Università di Camerino

Scuola di Scienze e Tecnologie

Laurea in Chimica
(Bachelor Degree in Chemistry)

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Number of credits: 180 ECTS.

Degree Programme introduced from the Academic Year 2009-2010.

Entry qualifications for this Degree Programme: High School-leaving certificate.

Self-evaluation report for application of the Eurobachelor Label in Chemistry

On the basis of the New Statute, issued by the Rectoral decree n.148 of February, 25th 2009 and published in Gazzetta Ufficiale della Repubblica Italiana n. 63 of March, 17th 2009, Faculties and Departments of University of Camerino merged into **Strutture Autonome Responsabili di Ricerca e Formazione (SARRF),** independent structures that supervise and coordinate research and formation activities, competencies and knowledge transfer and services. Such structures join the competencies of the Departments (research) and Faculties (formation) and are named "University Schools". The Chemistry degree is part of School of Science and Technology; the School Council is in charge for the survey of Chemistry Degree.

Table 1 provides an outline of the structure of the study programme divided according to years 1-3 (corresponding to 180-credit programmes).

Table 1

YEAR 1

Course unit title	Semester	Course No	Credits (ECTS)	Compulsory (C) or Elective (E)	Module	Total Teaching Hours			Pre-requisites
						Lecture	Practical	Other	
General Inorganic Chemistry and Laboratory	1	1	14 (7 +7)	C	General Inorganic Chemistry	56			None
					Laboratory of General Inorganic Chemistry	24	12	36 Exercises	
Mathematics	1,2	2	12 (8 I sem. + 4 II sem)	C		88		12 Exercises	Basic Algebra and Geometry of High School
Physics and Laboratory	1,2	3	12 (6 I sem + 6 II sem)	C		80		24 Exercises	Course No 2
Language studies	1	4	6	C		40		12 Exercises	
Informatics and Numerical Applications	2	5	5	C		32	12		None
Physical Chemistry 1 and Laboratory	2	6	10 (6 + 4)	C	Physical Chemistry 1	48			Course No 1,2
					Laboratory of Physical Chemistry 1	16	24		

YEAR 2

Course unit title	Semester	Course No	Credits (ECTS)	Compulsory (C) or Elective (E)	Module	Total Teaching Hours			Pre-requisites
						Lecture	Practical	Other	
Analytical Chemistry 1 and Laboratory	1	7	12 (6 + 6)	C	Analytical Chemistry 1	48			Courses No 1,2,3
					Laboratory of Analytical Chemistry 1	16	48		
Organic Chemistry 1 and Laboratory	1	8	10 (7 + 3)	C	Organic Chemistry 1	56			Courses No 1
					Laboratory of Organic Chemistry 1		36		
General Economics	1	9	4	C		32			None
Biochemistry	2	10	6	C		40	12		Course No 1, 8
Inorganic Chemistry 1 and Laboratory	2	11	10 (5 +5)	C	Inorganic Chemistry 1	40			Courses No 1
					Laboratory of Inorganic Chemistry 1	24	24		
Physical Chemistry 2 and Laboratory	2	12	10 (6 + 4)	C	Physical Chemistry 2	40		12 Exercises	Courses No 6
					Laboratory of Physical Chemistry 2	16	24		
Food Chemistry	2	13	6	C		32	24		Courses No 8
Elective Course [1]	2	From 18 to 31	4	E		32			

[1] The elective course can be chosen in the list reported below (from No 18 to No 31).

YEAR 3

Course unit title	Semester	Course No	Credits (ECTS)	Compulsory (C) or Elective (E)	Module	Total Teaching Hours			Pre-requisites
Analytical Chemistry 2 and Laboratory	1	14	12 (6 + 6)	C	Analytical Chemistry 2	48			Courses No 1,7
					Laboratory of Analytical Chemistry 2	16	48		
Organic Chemistry 2 and Laboratory	1	15	14 (7 + 7)	C	Organic Chemistry 2	48		12 Exercises	Courses No 8
					Laboratory of Organic Chemistry 2	32	36		
Certification	1	16	4	C	C	32			None
Chemistry and Technology of Materials	2	17	6	C	C	32	24		Course No 8,15
Elective Course [1]	2	From 18 to 31	4	E	E	32			
Elective Course [1]	2	From 18 to 31	4	E	E	32			
Bachelor Thesis Experimental and Discussion		32	15 (10+5)	C	C		375		

[1] Elective courses can be chosen in the list reported below (from No 18 to No 31).

Elective Courses:

Course unit title	Course No	Credits (ECTS)	Total Teaching Hours		
			Lecture	Practical	Other
Clinical biochemistry	18	4	24	12	
Gaschromatographic Chemical Analysis	19	4	24	12	
Spectroscopic Chemical Analysis	20	4	32		
Medicinal Chemistry	21	4	32		
Chromatography	22	4	24	12	
History of Chemistry	23	4	32		
Applied Biochemistry	24	4	24	12	
Biopolymers	25	4	32		
Analytical Chemistry of Cultural Artefacts	26	4	24	12	
Theoretical Chemistry	27	4	32		
Chemical Didactics	28	4	32		
Enzymology	29	4	24	12	
Catalytic Asymmetric Synthesis	30	4	32		
Molecular Spectroscopy	31	4	32		

Table 2

Outcomes: Subject Knowledge

Aspect of chemistry	Treated in Course unit
a) Major aspects of chemical terminology, nomenclature, conventions and units	**1, 6, 7, 8, 11**
b) The major types of chemical reaction and the main characteristics associated with them	**1, 6, 7, 8, 11, 17**
c) The principles and procedures used in chemical analysis and the characterisation of chemical compounds	**1, 6, 7, 8, 11, 12, 13, 14, 15, 17**
d) The principal techniques of structural investigations, including spectroscopy	**6, 7, 8, 11, 12, 14, 15**
e) The characteristics of the different states of matter and the theories used to describe them	**1, 6, 7, 11, 12, 14, 15**
f) The principles of thermodynamics and their applications to chemistry	**1, 6, 11, 12, 15**
g) The principles of quantum mechanics and their application to the description of the structure and properties of atoms and molecules	**1, 6, 8, 11, 12, 15**
h) The kinetics of chemical change, including catalysis; the mechanistic interpretation of chemical reactions	**1, 6, 8, 11, 12, 15, 17**
i) The characteristic properties of elements and their compounds, including group relationships and trends within the Periodic Table	**1, 11**
j) The structural features of chemical elements and their compounds, including stereochemistry	**1, 8, 11, 15**
k) The properties of aliphatic, aromatic, heterocyclic and organometallic compounds	**8, 11, 15**
l) The nature and behaviour of functional groups in organic molecules	**8, 15**
m) Major synthetic pathways in organic chemistry, involving functional group interconversions and carbon-carbon and carbon-heteroatom bond formation	**8, 15**
n) The relation between bulk properties and the properties of individual atoms and molecules, including macromolecules (both natural and man-made), polymers and other related materials	**8, 11, 15, 17**
o) The structure and reactivity of important classes of biomolecules and the chemistry of important biological processes	**10**

Tables 3-4.

Outcomes: Generic Competences

1.1 The capacity to apply knowledge in practice, in particular problem-solving competences, relating to both qualitative and quantitative information.

1, 6, 7, 8, 11, 12, 13, 14, 15, 32. Problem-solving skills and competencies are developed within all the practical laboratory activities and in numerical exercitations of theoretical courses on both qualitative and quantitative aspects of knowledge and information

1.2 Numeracy and calculation skills, including such aspects as error analysis, order-of-magnitude estimations, and correct use of units.

1, 2, 3, 5, 6, 7, 12, 14. Error analysis, order-of-magnitude estimation, correct use of units, together with numeracy and calculus skills, are developed by students within most of the practical laboratories and in General Inorganic Chemistry, Physics, both the Physical Chemistry 1 and 2 and both the Analytical Chemistry 1 and 2 courses.

1.3 Information-management competences, in relation to primary and secondary information sources, including information retrieval through on-line computer searches.

5, 9, 15, 32. In some courses the students are required to perform on-line computer search on specific topics and prepare final reports independently.

1.4 Ability to analyse material and synthesise concepts.

7, 13, 14, 15, 17. In some courses the students are required to set up an analysis procedure on the parameters involved in facing and solving a practical problem. They must prepare a written synthetic report on the procedure and the results.

1.5 The capacity to adapt to new situations and to make decisions.

6, 7, 8, 11, 12, 13, 14, 15, 32. Mostly in the laboratory courses the students must face the practical actuation of the theory and adapt to different situations.

1.6 Information-technology skills such as word-processing and spreadsheet use, data-logging and storage, subject-related use of the Internet.

5, 32. In the course of Informatics and Numerical Applications the students will be trained into the use of available Information-technology tools such as word-processing and spreadsheet use, data-logging and storage, subject-related use of the Internet, that will be massively applied during the Bachelor Thesis Final Report preparation.

1.7 Skills in planning and time management.

6, 7, 8, 11, 12, 13, 14, 15, 32. All the practical laboratories and mainly the experimental work during the Bachelor Thesis preparation, concur to develop and increase skills in planning and time managing.

1.8 Interpersonal skills, relating to the ability to interact with other people and to engage in team-working.

6, 7, 8, 11, 12, 13, 14, 15, 32. All the practical laboratories and mainly the experimental work in a safe environment during the Bachelor Thesis preparation, concur to develop and increase interpersonal and team-working skills.

1.9 Communication competences, covering both written and oral communication, in one of the major European languages (English, German, Italian, French, Spanish) as well as in the language of the home country.

4, 32. A total of 6 credits are allocated to language studies (English). In addition, in some courses the evaluation is based on final reports prepared independently by students with the aim of subject-related use of Library and Internet Scientific Sources and Data-Banks (in English) available in the buildings of the School of Science and Technology. Finally, also the preparation of the final report of the Bachelor Thesis or at least, the presentation of the experimental work, is strongly recommended in English Language to all students. Of course, students must face with retrieving and resuming the "state of the art" in the research field they apply for within the Thesis period, through a deep and comprehensive bibliographical research they must carry out on the scientific progresses in the subject topic.

1.10 Study competences needed for continuing professional development. These will include in particular the ability to work autonomously.

11, 12, 13, 14, 15, 16, 17, 32. In the Bachelor Thesis, in particular, the students work more independently on a new research topic assigned by the Tutor, however a number of courses are devoted to improve the study competences. In fact in the final examination a personal report is required which includes individual research on a particular field of chemistry and technological applications.

1.11 Ethical commitment

1, 7, 14, 16, 17, 32. Many courses deal with ethical aspects of chemistry, mainly related to the development of new environmental friendly strategies aimed to more sustainable and less waste-consuming industrial processes. This is a fundamental aspect for the solution of important social problems such as man's health and the improvement of quality of life. In the development of new materials for the electronics or other special uses, the search of alternative sources of energy and also the safeguard of the environment must be taken into account.

2. Outcomes: Chemistry-based Practical Skills

As reported in Table 1 there are 36 ECTS devoted to chemistry practical courses, in which training, experimental and numerical work is partly independent, and partly as cooperative learning where groups can be from two to four members. Particular attention is paid to safe laboratory procedures for handling hazardous materials, including compressed gases and cryogenic liquids. The whole number of credits (36) are composed by 27 ECTS of laboratory practice and 9 ECTS of numerical training. Teachers give hands-on guidance to the students and assign roles in cooperative learning activities. Teaching to small groups (2-3 students) is the predominant didactical methodology adopted in the practical courses.

3. Content (Tables 5a-5b)

Please supply the following information:

3.1 Several courses are organized in a modular form. The Total number of courses units in the Bachelor, including the Compulsory (C) and Elective (E) courses and the Bachelor Thesis is 21 (Table 5a). For further details see Table 1.

Table 5a	
Subject	**Total number of courses units**
Chemistry (C)	12*
Chemistry (E)	3**
Language (C)	1
Physics (C)	1
Mathematics (C)	2
Other Studies (C)	2

*Laboratory courses and Bachelor Thesis are included

** Students can select among elective courses in Table 5b

3.2 The minimum size of modules and lecture units is 3 credits, but the minimum size of courses is 4 credits; whereas maximum size is 14.

3.3 A list of available elective course units typically taken by students is reported in Table 5b :

Table 5b	
Course Unit Title	**Credits**
Clinical and Biochemistry	4
Gas-Chromatographic Chemical Analysis	4
Spectroscopic Chemical Analysis	4
Applied Biochemistry	4
Biopolymers	4
Analytical Chemistry of Cultural Artifacts	4
Medicinal Chemistry	4
Theoretical Chemistry	4
Chromatography	4
Chemical Didactics	4
Enzymology	4
Catalytic Asymmetric Synthesis	4
Molecular Spectroscopy	4
History of Chemistry	4

3.4 The total number of credits carried by course units (including the Bachelor Thesis if applicable) which deal with chemistry, physics, biology or mathematics is 166.

4. Distribution of Credits (Tables 5c-5d)

4.1 The number of credits forming the "core" is 139, which composition is reported in Table 5c:

Table 5c	
Subjects Courses	**Number of Credits**
Analytical Chemistry (C)	24 credit units
Inorganic Chemistry (C)	24 credit units
Organic Chemistry (C)	24 credit units
Physical Chemistry (C)	20 credit units
Biochemistry (C)	6 credit units
Food Chemistry (C)	6 credit units
Chemistry and Technology of Materials (C)	6 credit units
Physics (C)	12 credit units
Mathematics (C)	17 credit units

The number of credits forming the "core chemistry" is 110.

4.2 Additional sub-disciplines included (26 credits) are reported in Table 5d:

Table 5d	
Subjects Courses	**Number of Credits**
General Economics (C)	4 credit units
Biochemistry (C)	6 credit units
Food Chemistry (C)	6 credit units
Chemistry and Technology of Materials (C)	6 credit units
Certifications (C)	4 credit units

4.3 All the previous additional sub-disciplines are compulsory. The students must select 3 elective courses of 4 credits each from a recommended list as reported in previous Table 5b (total 12 credit units). The Bachelor Thesis (15 credit units) consists in an experimental work as part of an original research.

4.4 English course (6 credit units) is compulsory. The Language Centre of our University offers wide range of language courses of different levels.

4.5 Our Institution does not allow individually-negotiated study programmes.

5. ECTS and Student Workload

5.1 We have two annual semesters of *ca* 15 weeks, with a total of *ca* 30 weeks per year, as teaching activities (lessons and laboratories). A total of 14 weeks are reserved for examinations; in detail we have a winter period of 4 weeks after the 1st semester, a

summer period of 6 weeks after the 2nd semester, and an additional period of 4 weeks after the summer. Thus the average academic year will be *ca* 44 weeks.

5.2 The Ministry of Education expects that the students work annually 1500 hours, which makes 40-42 hours per week on academic study.

5.3 The assignment of the credit units is based on the following figures when estimating the student workload:

- lecturing: 1 credit unit corresponds to 8 h of lecturing and 17 h of individual study work.
- tutorials/problem-solving classes: 1 credit unit corresponds to 12 h tutorials/ problem-solving classes (depending on the activity requirements/bonus for the final examination) and 13 h of individual study work.
- laboratory courses: 1 credit unit corresponds to 12 h laboratory work and 13 h of individual study work.

5.4 The actual student workload is annually monitored by Quality Assurance Internal Office and evaluated by the School Council for its correspondence to the Study program, as a fundamental part of the revision process and quality improvement (see also section 11).

6. Course Units and Mobility

6.1 Mobility, according to international agreements, is strongly encouraged and evaluated in the final exam for the title achievement. The Office of Mobility and International Relations of the University of Camerino offers support and information to students on international mobility, on international cooperation and on the availability of European funds for research and education. In addition, the EU grant is increased by a financial contribution from the University.

To convert student grades obtained abroad into the local grading system, a procedure has been set up according to the new ECTS guidelines. With the collaboration of Unicam computer services, we obtained a list of grades of all exams of the Bachelor Degree in Chemistry of the last three years and we calculated the distribution of the grades. To build a conversion table with another, foreign, course, we will compare our distribution with the foreign one. We are implementing a trial procedure starting with the foreign universities with which we have closest relationships. With their help, we will then standardize the whole procedure to speed up its implementation with all foreign universities involved in the Erasmus Programme within the Bachelor Degree in Chemistry.

6.2 The non-transferable modules involve only the first year.

7. Methods of Teaching and Learning

7.1 Institutionally a professor as tutor is assigned to every student for his study program, in addition each professor has a defined time scheduled for receiving the students individually, to answer questions about the aspects discussed in the lectures and not clear in that moment, to give information on the program of the course, and to help them in each step of their studies, particularly concerning the preparation of the examination.

Tutorial system is used in some courses when it is possible, i.e., when there are students available for this activity, aim to provide training and practice in solving problems both individually and in groups, to provide feedback to students on their understanding of lecture course material and problem-solving skills and to develop students' communication skills.

7.2 Teaching to small groups (2-3 students) is the predominant didactical methodology adopted in the practical courses. In theoretical courses normally there isn't any special activity to be performed in small groups.

7.3 In some lecture courses problem-solving class tests are scheduled. In some cases these tests are needed to participate in the final examination of the course.

7.4 Multimedia techniques are often used in our courses. All the lecture halls are equipped with multimedia facilities and special facilities are available in the departments.

7.5 Teamwork as an element of teaching is not used in the Bachelor courses.

7.6 Bachelor Thesis is based on an experimental work carried out by the students that is verified through the final dissertation. The Bachelor Thesis can be based on a practical training followed in the university labs or in external research institution or industries. For such activity a system of cooperation must be agreed between University and industry, with a tutor from each partner.

7.7 Students can perform their Bachelor thesis period in external research institution or industries, on the basis of bilateral agreements. All the available positions are reported in a dedicated database of University website.
(https://vela.unicam.it/stageunicam/banca_dati.asp)

7.8 Chemistry students are warranted of one member in the School Council. All the university students are represented in the following Governance Organisms: Senate of the Representatives (6 students), Administration Council (1 student), Committee of Equal Opportunities (4 students) and Committee for University Sports (3 students).

8. Assessment procedures and performance criteria

8.1 Usually the assessment is carried out with examinations at the end of each period or semester, during specific sections assigned to the examinations. There are three official sections devoted to this activity: one just at the end of the semester, one summer section and one fall section. However, in many cases, special sections can be arranged, according to the demand of the students.

8.2 We have no "group examinations".

8.3 Both written and oral examinations are generally used. In some courses, preliminary laboratory reports are followed by oral discussion. In any case, oral examinations are

predominant.

8.4 Usually marking for students elaborations is not checked by a second examiner.

8.5 In all examinations at least 2 examiners are always involved.

8.6 Maximum time for written examinations is 4 h and the minimum 2 h.

8.7 Generally there is a public list with names of the students and the results obtained in the examination.

8.8 Normally there is not any feedback for students in the form of “model answers” except in few courses, since most of the examinations are oral and the corrections are done in real time. In the case of written examinations and scientific reports, some teachers discuss with the students their own examination or reports.

8.9 We have no examination board approving written examinations. It is the responsibility of the teacher(s) concerned.

9. Grading

9.1 The ECTS grading system is for all students (mobile and home).

9.2 For individual courses the ECTS grades of 18 – 30 are assigned by the lecturer. For modular courses the ECTS grades of 18 - 30 are assigned by all the lecturers involved. In all cases the grades are registered and collected by the Students Registry Office through an on-line procedure. The Bachelor grade (from 66 to 110) is assigned by the School of Science and Technology.
Grades obtained abroad are converted into the local grading system by following the new ECTS guidelines as described in section 6.1.

10. The Diploma Supplement

10.1 The Diploma Supplement describing all study attainments is given by the Office of the University after the discussion of the Thesis. The Diploma Supplement form is stated by the Italian Ministry of the University.

10.2 The languages of the Diploma Supplement are English and Italian.

11. Quality Assurance

Since 2000 the Bachelor degree course in Chemistry, as most of the courses in our University, has an Internal Quality Assurance Structure based on the ISO9001:2000 quality management system, which allowed the acquisition of the ISO9001:2000 quality certificate in 2003, released by the AFAQ group (now AFNOR). The structure of the

Quality Assurance system is described in the quality handbook (see Appendix 5-7) where procedures are reported for all the processes that have a direct impact on all the phases of the Bachelor degree (students enrollment, courses organization, courses delivering, communication, tutoring, stage and placement, mobility, resources, analysis and enhancement, etc.). Once a year the correct application of procedures is verified by an internal audit group. There is also a capillary customer satisfaction analysis based on students, families and employers interviews, which, together with the National and International indicators, leads the quality enhancement process. Particular attention is devoted to the student workload monitoring as mentioned in section 5.4. In detail, during the course the students fill a questionnaire covering various topics, including the workload of the course compared to the credit units. The questionnaires are collected anonymously and the summary made by a clerk is given to the lecturer and to the head of the School. Moreover, Group Didactic Tutoring Meetings are scheduled in which problems encountered by the students are discussed.

12. Employability

12.1 The acquisition of the Bachelor degree will give the following opportunities of employment:

- to assist specialists in chemical research activities or in activities requiring application of chemical protocols;
- to carry out well defined protocols or procedures;
- to execute laboratory tests for the development of new products under the supervision of a Senior Chemist;
- to carry out chemical analyses and quality checks, that can require the knowledge and mastery of advanced chemical and instrumental techniques, on the basis of the specific product under control;
- to apply standard methodologies in the chemical analyses, in the direction of chemical laboratories, in pure and applied chemical advices and in any other activity of Junior Chemist professional as defined by the actual legislation;
- to deal with customers' demands, suggesting them on the correct use of products. To put in relationship the customers' requests with the development activities in laboratory, production and marketing.

12.1 Actually almost 90% of our graduates continue their studies to a second degree or Master program in our or other institutions.

Statement of Applicant

I, Professor Silvia Zamponi, Responsible of the Degree Courses in Chemistry of the School of Science and Technology of the University of Camerino, Italy, hereby agree that this School will, if awarded the Eurobachelor label, recognize Bachelor degrees in Chemistry awarded by other institutions holding the Eurobachelor label as providing automatic right of access (but not of admission) to Chemistry Master programs offered by this School.

I hereby authorize ECTN Association and the Società Chimica Italiana to archive information provided as well as to use it (without giving source) for scientific, statistical, promotional, and educational use.

Appendix

1) Course unit descriptions.
2) Numbers of academic teaching staff.
3) Diploma Supplement form.
4) Manuale della Qualità.
5) Unicam Quality System.
6) Initiatives for Quality System.