanic cells. Solubility product, redox titrations.) Ion transport (conductivity, transport numbers.) Dynamical electrochemistry (electrolysis, overpotential, diffusion current.) Chemical kinetics (rate of a reaction, activation energy). Molecular structure and intermolecular interactions (spectroscopy). Radiochemistry (rate of de-excitation of radioactive nuclei, Geiger-Muller counter, absorption of 6-radiation). Computational Chemistry.

717. PHYSICAL CHEMISTRY IV (Elective 4-0, 6 ECTS credits credits)

Lectures: Fridays 8:00am - 12:00pm (ΦΧ)

Instructor : Apostolos Kalemos

Prerequisite Course: Physical Chemistry III

Course Content : General formalism of Angular Momentum, Angular Momentum and Spatial Rotations, Addition of Angular Momenta, Spin, Approximation Methods for Bound States (Perturbation theory, Variation Method, Methods for time-dependent Problems), Interaction of Quantum Systems with external Electric and Magnetic Fields, and with Electromagnetic Radiation.

Course Materials in Greek : Molecular Quantum Mechanics (by P. W. Atkins)

718. CHEMICAL KINETICS (elective 4 hours/week, 6 ECTS credits credits)

Lectures: Tuesdays 1 pm - 3 pm and Thursdays 12 pm - 2 pm (Phys. Chem. auditorium)

Instructor: A. Koutselos

Course website: https://eclass.uoa.gr/courses/CHEM225

Course content: Chemical reaction rate. Reaction order. Reaction mechanisms. Chemical reaction theories. Transport phenomena. Effect of temperature on reaction rate. Chemical reactions in dense phases. Influence of pressure and ionic force on reaction rate. Adsorption and reactions on surfaces. Photochemical reactions. Enzyme kinetics.

Course materials in Greek: "Physical Chemistry", P. W. Atkins and J. de Paola University Publications of Crete.

719. MOLECULAR SPECTROSCOPY (elective 3 hours/week, 4 ECTS credits credits)

Lectures: Fridays 12-3pm (ΦΧ)

Instructor: A. Tsekouras

Course webpage: http://jupiter.chem.uoa.gr/pchem/courses/719/

Course content: Aspects of light and spectra. Types of spectroscopy: atomic, rotational, vibrational, electronic, (nuclear) magnetic resonance: Energy levels, selection rules, spectral patterns. Spectroscopy techniques and setups.

Course materials in Greek: "Modern Spectroscopy", M. J. Hollas, Wiley.

818. RADIOCHEMISTRY (elective 3-2, 6 ECTS credits credits)

Lectures: Tuesdays 11am-1pm and Wednesdays 3-4pm (ΦΧ)

Laboratory: Wednesdays 4.00-6.00pm, (ΦΧ)

Instructor: G. A. Souliotis

Course website: http://eclass.uoa.gr/courses/CHEM199/

Course content: Introduction. Historical overview. Nuclear Chart. Radioactive decays. Forces in nature. Particle classification: Fermions/Bosons. Radius of the nucleus, density distribution, mass, binding energy. Bethe-Weizsacker equation. Nuclear stability. Q-value of nuclear processes. Spontaneous and non-spontaneous processes. Fermi gas model. Independent particle approximation. Introduction to the nuclear shell model. Magnetic moment of the nucleus. Principles of NMR and ESR. Radioactive decay law. Half-life. Interaction of (nuclear) radiation with matter. Heavy ions: Bethe-Bloch equation. Interaction of fast electrons with matter. Interaction of gamma radiation with matter. Compton Scattering. Photoelectric Effect. Pair production. Charged particle detectors. Photon detectors. Sources of natural radioactivity. Radioactivity units. Nuclear Fission. Nuclear reactors. Accelerators. Nuclear reactions. Synthesis of the chemical elements in the universe and the stars. Medical applications: imaging and therapy.

Laboratory Exercises: Types of detectors and characteristics of their pulses. Gas ionization detectors. Scintillation detectors (inorganic crystals, plastic scintillators). Semiconductor detectors (silicon, germanium). Electronic devices: Oscilloscope. Pulse generators. Preamplifier. Amplifier. Time measurement systems. Data Acquisition systems. Geiger-Muller Counter. NaI(Tl) detector. Gamma-ray spectrum characteristics. Silicon surface-barrier detector. Alpha spectroscopy. Statistics of nuclear measurements.

Course materials in Greek: Instructor's notes.

5.2.2 Division II – Lectures and Laboratories

Organic Chemistry Courses

323. ORGANIC CHEMISTRY I (required 4 hours/week, 6 ECTS credits credits)

Lectures: Wednesdays 11 am - 1 pm (ΦΜ3), Fridays 10 am -12 pm (Α15)

Instructors: V. Magrioti, P. Minakakis.

Course website: http://eclass.uoa.gr/courses/CHEM108/

Course content: (1) A Review of General Chemistry: Electrons, Bonds and Molecular Properties, (2) Molecular Representations, (3) Acids and Bases, (4) Alkanes and Cycloalkanes, (5) Stereoisomerism, (6) Chemical reactivity and Mechanisms, (7) Substitution Reactions, (8) Alkenes: Structure and Preparation via Elimination Reactions, (9) Addition Reactions of Alkenes, (10) Alkynes, (11) Radical Reactions, (12) Synthesis.

Course materials in Greek: «Organic Chemistry vol. I», David Klein, Translated in Greek, Utopia Publishing, Athens, 2015.

422. ORGANIC CHEMISTRY II (required 5 hours/week, 8 ECTS credits credits)

Lectures: Tuesdays and Fridays 11 am - 1 pm (Α15) and Wednesday 1 - 2 pm (ΦΜ3).

Instructors: T. Gimisis, C. Kokotos, G. Vougioukalakis

Course website: http://eclass.uoa.gr/courses/CHEM123/

Course content: Alcohols and phenols, ethers and epoxides, thiols and sulfides, infrared spectroscopy and mass spectrometry, nuclear magnetic resonance spectroscopy, conjugated π systems, aromatic compounds, aromatic substitution reactions, aldehydes, ketones, carboxylic acids and derivatives.

Course materials in Greek: «Organic Chemistry, Vol. II», David Klein, 1st edition, Greek Translation, Utopia Publishing, Athens, 2015.

422Π. ORGANIC CHEMISTRY II LABORATORY (required 10 hours/week, 7 ECTS credits credits)

Laboratory: The practical part of the course ORGANIC CHEMISTRY II takes place during the 5th semester, every Monday 10 a.m. – 3 p.m. and Tuesday 2 p.m. – 7 p.m. (ΟΡΓΧ)

Instructors: D. Georgiadis, A. Hatziyiannakou, G.Kokotos, C. Kokotos, P. Minakaki, S. Vassiliou

Course website: http://eclass.uoa.gr/courses/CHEM172/index.php

Course content: Synthesis of organic compounds corresponding to representative chapters of theoretical courses Organic Chemistry I and II. In particular: nucleophilic aliphatic substitution following S_N1 and S_N2 mechanisms, haloform reaction, electrophilic aromatic substitution, nucleophilic addition to a carbonyl group, rearrangement, esterification, Grignard reaction. Isolation of natural product. Column chromatography.

Course materials in Greek: «Laboratory Exercises», Laboratory of Organic Chemistry

Grading policy: At regular intervals during laboratory courses, two compulsory written examinations take place which result in an average grade (A). In addition, the "laboratory performance" of each student is evaluated by the instructor of each laboratory team for a second grade (B), taking into account (i) the careful and successful completion of laboratory experiments, (ii) the critical presentation and evaluation of experimental results and (ii) the theoretical and practical knowledge which are evaluated by written or oral tests during the course. The final Laboratory Grade is calculated by the formula: (A+B)/2. Students who fail to achieve an average grade >5/10, have the possibility to participate in examinations determined by the laboratory.

526Θ. ORGANIC CHEMISTRY III (required 4 hours/week, 6 ECTS credits credits.)

Lectures: Tuesdays 12 – 2 p.m. (A15) and Thursdays 11 a.m. – 1 p.m. (ΦΜ3)

Instructors: D. Georgiadis, G. Kokotos

Course website: http://eclass.uoa.gr/courses/CHEM130/

Course contents: Carbonyl condensation reactions. Carbonyl alpha-substitution reactions. Aliphatic amines. Arylamines and phenols. Carbohydrates. Amino acids, peptides and proteins. Lipids. Heterocyclic compounds and nucleic acids. Molecular orbitals and pericyclic reactions.

Course materials in Greek: «Organic Chemistry» Jonathan Clayden, Nick Greeves and Stuart Warren, Part I, 1st Edition (translation in Greek), Utopia Publishing, Athens, 2016

526Π. ORGANIC CHEMISTRY III LABORATORY (required 10 hours/week, 7 ECTS credits credits)

Laboratory: Mondays and Tuesdays 1 - 6 pm (ΟΡΓΧ).

Prerequisites: Completion of all laboratory exercises and reports for the 422Π Organic Chemistry II Laboratory course.

Instructors: A. Chatzigiannakou, D. Georgiadis, T. Gimisis, V. Magrioti, T. Mavromoustakos, A. Mores, A. Paschalidou, E. Sakki, G. Vougioukalakis.

Course webpage: http://eclass.uoa.gr/courses/CHEM203/

Course content: Synthesis of organic compounds. Lectures and exercises on the interpretation of spectral data (NMR, IR, MS) of unknown organic compounds. Qualitative analysis of known and unknown organic substances. Molecular graphics with PyMol. Theoretical calculations of lipophilicity, charge, free energy minimization, conformation analysis and binding of organic compounds to molecular receptors. Bibliographic exercise: A subject is assigned to each student during the semester and students submit a written report after being trained in the use of scientific databases (Reaxys, SciFinder, Scopus, Espacenet, e.t.c.) electronic management of bibliography, text editors (MS Office, Open Office e.t.c.) and chemical structure editors (MarvinScetch, ChemDraw, AccelrysDraw, e.t.c.).

Grading policy: As described for 422Π.

Course materials in Greek: (1) "Organic Structures from Spectra" L.D. Field, S. Sternhell, J.R Kalman, H.L. Li, A.M. Magill, 1st edition, Greek translation, Utopia Publishing, Athens 2016. (2) «Laboratory exercises», Organic Chemistry Laboratory.

6210. ORGANIC COMPOUND SPECTROSCOPY AND MOLECULAR MODELING (elective 4 hours/week, 6 ECTS credits credits)

Lectures: Mondays 12am-1pm and Fridays 9am-12pm (ORGCHEM)

Instructor: Th. Mavromoustakos

Course webpage: http://eclass.uoa.gr/courses/CHEM208/

Course content: Nuclear Magnetic Resonance Spectroscopy. Identification of organic molecules and biomolecules using single and two-dimensional liquid state techniques. Applications of Nuclear Magnetic Resonance Spectroscopy in the rational design of innovative drug molecules. Principles of Solid State NMR Spectroscopy. The use of other spectroscopies (IR, UV, CD, Raman, X-ray crystallography and MS) in the identification of organic compounds and biomolecules. Examples of applications of spectroscopies where their complementarity is demonstrated in the identification of organic compounds and biomolecules. Applications of Molecular Modeling in Conformational Analysis and Molecular Binding of Bioactive Molecules.

Course materials in Greek: 1) "NMR. Principles and Applications of Nuclear Magnetic Resonance Spectroscopy in Medicine, Pharmaceutical Science, Biochemistry and Food and Beverage Chemistry" Th. Mavromoustakos, I. Matsoukas, I.V. Parisianos Publ., Athens 2006 ISBN 96088751-5-3, 2) "Molecular Modeling. Applications in Organic and Pharmaceutical Chemistry", Th. Mavromoustakos, P. Zoumboulakis I.V. Parisianos Publ., Athens 2008 ISBN 978-960-89486-5-5, 3) "Solid State NMR", Th. Mavromoustakos, Athens 2001 ISBN 96086193-1-9

7216. MEDICINAL CHEMISTRY (elective 3, 4 ECTS credits credits)

Lectures: Wednesdays 12 pm - 3 pm

Instructors: G. Kokotos, V. Magrioti

Course website: http://eclass.uoa.gr/courses/CHEM138/

Course content: Introduction to Medicinal Chemistry. General approaches in the discovery of drugs and pharmaceuticals. Design and development of drugs. Receptors. Drug interactions with receptors. Enzymes and enzyme inhibitors. DNA and drugs that interact with DNA. Prodrugs and drug delivery systems. Selected drug categories.

Course materials in Greek: 1. Medicinal Chemistry notes by Prof. G. Kokotos, 2. Organic Chemistry vol II , Jonathan Clayden, Nick Greeves Stuart Warren, Translated in Greek, Utopia Publishing, Athens 2016.

8213. TOPICS IN BIOORGANIC CHEMISTRY(elective 4 hours/week, 6 ECTS credits credits)

Lectures: Tuesdays 11 am - 1 pm and Wednesdays 2 - 4 pm (ΟΡΓΧ)

Instructors: T. Gimisis, S. Vassiliou.

Course Webpage: http://eclass.uoa.gr/courses/CHEM127/

Course content: Sugars, glucals, deoxysugars, cyclitoles, aminosugars. Sugar conformation analysis, anomeric effect (1H, 13C NMR, Karpluss equation, magnetic anisotropy). Sugar protecting groups. Methods for *O*-and *N*-Glycoside synthesis. Synthesis of heterocyclic compounds. Nucleosides, nucleotides, nucleic

acids. Amino acids, amino acids synthesis, peptides, strategies in peptide synthesis, protecting groups, orthogonal protection, coupling reagents, solution and solid-phase peptide synthesis, side reactions, racemization. Proteins, levels of protein structure, tertiary structure, protein synthesis, disulfide bridge, cystine peptides. Reactions of heterocyclic compounds, an introduction.

Course materials in Greek: (1) "Organic Chemistry, Vol. II", Jonathan Clayden, Nick Greeves and Stuart Warren, 1st edition, Greek translation, Utopia Publishing, Athens 2016. (2) Lecture Notes.

8221. CONTEMPORARY METHODS IN ORGANIC SYNTHESIS (elective 4 hours/week, 6 ECTS credits credits)

Lectures: Mondays 10 am - 12 pm and Wednesdays 11 am - 1 pm (ΟΡΓΧ).

Instructors: C. Kokotos, G. Vougioukalakis

Course webpage: http://eclass.uoa.gr/courses/CHEM210/

Course content: Hyperconjugation, resonance, aromaticity, acidity-basicity-pKa, reaction energy diagrams, Hammond postulate, Curtin-Hammett principle, alkane conformations, cycloalkane conformations, mechanistic studies in organic chemistry (trapping of intermediates, Hammett equation, kinetic isotope effects), C-C bond formation with organometallic reagents (Grignard reagents, carbanions), basic principles and reaction patterns of transition metal catalysts, coupling reactions in organic synthesis (Buchwald-Hartwig, Mizoroki-Heck, Sonogashira, Migita-Stille, Suzuki-Miyaura, Tsuji-Trost), olefin metathesis (ring-closing metathesis and cross-metathesis reactions), named reactions and common oxidation and reduction reactions, modern synthetic approaches for the stereoselective formation of alkenes, modern synthetic approaches for the synthesis and ring opening of epoxides, 1-2 vs 1,4 addition, sigmatropic and other rearrangements, nucleophilic addition on carbonyl compounds, diastereoselective nucleophilic addition on carbonyl compounds (Felkin-Anh model, Cram-chelation model, Zimmerman-Traxtler transition states), asymmetric synthesis with chiral auxiliaries, catalytic asymmetric synthesis, Organocatalysis (origin, historic overview, enamine activation, iminium ion activation, activation via hydrogen bonding).

Course materials in Greek: Organic Chemistry, Jonathan Clayden, Nick Greeves and Stuart Warren, Volume II, 1st edition, Greek Translation, Utopia Publishing, Athens, 2016. Instructors' notes.

Industrial Chemistry Courses

528. INDUSTRIAL CHEMISTRY (required 4 hours/week, 6 ECTS credits credits)

Lectures: Wednesdays 9-11am, Thursdays 9-11am (A2)

Instructors: H. Iatrou, M. Pitsikalis

Course website: http://eclass.uoa.gr/courses/CHEM126/

Course content: Basic concepts of polymer chemistry. Polymer nomenclature. Polymer classification. Homopolymers and copolymers. Structure and microstructure. Size and shape. Average molecular weights of polymers.

Polymerization reactions. Step-growth polymerization. Radical, anionic and cationic polymerization. Polymer synthesis with controlled molecular weight and molecular weight distribution. Size exclusion chromatography. Viscometry of dilute solutions. Membrane osmometry. Vapor pressure osmometry. Static light scattering.

Course materials in Greek: 1) "Synthetic Macromolecules. Basic Consideration" A. Dontos, Kostarakis Publ., Athens 2006, 2)"Polymer Science and Technology", K. Panagiotou, Pegasus Publ., Thessaloniki 2006, 3) Instructors' notes.

7211. WINE AND ALCOHOLIC BEVERAGE CHEMISTRY AND TECHNOLOGY (elective 3 lecture hours/week-3 laboratory hours/week, 7 ECTS credits credits)

Lectures: Mondays 9 - 11 am και Wednesdays 9 - 10 am (BIOMX)

Laboratory: Wednesdays 10 am - 1 pm (BIOMX)

Instructor: M. Liouni

Course website: http://eclass.uoa.gr/courses/CHEM133/

Prerequisite courses: (1) Analytical Chemistry (213). (2) Instrumental analysis I. Due to the limited number of laboratory places (90), if the number of registered students is higher than 90, the number of completed course units by each student will be taken into consideration.

Course contents: Global economic geography of wine. Greek vine varietals. Must composition and correction. Alcoholic fermentation. Production of different types of wine. Specialized wine treatments. Wine-related legislature. Wine tasting. Beer brewing, wine distillates, alcoholic beverages (whiskey, rum, vodka, brandy, ouzo, gin, etc. Fermentation microbiology.

Laboratory instructors: M. Liouni, G. Papadogianakis, K. Papathanasiou (Technical Staff)

Laboratory course content: Analyses of wine and must ingredients. Analyses of beer, wine distillate and alcoholic beverage ingredients. Microscopic observation of fermentation yeast, their isolation and culture.

Grading policy: A separate exam is given in the laboratory section of the course, and the resulting overall grade, which also takes laboratory performance into consideration, corresponds to 40% of the combined grade.

Course materials: 1) In Greek «Oenology. Science and Expertise" Volumes I and II. Soufleros. E. Soufleros Publ., Thessaloniki, 1977, 2) Greek Translation of "Drinks" A. Varnam, I. Sutherland, by Stella Parikou &Co Ltd, Ion Publ., Athens 2006, 3)Instructor's notes. 4) Instructors' laboratory notes.

720. POLYMERS: MATERIALS FOR NEW APPLICATIONS (elective 3 hours/week, 4 ECTS credits credits)

Lectures: Fridays 12-3pm (A2)

Instructors: M. Chatzichristidi, G. Sakellariou

Course website: http://eclass.uoa.gr/courses/CHEM217/

Course content: Polymers on surfaces (theory, synthesis, characterization, properties, applications). Self-healing polymers (synthesis, characterization, properties, applications). Conductive polymers for photovoltaic devices. Polymeric sensors. Polymeric photonic crystals.

Course materials in Greek: "Polymer Chemistry" P. C. Hiemenz, T. P. Lodge, Translation: S. Vratolis, H. Kakoulidis, Th. Prevedoros, Edit. Spyros Ch. Anastasiadis, University of Crete Publ., Crete 2014.

7222. SPECIAL TOPICS IN POLYMERS (elective 3 lecture hours/week-3 laboratory hours/week, 7 ECTS credits credits)

Lectures: Mondays 11am - 12pm and Tuesdays 9am-11am (A2)

Laboratory: Fridays 10 am-13 pm (BIOMX)

Instructors: M. Chatzichristidi, G. Sakellariou

Course website: http://eclass.uoa.gr/courses/CHEM132/

Course content: Copolymer morphology. Effect of composition and architecture on morphology. Copolymer micellization in solution. Introduction to integrated circuits. Optical lithography. Lithographic materials. Lithographic processes. Ion lithography. Synthesis of materials with defined dimensions and shape at the nanometer level.

Laboratory course content: Lithography. Production of micellar solutions. Determination of micellar molecular weight and degree of aggregation by static light scattering. Determination of micellar hydrodynamic radius by dynamic light scattering. Determination of the micellar viscometric radius by dilute solution viscometry.

Course materials in Greek: 1) "Synthetic Macromolecules. A Basic Consideration", A. Dondos. Kostaraki Publ. Athens, 2006. 2)"Polymer Science and Technology", K. Panagiotou, Pegasus Publ., Thessaloniki 2006, 3) Instructors' notes, 4) Instructors' laboratory notes.

8210. INDUSTRIAL CHEMICAL PROCESSES (elective 3 lecture hours/week-3 laboratory hours/week, 7 ECTS credits credits)

Lectures: Wednesdays 1 - 3 pm and Fridays 4-5pm (A2)

Laboratory: Wednesdays 3 – 6pm (BIOMX)

Instructor: G. Papadogianakis

Course website: http://eclass.uoa.gr/courses/CHEM136/

Course content: Raw materials for industrial chemical processes. Green chemistry and sustainable chemistry. Industrial catalysis: homogenous, heterogenous, enzymatic, basic concepts. Unit Processes: Cracking and pyrolysis processes. Hydrogenation processes: hydrogenation of aromatic compounds, olefins, renewable raw materials and nitrogen. Dehydrogenation processes. Reactions in the presence of water as a reagent: production of synthesis gas and butadiene hydrodimerization. Processes with synthesis gas: methanol production and olefins hydroformylation. Processes with carbon monoxide: methanol carbonylation to acetic acid and alternating copolymerization of olefin with carbon monoxide to polyketones. Oxidation processes: olefin oxidation, ethylene epoxidation to ethylene oxide, ethylene oxidation to acetaldehyde and cyclohexane oxidation to cyclohexanol/cyclohexanone for polyamides (nylon) production. *o*-Xylene oxidation to phthalic anhydride and p-xylene oxidation to terephthalic acid for the production of poly(ethylene terephthalate), PET. Ammoxidation of propylene to acrylonitrile and oxidation of SO_2 to SO_3 for the production of sulfuric acid. Alkylation processes for the production of

intermediates in the synthesis of vitamin E. Isomerization, transesterification, metathesis, polymerization and dehydration processes.

Laboratory instructor: G. Papadogianakis

Laboratory course content: Catalytic dehydrogenation of ethylbenzene to styrene over $Fe_2O_3/Cr_2O_3/K_2CO_3$. Optimization of conditions with the Simplex method. Ziegler-Natta catalysts: polymerization of ethylene with $TiCl_4/AlR_3$. Olefin hydrogenation catalyzed by $RhCl(PPh_3)_3$. Catalytic reforming of naphtha – Platforming process. Olefin hydrogenation catalyzed by $RhCl[P(C_6H_4$-*m*-$SO_3Na)_3]_3$. Oxidation of ethylene – Wacker process.

Grading policy: The combined grade results from two separate exams, one in the lecture course and one in the laboratory course. Laboratory performance accounts for 30% of the grade.

Course materials in Greek: 1) G. Papadogianakis "Unit Processes – Notes for Industrial Chemical Processes", 2) G. Papadogianakis "Notes for the Industrial Chemical Processes Laboratory course, 3) "Industrial Organic Chemistry" S. Pegiadou-Koemtzopoulou, E. Tsatsaroni, I. Eleutheriades, Gartagani Publ. Thessaloniki, 2008.

8211. PETROLEUM AND PETROCHEMICAL CHEMISTRY AND TECHNOLOGY (elective 3 lecture hours/week-2 laboratory hours/week, 6 ECTS credits credits)

Lectures: Tuesdays 9-11am and Thursdays 2-3 pm (A2)

Laboratory: Thursdays 3-5pm (BIOMX)

Instructor: G. Papadogianakis

Course website: http://eclass.uoa.gr/courses/CHEM137/

Course content: Petroleum and natural gas reserves. Petroleum refineries. Physical processes: distillation, deasphalting with liquid propane, etc. Chemical processes: Thermal cracking and pyrolysis of asphalt (visbreaking, delayed coking, flexicoking). Catalytic cracking, hydrotreating, hydrocracking, catalytic reforming, alkylation, isomerization and polymerization. Refinery gas stream processing. Elemental sulfur recovery (Claus process). Steam cracking for the production of basic materials in the petrochemical industry such as ethylene, propylene, etc. Processes for the production of petrochemical intermediates. Production of alternative fuels from non-renewable resources: gasoline production from methanol (MTG pathway, methanol to gasoline). Gasoline production by the Fischer-Tropsch pathway. Hydrogen production by catalytic steam reforming. Liquid fuels production from renewable biomass. Biorefineries. 1st, 2nd and 3rd generation biofuels production.

Laboratory Instructors: H. Iatrou, M. Liouni, G. Papadogianakis

Laboratory course content: Quality control (flash point, vapor pressure, aniline point, pour point, etc.) of petroleum products

Grading policy: Separate exams for the lecture and laboratory courses. The final grade results from 30% from the laboratory grade and 70% from the lecture exam, with the prerequisite that both grades are passing.

Course materials in Greek: 1) G. Papadogianakis "Notes for Petroleum and Petrochemical Chemistry and Technology", 2) A. Kioulafa "Notes for the Petroleum and Petrochemical Chemistry and Technology Laboratory course", 3)

"Petroleum Chemistry and Technology", N.A. Nikolaou, Vivlioekdotiki, Thessaloniki, 2002.

628. POLYMER SCIENCE (elective 3 lecture hours/week-3 laboratory hours/week, 7 ECTS credits credits)

Lectures: Wednesdays 8-10am and Thursdays 9-10am (A2)

Laboratory: Mondays 9am-12pm or Wednesdays 2-5pm

Instructors: H. Iatrou, M. Pitsikalis

Course website: http://eclass.uoa.gr/courses/CHEM128/

Course content: Anionic polymerization, living radical polymerization. Cationic polymerization. Catalytic polymerization. Introduction to macromolecular architecture. Polymer chain configuration and flexibility. Θ-conditions. Amorphous and crystalline polymers. Thermal transitions (melting temperature/crystallization temperature, glass transition temperature).

Laboratory Instructors: H. Iatrou, K Papathanasiou (Technical staff), M. Pitsikalis, G. Sakellariou, M. Chatzichristidi

Laboratory course content: Polymer synthesis by radical and living radical polymerization. Kinetics of step-growth polymerization. Polymer characterization by size exclusion chromatography and dilute solution viscometry in a capillary tube. Determination of the glass transition temperature and melting/crystallization temperature.

Grading policy: Separate exams for the lecture and laboratory courses. The final grade results 30% from the laboratory exercises and 70% from the lecture exam.

Course materials in Greek: 1) "Synthetic macromolecules. Basic Consideration", A. Dontos, Kostarakis Publ. Athens, 2006 2) "Polymer Science and Technology", K. Panagiotou, Pegasus Publ., Thessaloniki, 2006 3) Instructors' notes.

Food Chemistry Courses

626. FOOD CHEMISTRY (required 4 hours/week, 6 ECTS credits credits)

Lectures: Tuesdays 9-11am and Thursday s10 am - 12 pm (A1)

Instrutors: P. Markaki, C. Proestos

Course webpage: http://eclass.uoa.gr/courses/CHEM150/

Course content: Food Science, Food Chemistry in general, Food in general, Water, Carbohydrates, proteins, enzymes, Fats and oils and other lipids, vitamins, minerals. Desirable and not food ingredients, chemical additives, pigments, flavor and odor. Food of animal and vegetable origin, Non alcoholic and alcoholic Beverages, Digestion, Food Poisoning, New Foods.

Course materials in Greek: 1) "Food Chemistry" G. Zampetakis, C. Proestos, P. Markaki. Stamoulis Publications, Athens, 2014, 2) Instructors' notes.

7219. ASSESSING FOOD QUALITY AND FOOD SAFETY (elective, 3 lecture hours/week -6 laboratory hours/week, 9 ECTS credits credits)

Lectures: Tuesdays 1-3 pm and Thursdays 9-10 am (A1)

Laboratory: Tuesdays 3 - 6 pm and Thursdays 10 am - 1 pm (FCHEM)

Instructor: C. Proestos

Course webpage: http://eclass.uoa.gr/courses/CHEM101/

Prerequisites: (1) Analytical Chemistry (213), (2) Food Chemistry (626).

Course content: Methods of food analysis, quality control principles, specifications, legislation, sampling, HACCP, microscopic food control.

Laboratory Instructors: F. Vassilopoulou, C. Protestos.

Laboratory course content: Analysis of milk, flour, honey, oil, cheese, juice. Determination of aromatic compounds with GC and pigments by HPLC. Organoleptic properties of juice and yoghurt. Determination of total phenolics in wine spectrophotometrically. Determination of antioxidants in foods.

Course materials in Greek: 1) C. Proestos P. Markaki "Food: Quality Control, Safety and microbiology, 2017. Da Vinci Publications, 2) Instructors' Notes for the laboratory exercises.

7220. FOOD MICROBIOLOGY (elective 3 lecture hours/week-6 laboratory hours/week, 9 ECTS credits)

Lectures: Mondays 11-12 am (A1) Thursday 1-3 pm (A1)

Laboratory: Mondays 12 – 3 pm, Thursdays 3-6pm (BIOCHEM)

Instructor: P.Markaki

Course webpage: : http://eclass.uoa.gr/courses/CHEM134/

Prerequisites: Food Chemistry (626).

Course content: Microorganisms classification. Factors that affect microbial growth in food. Microorganisms associated with food. Foodborne agents causing illness. Food conversions (Food spoilage and Fermentations)

Laboratory course content: Microscopic observation of microorganisms. Microorganism stains (Gram and simple).Assay of bacteria in milk. Coliform test in water. Microscopic and cultural characteristics of molds isolated from food of plant origin . Identification of microorganisms in food.

Laboratory course instructors: F. Vassilopoulou, P.Markaki

Maximum number of students = 35.

Course materials in Greek: 1) C. Proestos P. Markaki "Food: Quality Control, Safety, and Microbiology, 2017. Da Vinci Publications, 2) Instructors' Notes for the Microbiology Laboratory Exercises

8218. FOOD TECHNOLOGY (elective, 2 lecture hours/week -3 laboratory hours/week, 5 ECTS credits)

Lectures: Mondays 9 - 11 am (A1)

Laboratory: Mondays 11am - 2pm (FCHEM)

Instructor: C. Proestos

Course webpage: http://eclass.uoa.gr/courses/CHEM115/

Prerequisites: (1) Analytical Chemistry (213). (2) Food Chemistry (626).

Course content: Food Industries Introduction, food preservation methods, food packaging, food hygiene, Biotechnology principles.

Laboratory instructors: F. Vassilopoulou, C. Proestos.

Laboratory course content: Technology and Food Biotechnology Exercises, food preservation techniques and methods that affect shelf life of food and its nutritional value.

Course materials in Greek: 1) "Food Technology" by Nasopoulou, K., Nicolaou, S. and Zambetakis I.,
Ath. Stamoulis publications, Athens, 2010.

Biochemistry Courses

627. BIOCHEMISTRY I (required 4 hours/week, 6 ECTS credits)

Lectures: Wednesdays 10-11am (A2) and 11am-12pm (A15) and Fridays 2-4pm (A15)

Instructor: E. Emmanouilidou

Course website: http://eclass.uoa.gr/courses/CHEM222/

Course content: Introduction to basic biochemistry. Proteins, carbohydrates, fatty acids, membranes. Enzymes and co-enzymes. Basic principles of metabolism. Oxidation in biological systems. Metabolism of carbohydrates, fatty acids and amino acids. DNA, RNA, basic genetic mechanisms, recombinant DNA.

Course materials in Grek: : 1) "Biochemistry" J. M. Berg, J. L. Tymoczko, L. Stryer 2) "Lehninger Principles in Biochemistry" D. L.Nelson, M. Cox

7213. BIOCHEMISTRY II (elective 3 lecture hours/week – 5 laboratory hours/week, 8 ECTS credits)

Lectures: Mondays 3-4pm and Fridays 9-11am (A1)

Laboratory: Mondays 4-6 pm and Fridays 11am- (BIOX)

Instructor: E. Emmanouilidou

Course website: http://www.chem.uoa.gr/courses/mathimata1.htm

Course Content: Enzymes: Catalytic function, mechanisms of action and regulation of enzymatic activity. Multi-enzymatic complexes. Applications of enzymatic action in science. DNA structure and assembly into chromosomes. DNA replication, transcription and translation. Application of the above to understand specific molecular pathways of the cell.

Laboratory course content: A) Tutorials: Theory of basic laboratory techniques. Basic biochemistry procedures for the purification and analysis of biomolecules. Use of cellular and animal models. Introduction to molecular biology techniques.

B) Laboratory exercises: A. Protein analysis (cell culture, cell homogenization, differential centrifugation, SDS-PAGE electrophoresis). B. Molecular biology (E.coli culture, genomic DNA isolation, transformation of E.coli cells with plasmid DNA, agarose electrophoresis).

Grading policy: The lecture course grade counts for 70% of the final grade, and the laboratory grade counts for 30%. The grades from both courses must be passing.

5.2.3 Division III – Lectures and Laboratories

Inorganic Chemistry Courses

133Θ. GENERAL AND INORGANIC CHEMISTRY I (required 5 hours/week, 6 ECTS credits)

Lectures: Wednesdays 9 - 11 am and Thursdays 9 - 11 am (A15)

Instructors: C. Methenitis, C. Mitsopoulou (coordinator)

Course website: http://eclass.uoa.gr/CHEM109

Course content: Atoms. The periodic system. Chemical bonds. Molecules: Molecular shape, interactions between molecules, states of matter. Chemical equilibrium. Chemical thermodynamics. Chemical kinetics. Reaction mechanisms. Solutions. Acids, bases and ions in aqueous solution. Redox reactions: Reduction and Oxidation, The diagrammatic presentation of potential data (Latimer, Frost and pH dependence diagrams).

Course material in Greek: 1) "Basic Principles of Inorganic Chemistry", G. Pneumatikakis, C. A. Mitsopoulou, C. Methenitis ed. UNIBOOK IKE, Athens 2006. 2) Basic General Chemistry, Cotton, Wilkinson, Gauss , 3rd edition, translated in Greek , ed. Parisianou, 2015, 3) General Chemistry (10th International Edition)», Darrell Ebbing, Steven Gaummon, G translated in Greek (ed. Travlos & Co O.E.) 2014.

133Π. GENERAL AND INORGANIC CHEMISTRY I LABORATORY (required 4 hours/week, 4 ECTS credits)

Laboratory: Tuesdays 11am -3pm and Fridays 11am -3pm (ANOX)

Instructors: K. Methenitis (coordinator), I. Papaefstathiou, M. Roulia

Course webpage: http://eclass.uoa.gr/CHEM109

Course content: Basic laboratory techniques. Solubility studies. Apparent degree of disassociation. Chemical balance of inorganic systems (A). pH - buffers. Determination of pKa. Heat of chemical reactions. Redox reactions. Principles of chemical kinetics. Synthesis of metal complexes. Lambert-Beer law. Job's continuous variation method.

Grading policy: The grade is determined from: a) The diligent and successful execution of the experiments. - Oral or written examinations in the exercise of the day. b) The way of presenting and evaluating the experimental results in the laboratory notebokk. c) From the average of the two exams during the semester. The first exam examines the content of the first five laboratory exercises and is given immediately after their completion, and the second is the content of the remaining five. The grade of the laboratory is calculated as follows:

{0.3 × points [(a) + (b)]: 2} + {0.7 × grade (c)}

If the student has completed the laboratory part of the exercises but has a laboratory grade of less than 5, then she/he is allowed to take part in an examination in September. In the case of laboratory examination failure, then must re-register for the course and re-take the written semester exams. There is no examination during the January-February examination period.

Course materials in Greek: "Laboratory Exercises of General and Inorganic Chemistry" C. Mitsopoulou, K. Methenitis, A. Karaliota, M. Paparigopoulou, D.

Stambaki, I. Markopoulos, P. Kyritsis, N. Psaroudakis, G. Kalatzis (UNIBOOKS IKE) 2005 .

232Θ. INORGANIC CHEMISTRY II (required 4, 5 ECTS credits)

Lectures: Wednesdays 9 - 11 am (ΦΜ3) and Thursdays 9 - 11 am (Α15)

Instructors: P. Paraskevopoulou, A. Philippopoulos (coordinator)

Course Website: http://eclass.uoa.gr/courses/CHEM110/index.php

Course content: Main Group Chemistry. Hydrogen. Noble Gases. Halogens. Oxygen group. Nitrogen group. Carbon group. Boron group. Alkali and Alkaline Earth Metals. Zinc, Cadmium, Mercury. Lanthanides and Actinides. Properties and Periodic trends of the elements and their compounds (structure, substitution). Inorganic Chemical Technology. Applications to Materials, Catalysis, Energy, Organometallic and Bioinorganic chemistry.

Course materials in Greek: (1) "Inorganic Chemistry – The Elements" D. Katakis, K. Methenitis, C. Mitsopoulou, G. Pneumatikakis (Ed. Papazissis SA) Athens, 2002. (2) "Special Inorganic Chemistry – Chemical Elements and Compounds" P. P. Karagiannidis (Ed. Ziti Pelagia & SIA OE) 4th Ed., Thessaloniki, 2009.

232Π. INORGANIC CHEMISTRY II LABORATORY (required 4, 4 ECTS credits)

Laboratory: Wednesdays 11 am - 5 pm (ANOX)

Instructors: P. Paraskevopoulou (coordinator), A. Philippopoulos, M. Roulia

Course website: http://eclass.uoa.gr/courses/CHEM110/index.php

Prerequisites: Completed successfully General and Inorganic Chemistry I - Laboratory

Course content: Halogens. Group 2. Preparation of $NaHCO_3$ and Na_2CO_3 (Solvay method). Periodic Table – Oxides and their Properties. Isolation of Metals from their Ores. Electrical Conductivity: Calculation of Salt Index of Soils.Literature Search – Report – Presentation: Topics in the area of Inorganic Chemistry and Technology are assigned to groups of 5-6 students at the beginning of the semester. Groups work independently throughout the semester to collect relevant literature, and to prepare written reports and a PowerPoint presentation on their assigned topics. Students learn how to use library resources, on-line reference databases (ISI-WoS, Scopus etc.), and relevant software (Word, Excel, PowerPoint, ISIS-DRAW, CHEMDRAW, ACD/ChemSketch, etc.). Oral presentations of the assigned topics at the end of the semester are mandatory and comprise an integral part of the grade. On-site visits to local industry: if time permits, such on-site visits are organized towards the end of the semester.

Grading policy: The Laboratory grade is calculated as follows:
{0,05 × grades [(a)+(b)]/2} + {0,25 × grade (c)} + {0,7 × grade (d)},
where grades (a) and (b) are given as in "General and Inorganic Chemistry I - Laboratory", grade (c) is assigned to the report and the oral presentation, and grade (d) is the result of the final comprehensive written laboratory exam.

Course material in Greek: "Laboratory Exercises in Inorganic Chemistry II" C. Mitsopoulou, K. Methenitis, A. Lymperopoulou-Karaliota, P. Paraskevopoulou, Student's laboratory companion.

332Θ. SPECTROSCOPY IN INORGANIC CHEMISTRY (required 3 hours/ week, 4 ECTS credits)

Lectures: Tuesdays 9 – 11am, Fridays 9– 10am.

Instructors: N. Psaroudakis, A. Chrissanthopoulos

Course website: http://eclass.uoa.gr/CHEM231

Course content: Introduction to molecular symmetry: point groups, group representation, Group Theory. Electronic structure of the free atoms: electronic representations, spectroscopic terms, energy states. Atomic Spectroscopy – Zeeman effect. IR and Raman spectroscopies. Elementary study of the harmonic oscillator. Determination of the number and the symmetries of the IR and Raman active vibrations. Characteristic group frequencies. Introduction to NMR spectroscopy. 1D NMR spectra. Decoupling. Intramolecular and intermolecular exchange.

Course materials in Greek: "Topics in Inorganic Chemistry – Symmetry and Spectroscopy", S. Koinis.

332Π. SPECTROSCOPY IN INORGANIC CHEMISTRY LABORATORY (required 4 hours/week, 3 ECTS credits)

Laboratory: Mondays 12 - 4 pm, Thursdays 12 – 4pm.

Instructors: N, Psaroudakis, A. Chrissanthopoulos

Course website: http://eclass.uoa.gr/CHEM231

Prerequisites: In order to register for this Laboratory course, students must have completed the exercises in the General and Inorganic Chemistry I and Inorganic Chemistry Laboratory courses.

Course content: 1. Measurement and study of the IR and Raman spectra of simple inorganic ionic compounds. Bands of characteristic groups. 2.Synthesis and IR and Raman spectroscopic study of the complex salts $[Co(NH_3)_5X]Cl_2$ (X=Cl, ONO (nitrito), NO_2 (nitro)). The effect of the coordination on the IR and Raman spectra of the ligands. 3. NMR Spectroscopy in Inorganic Chemistry. Measurement and study of ^{1}H and ^{31}P NMR spectra. 4. Study of the structure of coordination and organometallic compounds, using chemical and spectroscopic data.

Grading policy: The successful completion of the course depends on the following: a) careful and successful completion of the experimental work, b) the appropriate presentation and assessment of experimental data in the laboratory notebook, c) the average grade (≥5) of the two examinations during the course (30% of the final grade). In each examination, the students are examined on the corresponding unit, after its completion in the laboratory. In the case that a student has completed the experimental work but the examination mark is lower than 5, it is possible for the student to take an exam on both units, during the September exams. In the case that a student has not passed the laboratory exam, the student must re-register for the course and then she/he can re-take the written examinations during the course. There is no examination during the January-February exams.

Course materials in Greek: S. Koinis, A. Chrissanthopoulos, N. Psaroudakis: "Spectroscopy in Inorganic Chemistry – Laboratory Manual".

433Θ. INORGANIC CHEMISTRY III (required 4 hours/week, 5 ECTS credits)

Lectures: Wednesdays 9 - 11 am and Fridays 9 - 11 am (A15)

Instrutors: P. Kyritsis, C. Mitsopoulou (coordinator)

Course website: https://eclass.uoa.gr/CHEM129

Course content: Electronic configuration and magnetic properties of transition elements. Theories of metal complexes. Electronic spectra of metal complexes. Introduction on organometallic chemistry and metal clusters. Introduction on mechanisms of inorganic reactions and bioinorganic chemistry of transition elements. Photochemical reactions of transition elements. Catalysis. Transition element groups (triads).

Course material in Greek: 1) "Inorganic Chemistry", C. Housecroft, A. Sharpe, edited by N. Hadjiliadis (UNIBOOKS IKE) 2014, 2) "Inorganic Chemistry, 4th edition", J.E. Huheey, E.A. Keiter, R.L. Keiter, editions M. Parikou and Co., 2011.

433Π. INORGANIC CHEMISTRY III LABORATORY (required 4 hours/week, 4 ECTS credits)

Laboratory: Mondays 11 am - 3 pm and Thursdays 12 - 4 pm (ANOX)

Instructors: P. Kyritsis (coordinator), G. Papaefstathiou, M. Roulia, A. Chrissanthopoulos, E. Efthimiadou

Course website: https://eclass.uoa.gr/CHEM129

Prerequisites: In order to be enrolled, it is necessary to have completed the laboratory courses of General and Inorganic Chemistry I, and Inorganic Chemistry II.

Course content: 1) Magnetochemistry: Synthesis of complex $Hg[Co(SCN)_4]$. Determination of the magnetic susceptibility of solid compounds. 2) Synthesis of complexes *trans*- and *cis*-$[Co(en)_2Cl_2]Cl$. Spectrometric kinetic study of *cis* → *trans* isomerization in methanolic solution. 3) Study of the electronic spectra of complexes $[Cr(H_2O)_6]^{3+}$, $[Co(H_2O)_6]^{2+}$, $[Ni(H_2O)_6]^{2+}$ and $[Co(NH_3)_6]^{3+}$ in aqueous solutions.

Grading policy: The successful completion of the course depends on the following: a) careful and successful completion of the experimental work, b) the appropriate presentation and assessment of experimental data in the laboratory notebook, c) the average grade (≥5) of the three examinations during the course, which is the final grade of the course. In each examination, the students are examined on the corresponding unit, after its completion in the laboratory. In case a student has completed the experimental work but the examination mark is lower than 5, it is possible for the student to take an exam on all three units, during the September exams. There is no examination during the June exams.

Course materials in Greek: "Laboratory course of Inorganic Chemistry III", Lecture notes and presentations from the e-class.

533. GROUP THEORY – PHOTOCHEMISTRY AND APPLICATIONS (elective, 4 hours per week, 6 ECTS credits)

Lectures: Wednesday 11 - 1 PM, Friday 2 - 4 PM. (ANOX)

Instructors: C.Mitsopoulou, E. Koutsouri

Course website: http://eclass.uoa.gr/CHEM178

Course content: Group Theory. Wavefunctions and point group representations. Valence Bond Theory (hybrid orbitals). Projection operators. Symmetry adapted linear combinations. Molecular Orbital Theory. The direct product. Vibrational representations of linear molecules. The symmetry of the eigenfunctions of the harmonic oscillator. Overtones and combination bands. Symmetry aspects of Ligand Field Theory. Applications of symmetry to the study of d-d transitions.
Photochemistry and applications. Fundamental laws of Photochemistry. Electronic transitions of polyatomic molecules. Beer-Lambert law, selection rules and spectral band intensities. The Frank-Condon pronciple. Jablonski diagrams. Fluorescence – Phosphorescence. Relaxation pathways (Vibrational relaxation, intersystem crossing and internal conversion, Dissociation/Photodissociation). Lifetime of excited states. Stern-Volmer diagram. Electron and energy transfer, short and long range mechanisms. Triplet state sensitization. Excited states: chemical activity, acidity, redox potentials, molecular orbitals etx.Basic pronciples of Photocatalysis. Applications in synthesis, energy and medicine. Modern experimental methods for the study of dynamic perocesses of photochemical reactions.

Course Materials in Greek: 1) Instrutors' notes, 2) "Basic Inorganic Chemistry (3rd edition)", cotton, Wilkinson, Gauss, translated in Greek (Parisianou Publ.), 2015, 3) eBook "Molecular Symmetry and Group Theory", M. Siagalas, N. Charistos, L. Antonoglou (Kallipos Programme ESPA) 2015

633. ORGANOMETALLIC CHEMISTRY (elective, 4 hours/week, 6 ECTS credits)

Lectures: Wednesdays 2 - 4 pm (ANOX) and Thursdays 3 - 5 pm (A2)

Instructors: A. Philippopoulos, N. Psaroudakis (coordinator)

Course website: http://eclass.uoa.gr/courses/CHEM204/

Course contents: General properties of organometallic compounds. The metal-carbon and metal-hydrogen bond. Complexes with π-type ligands. Oxidative addition and reductive elimination reactions. Insertion and elimination reactions. Nucleophile and electrophile insertion and elimination reactions. Homogeneous catalysis. Metal-carbene and metal-carbyne complexes, metathesis and polymerization. Organometallic chemistry of the main group elements (Ge, Sn, Pb etc.). Organometallic compounds of the transition metals. Applications in organic synthesis. High oxidation state organometallic chemistry. Characterization methods of organometallic compounds. Literature search and selected examples of high impact molecules, from the field of organometallic chemistry.

Laboratory Instructors: A. Philippopoulos, N. Psaroudakis (coordinator)

Outline: Inert atmosphere and vacuum line techniques. Synthesis, purification and spectroscopic characterization of Ferrocene. Laboratory exercises take part before the end of the Semester.

Grading policy: The final grade is calculated as follows: 20% from the laboratory exercises and 80% from the written final exam.

Course material in Greek: (1): "Chemistry of the Organometallic Compounds" A. Christofides, (Ed. Ziti) 2008. (2) "Basic Organometallic Chemistry", Haiduc, Zuckerman (Ed. Papazissis SA) Athens, 1987. 3) Instructors' notes.

739. SPECIAL ISSUES IN INORGANIC CHEMISTRY (elective, 4 hours/week, 6 ECTS credits)

Lectures: Mondays 9 - 11 am and Tuesdays 4 - 6 pm (ANOX)

Instructors: K. Methenitis (coordinator), I. Papaefstathiou

Course webpage: http://eclass.uoa.gr/courses/CHEM131/

Course content: Cluster chemistry. Clusters of p-, d- and f-groups. Multiple metal-metal bonds of transition elements. Synthesis and characterization, bond and structure interpretation, chemical reactivity and properties. Applications in synthesis - Advanced materials. Metal-organic polygons and polyhedrons, metal-organic frameworks: synthesis, structure and properties. Bioinorganic Chemistry. Metal ions in biological systems - Biogeochemical cycles. Interaction of metal ions with polynucleotides and nucleic acids. Metal complexes as drugs and diagnostics. Kinetics and mechanisms of reactions in biological systems. Biomimetic materials, biocatalysis and biocatalysts.

Course materials in Greek: 1) "Bioinorganic Chemistry" D.P. Kesisoglou, G. Psomas (Ziti Pelagia & Co. Ltd.) 2010. 2) "Bioinorganic Chemistry" R. W. Hay (Papazisis AEBE) 1992.

838. INORGANIC CHEMICAL TECHNOLOGY (elective 3 hours/week, 4 ECTS credits)

Lectures: Wednesdays 11 am-2 pm (ANOX)

Instructor: K. Methenitis

Course website: http://eclass.uoa.gr/courses/CHEM200/

Course content: General considerations of inorganic chemical technology. Iindustrial production (primary and secondary) of inorganic materials (inorganic acids, fertilizers, building materials, cements, glasses, ceramics, etc.). Minerals, metals and alloys. Mineral carbons. Recycling and waste management processes. Educational visit to a production unit.

Course materials in Greek: "Inorganic Chemical Technology" , A. Sdoukou, F.I.Pomonis (Tziola Editions) 2010

Environmental Chemistry Courses

632. ENVIRONMENTAL CHEMISTRY (required 4 hours/week, 6 ECTS credits)

Lectures: Wednesdays 12 - 2 p.m. (A15) and Fridays 12 - 2 p.m. (FM3)

Instructors: E. Dassenakis, S. Karavoltsos, F. Botsou, V. Paraskevopoulou, A. Sakellari, E.Stathopoulou

Course website: http://eclass.uoa.gr/courses/CHEM166/

Course content: General object and branches of Environmental chemistry. Environmental pollution: Pollutant sources, categories and transport. Ecological principles and environmental parameters. Carbon cycle: Greenhouse effect, ocean acidification. Dissolved oxygen and pollution by wastewater. Nutrients - eutrophication. Trace metals (copper, mercury, lead, cadmium, chromium, nickel, zinc etc). Petroleum products, oil spills, polyaromatic hydrocarbons. Plant protection products (insecticides, fungicides, pesticides etc). Synthetic organic

compounds (PBCs, detergents, TBT - tributil tin, phenols). Chemical substances management – the REACH regulation. Litter – microplastics. Radioactive pollution. Pathogenic microorganisms. Atmospheric pollutants: carbon monoxide, nitrogen oxides, sulphur oxides, ozon. Atmospheric suspended particles. The ozon hole. Atmospheric pollution in urban regions (London, Los Angeles, Athens). Indoor pollution: workplace and residential spaces.

Calculation of final grade: An optional bibliographic study can be performed by each student. The grade of the bibliographic study increases that of the written examination provided it exceeds 5.

Course materials in Greek: 1) "Environmental Chemistry", M. Scoullos, P. Siskos 2)"Environmental Chemistry", K. Fytianos, K. Samara.

737. ATMOSPHERIC CHEMISTRY (elective 3 lecture hours/week-2 laboratory hours/week, 6 ECTS credits)

Lectures: Tuesdays 1 - 2 p.m. and Thursdays 9 -11 a.m. (ENVCHEM)

Laboratory: Tuesdays 2 - 4 p.m. (ANOX)

Instructors: E. Bakeas (coordinator), S. Karavoltsos

Course website: http://eclass.uoa.gr/courses/CHEM163/

Prerequisites: Students may enrol in the course, provided they have passed the following courses: Environmental Chemistry (632) and Analytical Chemistry (213) or Instrumental Analysis II (415).

Course content: Structure and characteristics of the atmosphere. Basic principles of meteorology. Emissions, transport and transformation of pollutants in the atmosphere. Mechanisms of atmospheric reactions. Aerosols and suspended particles. Emphasis on the chemical behavior of air pollutants. Secondary pollutants. Application of models in atmospheric pollution. Programs for pollution confrontation. Indoor pollution (sick building syndrome). Methods for the determination of pollutants in emissions from stationary sources. Automatic methods for monitoring atmospheric pollution.

Laboratory course content: Atmospheric particles. Determination of metals (lead). Determination of polycyclic aromatic hydrocarbons (PAHs). Determination of ions. Determination of BTEX. Automatic analyzers. Determination of dioxins. Visit to Democritus Research Centre. Bibliographic study.

Calculation of final grade: Examinations include subjects related both to theory and laboratory work. Laboratory performance is calculated at a percentage equal to 15%. The grade of the bibliographic study increases that of the written examination provided it exceeds 5.

Course materials in Greek: 1)"Atmospheric Pollution with Meteorology Elements", M. Lazaridis Tziola Publications, 2) "Atmospheric Pollution", S. Karathanasis Tziola Publications

738. CHEMICAL OCEANOGRAPHY (elective 3 lecture hours/week-2 laboratory hours/week, 6 ECTS credits)

Lectures: Tuesdays 9 - 11 a.m. and Fridays 3 - 4 p.m. (ENVCHEM)

Laboratory: Fridays 4 - 6 p.m. (ANOX)

Instructors: E. Dassenakis, S. Karavoltsos, F. Botsou, V. Paraskevopoulou, A. Sakellari, E. Stathopoulou

Course website: http://eclass.uoa.gr/courses/CHEM162/

Prerequisites: Students may enrol in the course, provided they have passed the following courses: Environmental Chemistry (632) and Analytical Chemistry (213) or Instrumental Analysis II (415).

Course content: The object of chemical oceanography. Historical review. Water distribution on the Earth – the hydrological cycle. Introduction in of physical, biological and geological oceanography (marine ecosystems, marine sediments, ocean circulation). Fresh vs sea water: the effect of electrolytes on the structure and properties of water molecules. The formation, evolution, composition and stability of the oceans. The ocean as a chemical system (water, particulate matter, sediments). Chemical elements and their speciation in the marine system. Chemical processes, balances and reactions. Photosynthesis and life cycle in the sea. Dissolved gasses in seawater. Nutrients and the cycles of nitrogen, phosphorus and silica. Basic characteristics of surface and ground waters. Lakes, lagoons, wetlands, rivers and estuaries.

Laboratory content: Aims and purposes of oceanographic research. Sampling and *in situ* measurement techniques. Basic analytical determinations in marine waters: Salinity/Chlorinity, Dissolved Oxygen, Nutrients (nitrogen species - nitrites, nitrates, ammonium, organic nitrogen, phosphates, silicates), Chlorophyll content, Organic carbon in sediments. Visit to the Hellenic Centre for Marine Research (HCMR).

Calculation of final grade: Examinations include subjects related both to theory and laboratory work.. Laboratory performance is calculated at a percentage equal to 15%. An optional bibliographic study can be performed by each student. The grade of the bibliographic study increases that of the written examination provided it exceeds 5.

Course materials in Greek: 1)"Chemical Oceanography", M. Scoullos Symmetria Publications, 2) "Chemical Oceanography", E. Dassenakis, S. Karavoltsos, E. Ladakis, V. Paraskevopoulou, Kallipos Publications (https://repository.kallipos.gr/handle/11419/4683), 3)"Chemical Oceanography", F. Sakellariadou, Stamouli A.E. Publications

836. ENVIRONMENTAL MANAGEMENT AND TECHNOLOGY (elective, 3 lecture hours/week-2 laboratory hours/week, 6 ECTS credits)

Lectures: Mondays 2 - 3 p.m. and Wednesdays 9 - 11 a.m. (ENVCHEM)

Laboratory: Mondays 3 - 5 p.m. (ANOX)

Instructors: E. Dassenakis (coordinator), F. Botsou, V. Paraskevopoulou, A. Sakellari, E. Stathopoulou

Course website: http://eclass.uoa.gr/courses/CHEM167/

Prerequisites: Students may enrol in the course, provided they have passed the following courses: Environmental Chemistry (632) and Analytical Chemistry (213) or Instrumental Analysis II (415).

Course content: (A) The need for environmental management and various management perceptions. The concept of "sustainable development". Principal terms – definitions in environmental management. Environmental management tools (institutional, financial, technological etc). Levels of environmental management – sectors, organizations. International conventions, legislation. Evolution of the of management since 1950. Environmental monitoring.

Environmental impact studies. Examples of good and bad management practices. (B) Environmental Technology: Wastes vs Environment. Management and treatment of wastes-wastewaters: Primary, secondary and tertiary treatment. Management of activated sludge. Management of solid wastes management - land filling. Technologies of treatment, incineration, recycling, composting of solid wastes. Technologies for the confrontation of marine and atmospheric pollution. Technologies for the remediation of polluted areas.

Laboratory content: Environmental monitoring programs. Samplings – *in situ* measurements. Determinations: BOD/COD, ammonium, trace metals (Cu, Pb, Zn, Cr(VI) etc) organic pollutants (phenols, detergents etc). Microbial infection of water. Quality control of environmental monitoring results – accreditation of environmental laboratories. Visit to the Sewage Treatment Plant of Psyttalia.

Calculation of final grade: Examinations include subjects related both to theory and laboratory work. Laboratory performance is calculated at a percentage equal to 15%. An optional bibliographic study can be performed by each student. The grade of the bibliographic study increases that of the written examination provided it exceeds 5.

Course materials in Greek: 1)"Management of Liquid Wastes", G. Liberatos, D. Vagenas Tziola Publications 2)"Pollution and Technologies for Environmental Protection", T. Albanis Tziola Publications

8121. TOXICOLOGY - ECOTOXICOLOGY (elective 3 hours/week, 4 ECTS credits)

Lectures: Thursday 11 a.m. - 2 p.m. (ANAX)

Instructors: E. Dassenakis (coordinator), P. Markaki, E. Bakeas, A. Sakellari

Course website: http://eclass.uoa.gr/courses/CHEM229/

Prerequisites: Students may enrol in the course, provided they have passed the following courses: Environmental Chemistry (632) and Analytical Chemistry (213) or Instrumental Analysis II (415).

Course content: (A) Toxicology – Environmental Toxicology: brief historical evolution and their role in risk assessment due to environmental pollution. Circulation of toxic substances and medicines in the organism (absorption, distribution, biotransformation, excretion). Mechanisms of detoxification. Toxicokinetics, toxicity tests, security – danger relations. Toxicological data for dangerous chemicals (toxic gases, alcohols, medicines, toxic substances existing in industrial, agricultural, domestic and working environment, foodstuffs, risk assessment). Sources of exposure, mechanism of toxic activity, therapeutic treatment. Toxicological analysis for specific categories of substances (drugs, alcohol, dopping). The most significant factors responsible for health problems and security matters of employees in the working environment. (B) Ecotoxicology: Basic principles and concepts. Bioaccumulation - biomagnification. Ecological risk assessment. Organisms – Bioindicators and substances – biomarcers in toxicological research. Characteristic examples of ecotoxicological consideration of environmental problems. Toxicological tests in aquatic ecosystems: microcosms, mesocosms and field studies. Presentation of research techniques in the field of Toxicology - Ecotoxicology.

Calculation of final grade: The final grade in the course is calculated by those from the written examination (75%) and the mandatory bibliographic study (25%). Both grades should exceed 5

Course materials in Greek: 1)"Human Toxicology", K. Hourdakis UNIVERSITY STUDIO PRES Publications, 2) "Ecotoxicology", Ath. Valavanidis

5.2.4 Multi-disciplinary Courses and Courses taught by Faculty members from other Departments

113. INTRODUCTION TO COMPUTING – APPLICATIONS IN CHEMISTRY (elective 2 hours/week, 5 ECTS credits)

Lectures: Mondays 11am-1pm (A15)

Laboratory: Mondays 1-3pm, Wednesdays 1-3pm (SSATES)

Instructors: A. Economou (coordinator), A. Gimisis, C. Polydorou (lab coordinator), A. Chrissanthopoulos, A. Kapsalis, E. Sakki

Course website: http://eclass.uoa.gr/courses/CHEM206

Course content: Description of PCs and operational systems. System security. Internet search for retrieval of scientific information. Chemistry journals and scientific databases. Word processing. Excel. Plots and graphs. Chemical drawing and simulation software. Applications in Chemistry. Short introduction to programming and to logical diagrams.

Laboratory course content: Word processing and mathematical formulae. Creation of presentations. Use of chemical drawing software. Internet search for retrieval of scientific information. Information retrieval from chemistry journals and scientific databases. Introduction to MicrosoftExcel, input of data in worksheets, data types, functions, data filtering and sorting, graphs and printing. Creation of molecular structure files through internal and cartesian coordinates and computer imaging.

Course materials in Greek: Instructor's notes.

101. PHYSICS I (required 4 hours/week, 6 ECTS credits)

Lectures: Tuesdays 9-11am (ΦΜ3) and Thursdays 12-3pm (A15)

Instructors: A. Moustakas, Asst. Professor Department of Physics Ιστοσελίδα μαθήματος: -

Course content: Introduction, mathematical introduction to physics. Measurements and units. Statics. Forces. Kinematics. Relative motion. Rigid body dynamics. Work. Energy. Many-body dynamics. Dynamics of solids.
Oscillations. Fluid dynamics. Geometric optics.

Course materials in Greek: 1) "University Physics Vol.1" H.Young, R. Freedman, Papazisis Publ. 2) "Physics, Vol 1" . D. Halliday, R. Resnik, J. Walker, Dardanos and Co. Publ.

104. MATHEMATICS I (required, 6 hours/week, 10 ECTS credits)

Lectures: Mondays 9 - 11 am (A15), Wednesdays 11am-1pm (A15) and Fridays 9-11am (ΦΜ3)

Instructor: A. Bournetas , Professor, Department of Mathematics, G. Chalikias, Assoc. Professor, Department of Mathematics

Course Website: http://eclass.uoa.gr/courses/MATH440

Course content: Real numbers. Functions. Sequences and series of real numbers. Real functions of a single variable: limits, continuity, derivative, integral, function investigation. Differential equations. Linear first order differential equations. General solution of general second order differential equations. Method of indeterminate coefficients. Introduction to Rn space. Many variable functions. Limits. Continuity. Partial derivatives. Slope. Directional derivative. Critical points. Second order partial derivatives. Hessian matrix. Local extrema. Critical point criteria. Double integrals, polar transformation, change of integration order. Triple integrals, cylindrical transformation. Line integrals of first and second kind. Applications: Calculation of work in
a vector field.Vector analysis (differential operators). Green's theorem.

Course materials in Greek: 1) "General Mathematics, Vol. 1 (Calculs)", C. E. Athanasiadis, E.M. Giannakoulias, S.C. Giotopoulos, Symmetria Publ., Athens 2009 2) "Applied Calculus" L. N. Tsitsas, Symmetria Publ. , Athens 2003 3) "Calculus Vol I", R. Finey, M. Weir, F. Giordano, University of Crete Publ, Heraklion 2005 4) "Differential Equations", C. E. Athanasiadis

201. PHYSICS II (required, 4 hours/week, 6 ECTS credits)

Lectures: Mondays 12-3pm and Thursdays 1-3pm (A15)

Instructors: D. Fratzeskakis, A. Tzanakakis, Professors, Department of Physics

Course webiste: http://eclass.uoa.gr/courses/PHYS237/

Course content: Electric fields. Gauss's Law. Electric potential. Capacitance and dielectrics. Electric current and resistance. Direct current circuits. Magnetic fields. Magnetic fields sources. Faraday's law. Induction. Alternating current circuits. The nature of light and geometric optics laws. Picture composition. Electromagnetic wave interference. Diffraction and polarization.

Course materials in Greek: 1) "University Physics Vol.1" H.Young, R. Freedman, Papazisis Publ. 2) "Physics, Vol 1" . D. Halliday, R. Resnik, J. Walker, Dardanos and Co. Publ.

205. MATHEMATICS II (required, 4 hours/week, 6 ECTS credits)

Lectures: Mondays 10am-12pm and Thursdays 11am-1pm (A15)

Instructor: M. Sykiotis, Asst. Professor, Department of Mathematics

Course content: Vector spaces. Matrices. Determinants. Linear systems, linear mapping, characteristics of operators and matrices (eigenvectors, eigenvalues, eigenspaces, etc.). Matrix diagonalization. Elements of vector analysis. Plane geometry (perpendicular line, change of coordinates, conic sections, tangent). Three dimensional geometry (straight line, plane, standard surfaces), inner product vector spaces, orthogonality. Examples and problems.

Course material in Greek: 1) "Linear Algebra and Analytical Geometry", A. Chrysakis 2) "Linear Algebra", A. Fellouris

302. NUMERICAL METHODS AND PROGRAMMING (elective* 4 lecture hours/week-2 laboratory hours/week, 7 ECTS credits.)

Lectures: Tuesdays 4-6pm and Wednesdays 1-3pm (ANAX)

Laboratory: Wednesdays 3-5pm (ΣΣΑΤΕΣ)

Instructors: N. Misyrlis and F. Tzaferis, Faculty members of the Department of Informatics and Telecommunications

Course website: http://eclass.uoa.gr/courses/CHEM142/

Prerequisites: Passing grade in the course "Learning to Use Computers"

Course content: Part I: Programming. Introduction: Historical review, computer structure, software. Introduction to C programming language: the structure of a program in C, C's alphabet, declarations, assignment operators, logical expressions, basic input-output functions. Simple programs. Selection commands. Repetition commands. Functions: Functions returning a single value, defining parametric functions, Indicators, call by value, call by reference. Numerical data. Matrices, data structures. Text files, Binary files

Part II: Numerical Methods. Topics on error analysis. Numerical solution of non-linear equations (fixed point method, Newton-Raphson method). Numerical methods for linear systems (direct and iterative). Numerical methods for the calculation of eigenvalues-eigenvectors. Interpolation (Lagrange, divided differences). Least squares method. Numerical differentiation. Numerical integration. Numerical solution of ordinary differential equations

Laboratory: Programming in C (2 groups, 2 hours/week)

Course material in Greek:: 1) Numerical Analysis : Μια αλγοριθμική προσέγγιση, N. Misyrlis, 2009. 2) Introduction to C programming language, N. Misyrlis, 2006,. *This course was required for students entering the Department up to and including the 2013-14 academic year.

501. MODERN TOPICS IN CELL BIOLOGY (elective 3 hours/week, 4 ECTS credits)

Lectures: Wednesdays 3-6pm, "G. Panatazis" Classroom, 2nd floor, Department of Biology

Instructors: I. Papasideri, Professor, Department of Biology (coordinator), M. Antonelou, Lecturer, D. Stravopodis, Asst. Professor, I. Trougakos, Assoc. Professor, Department of Biology

Course website: http://multimedia.biol.uoa.gr/fusiko-ximiko.htm

Course content: Origin and evolution of organisms. Cell organization. Research methodology. Structure and function of a standard cellular system. Biological membranes – functional separating layers. The first step in the flow of genetic information – levels of DNA organization. Second step in the flow of genetic information – protein synthesis. Post-translational modification - screening of protein targeting and cellular polarity. Cellular energy production and conversion organelles: mitochondria and chloroplasts. Biomolecule conversion and breakdown organelles: peroxisomes and lysosomes. Cell fibrils and cytoskeleton. Supramolecular structure selfassembly – viruses and phages. Principles of signal transduction. Cellular communication and cell junctions. Extracellular substances.

Cell cycle – reproduction, cloning, cell senescence. Cellular transformation – carcinogenesis. Programmed cell death – apoptosis.

Course materials in Greek: 1) "Cell Biology", M. Loukas, K.& N. Litsas Publ. 2) "Cell Biology – Molecular Approach", B. Marmaras, M. Lampropoulou, Typorama Publ. 3) "The Cell: A Molecular Approach" , , G.M. Cooper, R.E. Hausman, I. Basdara and Co. Academic Publ.

803. VITICULTURE (elective 3 hours/week)

Lectures: To be announced by the Instructor

Instructor: A. Biniari, Asst. Professor, Agricultural University of Athens

Course content: Vine-growing. Wine products. Vine morphology-anatomy. Pruning. Annual vegetation cycle. Fertilization. Harvest

Course materials in Greek: "Viticulture", M.N. Stavrakakis, Tropi Publ.

701. TEACHING CHEMISTRY (elective 4 hours/week, 6 ECTS credits)

Lectures: To be announced by the instructor.

Instructor: Z. Smyrnaiou, Faculty member of the Department of Philosophy, Pedagogy and Psychology

Course website: http://eclass.uoa.gr/courses/PPP394/

Course content: 1. LEARNING THEORIES AND CHEMISTRY EDUCATION: A. Behaviorism and constructivism, Piaget, Vygotsky, Ausubel, Information-processing Theory, students' alternative conceptions, Conceptual Change. B. Students' alternative conceptions about chemical concepts (atomic and molecular structure, states of matter, chemical reactions, chemical equilibrium, acids and bases, neutralization, redox). 2. SCIENCE EDUCATION CONCEPTS: Nature of scientific concepts, scientific method / inquiry, modeling and creativity. The development of scientific concepts (psycho-pedagogical approach), steps of the scientific method (observation, hypothesis, hypothesis testing, etc.), use of ICT in the educational process, creativity. 3. CHEMISTRY AS TEACHING SUBJECT: A. The history of Chemistry as a framework of analysis based on Jensen's scheme. Johnstone's three levels of Chemistry and students' difficulties. B. Macroscopic level, C. Submicroscopic level, D. Symbolic Level, E. Linking the three levels. 4. TEACHING OF CHEMISTRY: A. Chemistry curricula. B. Teaching approaches (applications of learning theories in chemistry teaching, analogies, concept maps, problem solving, inquiry approach). C. Assessment during teaching of Chemistry (teaching objectives - taxonomy, higher-order cognitive skills). 5. New theoretical approaches: Teaching scenarios.

Course materials: 1) "Science Education", P. Kokkotas (Gregory Pub.). 2) "Physic and Chemistry Education Topics in Secondary Education:, G. Tsaparlis (Grigori Pub.).

502. PSYCHOLOGY OF LEARNING – COGNITIVE PSYCHOLOGY (elective 3 hours/week)

Lectures: To be announced by the instructor on e-class.

Instructor: P. Roussos, Assistant Professor, Faculty member of the Department of Psychology

Course website: http://eclass.uoa.gr/courses/PPP146/

Course content: Definition, subject and history of Cognitive Psychology. Research methods of cognitive psychology (experimental, neuroimaging, simulations, artificial intelligence, etc.). Biological bases of cognitive processes. Information-processing Theory. Knowledge and representation (semantic representations: semantic features, semantic networks, propositional, schematics, scenarios). Analogical Representations: New Images, Mutual Models. Cognitive functions of attention, perception and memory. Organization of information in memory.

Course materials: Roussos, P. L. (2011). "Cognitive Psychology: The basic cognitive processes", Athens: TOPOS

Attention: The course examination (given in the Spring semester) is announced by the School of Philosopy Rectorate and takes place in auditoriums of the School of Philosophy.

602. HISTORY OF NATURAL SCIENCES (elective 3 hours/week)

Lectures: To be announced by the instructor.

Instructor: E. Patiniotis, Faculty member of the Department of History and Philosophy of Science.

Course website: http://eclass.uoa.gr/courses/PHS222/

Course content: The course aims to introduce students to the basic topics of history and historiography of modern science. It begins with an overview of the Scientific Revolution and continues with the episodes that marked the emergence and establishment of science from the 17th to the late 19th century: Chemical Revolution, the transition from force to energy and the emergence of modern physics, the transition from the History of Earth to Geology, Darwinism and the emergence of modern Biology, Electromagnetism and the theories of ether, etc. The course focuses on the events and the intellectual context of each period, but also on the methodological problems related with the ways historians reconstruct past scientific "discoveries" and the creation of new disciplines.Course materials: 1. Bowler, Peter J., and Iwan Rhys Morus. 2005. *Making modern science: a historical survey*. Chicago: University of Chicago Press. [Greek translation]. 2. Gillispie, Charles Coulston. 1960. *The Edge of objectivity: an essay in the history of scientific ideas*. Princeton, N.J.: Princeton University Press. [Greek translation]

603. INTRODUCTION TO PEDAGOGY (elective 3 hours/week)

Lectures: To be announced by the instructor.

Instructor: Z. Smyrnaiou, Faculty member of the Department of Philosophy, Pedagogy and Psychology

Course website: http://eclass.uoa.gr/courses/PPP303/

Course content: 1. Clarification of basic pedagogical concepts: Conceptual approach to the basic concepts of Pedagogy, such as: Education, Instruction, Culture, Learning, Teaching, Behavior and Training. 2. General objectives of teaching and learning objectives: Modern approaches to general learning objectives. What is a learning objective and how is it defined. The use of learning objectives. 3 Learning to teach and teaching: A brief overview of the theories of knowledge and learning. Teaching methods. Forms of teaching. Techniques and means. Teaching pathways. Evaluation system. 4. The nature of scientific concepts, scientific method, modeling and the experimental approach: 5. Recent

theoretical approaches: Modern theories of learning and teaching scenarios. 6. Evaluation: Modern approaches to evaluation where formative assessment is favored over cumulative or final evaluation. 7. Motivation, reward, punishment: Types of motivation, their use in education, rewards, punishments. 8. Classroom management: Students with learning issues, dyslexia, attention deficit syndrome, delinquent behavior, bullying.

Course materials in Greek: 1) "Cognitive Psychology and Teaching: Jean Piaget's Contribution to Modern Pedagogical and Didactical Thought", A. Koutsoukos, Z. Smyrnaiou, Herodotus Publ., Athens 2007, 2) "Learning and Teaching. Vol 2. Teaching Theory, Practice and Evaluation", M. Kassotakis and G. Flouris, Athens 2006.

529. ECONOMICS AND BUSINESS ADMINISTRATION (elective 3 hours/week, 4 ECTS credis)

Lectures: Mondays 3-6 pm (A15).

Instructor: N. Mylonas, Faculty member of the Department of Economic Sciences (coordinator)

Course website: http://eclass.uoa.gr/courses/CHEM214/

Course content: Introduction to the course. Part A: - Economy and Finance - Macroeconomic Models - The Laws of Supply & Demand - Basic Accounting Principles - The Time Value of Money - Investment Evaluation - The Chemical Industry.

Part B: Marketing and Strategy - Marketing - Human Resources Management - Business Strategy - Business Strategy in the Present - Introduction to Entrepreneurship. Epilogue.

Course materials: Instructors' notes.

703. MATERIALS CHEMISTRY (elective 4 hours/week 6 ECTS credits)

Lectures: Tuesdays and Thursdays 2am - 4pm (A2)

Instructors: A. Tsekouras, I. Papaefstathiou, C. Mitsopoulou (coordinator), G. Vougioukalakis, M. Pitsikalis

Course webpage: http://eclass.uoa.gr/courses/CHEM212/

Course content: Crystal structure and crystallography. Structure of solid and mechanical, electrical, magnetic and optical properties. Non-crystalline materials; ceramic materials (oxides, carbides, nitrides, borides) including optical inorganic materials and conductive inorganic materials (insulators, semiconductors, conductors). Nanoparticles. Complexes - catalysts (mono-, di- and polynuclear complexes). Optical materials including photosensitizers. Biomimetic materials including complexes with applications in medicine (eg MRI agents, radiofrequency materials) without drugs. Metal-Organic Frameworks, Metal-Organic Polyhedrons and Polygons. Magnetic materials (metal clusters, molecular magnetic materials and magnetic refrigerators). Alotropic forms of carbon (fullerenes, carbon nanotubes, graphene, graphene nanoribbons, other allotropic forms of carbon): symmetry, aromaticity, physicochemical properties, chemical reactivity, synthesis, derivatization methods, derivatives, characterization, applications. Carbon nanodots: synthesis, properties, applications. Supramolecular chemistry, molecular recognition, inclusion complexes and host-guest interactions,

organic materials for transfer of drug substances, molecular engines, nanoreactors, nanoparticles and other related nanostructures. Polymeric nanoparticles a. Nanoreactors b. Nanocontainers and c. Nanocarriers formed from pure polymeric materials. Nanocomposites (Hybrid) Materials: a. Polymeric/Inorganic Nanoparticles (Au, Ag, SiO_2, CdSe, CdTe, Fe_3O_4, Fe_2O_3) b. Polymers/Plane Inorganic Substrates (clay, mica) c. Polymer/Allotropic forms of carbon (fullerenes, carbon nanotubes, graphene, graphene nano-films).

Course materials in Greek: 1) Atkins and Paola, Physical Chemistry, Chapter 19. 2) Materials Chemistry, B.D. Fahlman, 2011, Springer. 3) Instructors' notes.

CHAPTER 7
UNDERGRADUATE THESIS REGULATIONS

7.1 Introduction – Definition – Purpose (Article 1)

[1] Introduction

The Curriculum includes the compulsory Undergraduate Thesis (UT). The UT is carried out in the last two semesters of study and corresponds to 2 semester-long courses. Each student is assigned a UT at the beginning of either the Winter or Spring semester, as long as specific prerequisites are met and according to the procedure described below.
The UT must correspond to one of the following 11 topics:
1) Analytical Chemistry, 2) Inorganic Chemistry, 3) Industrial Chemistry, 4) Biochemistry, 5) Clinical Chemistry, 6) Organic Chemistry, 7) Polymers, 8) Physical Chemistry, 9) Environmental Chemistry, 10) Food Chemistry, 11) Chemistry and Education.

[2] Definition – Purpose

The Undergraduate Thesis (UT) is an undergraduate experimental or theoretical research project on one topic, with rudimentary originality, which requires 2 semesters. The results of the research are written in a thesis, which is evaluated.
The purpose of the UT is for students to have practice and training in bibliographic research methods, designing and carrying out experiments or theoretical calculations to investigate or resolve questions in chemistry, evaluating results and their rational written and oral presentation. Finally, the purpose of the UT is to transmit to and cultivate the love for research in tomorrow's scientists. Basic knowledge of a foreign language is a prerequisite for success in bibliographic research.
While a student is working on their UT, they may also carry out a practical internship in a company/organization on a topic related to their UT. (See Department Announcements).

7.2 Conditions for Assigning an Undergraduate Thesis Topic (Article 2)

[1] The student must be in the 4th year of her/his studies. In exceptional cases, it is possible for students to start their thesis work during the spring semester of the 3rd year, only if the remaining Departmental, Laboratory and Topic conditions are met. The student must submit an application to the Secretariat for the early initiation of the Undergraduate Thesis. The General Assembly of the Department will take a decision after recommendation from the Undergraduate Studies Committee.
[2] The student must have passed at least 13 required courses.
[3] The student must have passed 1-5 required courses as determined by the Laboratory in which she/her will carry out the UT. These courses must be directly related to general scientific focus of the Laboratory. Thus, the student

will have successfully completed as many obligations as possible in the specific Laboratory so as to have the broadest knowledge of her/his UT topic.
These courses are determined by the Division in which the Laboratory is associated, immediately after adoption of these Regulations and will apply as long as these Regulations apply.

The corresponding course list for students who entered the Department before and including the 2011-2012 academic year is provided in the table below:

1. ANALYTICAL CHEMISTRY 1. Analytical Chemistry 2. Instrumental Analysis I 3. Instrumental Analysis II	2. INORGANIC CHEMISTRY 1.General & Inorganic Chemistry I 2. Inorganic Chemistry II 3. Inorganic Chemistry III (2 out of 3)	3. INDUSTRIAL CHEMISTRY 1. Analytical Chemistry 2. Instrumental Analysis I 3. Organic Chemistry I
4. BIOCHEMISTRY 1.Instrumental Analysis II 2. Biochemistry I	5. ORGANIC CHEMISTRY 1. Organic Chemistry I 2. Organic Chemistry II 3. Organic Chemistry III (2 out of 3)	6. POLYMERS 1. Analytical Chemistry 2. Organic Chemistry I 3. Industrial Chemistry
7. PHYSICAL CHEMISTRY 1. Physical Chemistry I 2. Physical Chemistry II 3. General & Inorganic Chem. I	8. ENVIRONMENTAL CHEMISTRY 1. General & Inorganic Chemistry I 2. Environmental Chemistry 3. Analytical Chemistry or Instrumental Analysis II	9. FOOD CHEMISTRY 1. Analytical Chemistry 2. Food Chemistry or Organic Chemistry III
10. CLINICALCHEMISTRY 1. Analytical Chemistry 2. Instrumental Analysis I 3. Instrumental Analysis II	11. CHEMISTRY AND EDUCATION As defined in Article 5	

The corresponding course list for students who entered the Department in the 2012-2013 academic year and after is provided in the table below:

1. ANALYTICAL CHEMISTRY 1. Analytical Chemistry 2. Instrumental Analysis I 3. Instrumental Analysis II	2. INORGANIC CHEMISTRY 1. General & Inorganic Chemistry I (Lecture) 2. General & Inorganic Chemistry I (Laboratory) 3. Inorganic Chemistry II (Lecture) 4. Inorganic Chemistry II (Laboratory) 5. Inorganic Chemistry III (Lecture) (prerequisite) 6. Inorganic Chemistry III (Laboratory) (prerequisite) (5 out of 6)	3. INDUSTRIAL CHEMISTRY 1. Analytical Chemistry 2. Instrumental Analysis I 3. Organic Chemistry I
4. BIOCHEMISTRY 1.Instrumental Analysis II 2. Biochemistry I	5. ORGANIC CHEMISTRY 1. Organic Chemistry I 2. Organic Chemistry II (Lecture) 3. Organic Chemistry II (Laboratory)	6. POLYMERS 1. Analytical Chemistry 2. Organic Chemistry I 3. Industrial Chemistry

	4. Organic Chemistry III (Lecture) 5. Organic Chemistry III (Laboratory) (3 out of 5 of which 1 must be a Laboratory)	
7. PHYSICAL CHEMISTRY 1. Physical Chemistry I 2. Physical Chemistry II (Lecture) 3. Physical Chemistry II (Laboratory) 4. General & Inorganic Chemistry I (Lecture) 5. General & Inorganic Chemistry I (Laboratory)	8. ENVIRONMENTAL CHEMISTRY 1. General & Inorganic Chemistry I 2. Environmental Chemistry 3. Analytical Chemistry or Instrumental Analysis II	9. FOOD CHEMISTRY 1. Analytical Chemistry 2. Food Chemistry or Organic Chemistry III (Lecture) Organic Chemistry III (Laboratory)
10. CLINICALCHEMISTRY 1. Analytical Chemistry 2. Instrumental Analysis I 3. Instrumental Analysis II	11. CHEMISTRY AND EDUCATION As defined in Article 5	

[4] The student must have passed 1-2 courses, predefined by each faculty member who will supervise the UT. These courses must be related to the UT topic and ensure the foundation for more specialized knowledge. Courses from the two most recent semesters are allowed as long as they are alternately considered with an equal number of courses from the previous 6 semesters. These courses will be announced together with Thesis topics as described below.

[5] Faculty members from various Laboratories can supervise UT topics in the "Chemistry and Education" category after notifying the Department Secretariat. The conditions regarding the topic include the prerequisite courses as defined by the Laboratory to which the supervising Faculty member is associated as well as a passing grade in the "Teaching Chemistry" course.

[6] Conditions [1] – [2] are Departmental requirements, ensure a minimum level of basic knowledge and, to a certain extent, lighten the burden of an excessive number of courses to pass, in order for the student to be capable of choosing a Thesis topic. Any modification of the Department Requirements must be approved by the Department General Assembly, must be announced in time and will be taken into effect for the group of students who will begin their UT in the semester following the next. Condition [3] is a Laboratory Requirement, and condition [4] is a Topic Requirement.

Laboratory and Topic Requirements may not be met completely as long as there are available UT places and both the Laboratory and the Faculty supervisor agree.

7.3 Announcement of Undergraduate Thesis Topics (Article 3)

[1] Each Chemistry Department Faculty member can supervise a maximum of 4 UT in each academic year, 2 per semester.

[2] Each UT topic is carried out by two students. If however, there are available UT places and both the Faculty supervisor and the student agree, a Thesis topic can be given to an individual student.

[3] The announcement of UT topics, by Laboratory and Faculty member, is made by the Department Secretariat, which collects the corresponding lists from the Laboratories 15 days before the end of examination periods in June, September and February.

[4] Informal or early assignment of UT topics to students is not allowed, if the awarding procedure is not followed exactly as prescribed in these Regulations.

[5] After the timely announcement of topics, students have ample time to contact Faculty members for additional information regarding the projects and demands (for example, attendance in the Laboratory or other Public/Private Organizations, laboratory time requirements, possible difficulties) in order to have a more complete idea before choosing a topic. In addition, the timely announcement of topics and related requirements allows students to make alternative choices and also to choose which courses to concentrate on in the forthcoming exams.

7.4 How students are selected for the Undergraduate Thesis (Article 4)

Immediately after posting the exam results from the September, and Winter and Spring semesters, and within 10 days after the Secretariat Announcement of topics, students who fulfill the requirements in Article 2 can submit an electronic application, following the Secretariat instructions.

Only the first preference of the students is taken into account, and as a selection criterion, the sum of the grades in the courses which they have passed, doubling the grade in those courses required by the Laboratory (Article 2 paragraph 3). In the case of available places, a new selection follows, taking into account students' second preference, then the third, and so on. The Secretariat follows the choice of students according to topic.

7.5 Undergraduate Thesis Work (Article 5)

[1] Undergraduate theses have exclusively research content. The Thesis topic can be changed so that it has bibliographic content fully justified by the Faculty member concerned. The Department General Assembly will decide accordingly after recommendation from the Undergraduate Studies Committee.

[2] The UT work cannot be significantly overdue. The UT duration (including bibliographic research, experimental work, writing, correcting and presentation) cannot exceed two academic semesters. In the case that two semesters are exceeded, the Faculty supervisor and the student must request a semester extension. The Department General Assembly will decide accordingly after recommendation from the Undergraduate Studies Committee.

[3] In the case that the Faculty supervisor finds that the student is delaying the progress of or is not showing adequate interest in the Thesis work, or is using

laboratory equipment and means at the expense of other students, then the supervisor can submit a written report to the Undergraduate Studies Committee. The report may request the repeal of the topic assignment in order to re-assign the same topic or a related topic to other students in the following semester.

[4] As in the case described above, students who have been assigned a Thesis topic and who find that their assigned Faculty member is not adequately supervising or helping in carrying out their UT, or situations which are leading to delay in completing the Thesis, can also submit a written report to the Undergraduate Studies Committee.

7.6 Undergraduate Thesis Examination – Grading (Article 6)

[1] After carrying out the UT work and following correction of the initial text by the Faculty supervisor, the UT is printed in its final form, which is uniform and conforms to a model to be determined. A copy is submitted to the Department Secretariat. The Secretariat provides the Faculty supervisor with the grade sheet, on which the following evaluation points will be graded (from -10):

- UT content quality and presentation (the same grade for both students)

and for each student individually:

- Oral presentation
- Knowledge of the specific UT topic and related bibliographic information
- Knowledge of the general area of the UT topic
- Work ethic and good laboratory practices

The grade sheet is completed, signed and returned to the Department Secretariat. The average grade of all the evaluation points for each student, rounded to the nearest unit, make up the final UT grade which is assigned to the each student transcript.

[2] The Thesis examination is given in the presence of an audience and only during the normal examination periods of the Academic year and not after more than one week after the last lesson of each period.

7.7 General Provisions (Article 7)

[1] Any issue which arises during the application of these regulations and which is not addressed here is settled in the Undergraduate Studies Committee, which depending on the issue's severity and nature may refer to the Department or Division Assembly for solution.

[2] Modifications or additions to these Regulations, required for good reason, are only decided by the Department Assembly upon recommendation of the Undergraduate Studies Committee.