Part Two: Information on degree programs

A) General description

FACULTY OF CHEMISTRY AND CHEMICAL ENGINEERING

ADDRESS

Faculty of Chemistry and Chemical Engineering
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BRIEF HISTORY

The Faculty of Chemistry and Chemical Engineering was formally founded in the beginning of 1995, but its evolution started 35 years ago. At that time the College of Engineering and Technology with the Department of Chemical Engineering was founded. In 1975 the College of Engineering and Technology evolved into the School of Engineering and Technology and became a member of the newly founded University of Maribor. Ten years later it developed into the Faculty of Technical Sciences. From this date onwards the Department of Chemical Engineering actually functioned within the School of Engineering and Technology or the Technical Faculty, respectively, as an independent unit offering study programs leading to the degree of higher education and to an associate degree. Thus the Faculty of Chemistry and Chemical Engineering started on its own by merely continuing its work as an established scientific institution of higher education with the relevant references and rich co-operation with similar institutions home and abroad.

Parallel to pedagogical work research work was developed and deepened in the fields of process and system engineering, separation processes, polymer, inorganic, organic, analytical, physical and structural chemistry. All the teachers, assistants and technicians are engaged in the research process in terms of basic and/or applied research. Most of the research is financed by the competent ministries, and particularly by the town research community. Some projects are international while others are financed by companies. Most researchers involved in chemistry or chemical technics from other faculties of our university too are engaged in our research process. We are herewith the basic research unit in the mentioned fields at our university. Our research work thus encourages the development of new researchers who work on diplomas, master's and doctoral theses.

ORGANISATION

The Faculty of Chemistry and Chemical Engineering has two Chairs which are responsible for academic and study related matters:

Chair of Chemistry
Chair of Chemical Engineering

The Institute of Chemical and Chemical Engineering Research is an organisation unit of the Faculty. Research work is performed in eight Laboratories:

Laboratory of Inorganic Chemistry
Laboratory of Organic and Polymeric Chemistry and Technology
Laboratory of Analytic Chemistry and Industrial Analysis
Laboratory of Physical Chemistry and Chemical Thermodynamics
Laboratory of Process Systems Technology
Laboratory of Separation Processes
Laboratory of Water Technology
Laboratory of Heating Engineering

TEACHING AND RESEARCH STAFF

The number and structure of faculty staff as of July 2004 are:

	Regularly employed	Part-time lecturers	Lecturers with contract or retired lecturers
Full Professors	6	3	1
Associate Professors	4	2	-
Assistant Professors	14	14	1
Lecturers	-	2	-
Scientific Councilor	-	1	-
Assistant	6	3	-
Technicians	7	-	-
Researches	15	-	-
Administrators	9	-	-
Public work staff	3	-	-
Meritorious Professors	-	-	4
Alltogether	64	25	6

Regarding students, however, estimates of the last ten year period have shown that the average of graduate full time students enrolled in all four study years is 210 per year. The average of graduates is 53, including the 15 from the university program. The postgraduate study has since its start in 1984 given 44 holders of a PhD degree and 52 holders of an M.Sc. degree.

The extent of the research work is quite broad. The teaching staff members and junior researches are involved in many international projects as coordinators or equal research partners, in several fundamental and applied projects, which are joint projects with the industry.

QUALIFICATION AWARDED

The Faculty of Chemistry and Chemical Engineering offers the following study programs:

- **Undergraduate program of university studies chemical engineering**

  Qualification awarded: University Degree in Chemical Engineering
  Options: Chemical Engineering
  Biochemical Engineering
  Duration of studies: four years. Another year is allowed for writing a diploma thesis.

- **Professional higher education program chemical engineering**

  Qualification awarded: Higher Professional Degree in Chemical Engineering
  Duration of studies: three years. Another year is allowed for writing a diploma thesis.

- **Postgraduate programs**

  a) Qualification awarded: M.Sc. Degree in Technical Sciences
  Duration of studies: two years

  b) Qualification awarded: PhD Degree in Technical Sciences
  Duration of studies: two years

Undergraduate programs

Both curricula, the university and as well the higher professional, have a common first year. The common subjects are mathematics, physics, chemistry (inorganic, analytical, organic and physical), materials, process balances, machine elements, process devices and economics. Special attention is given to the empirical student work. There are no fields in our program where students are not required to do calculation – laboratories – computer exercises or seminars.

In the third year, the students of the university program select between two options of study: Chemical Engineering and Biochemical Engineering. The fundamentals of the technical study are common for both options, e.g. thermodynamics, transport phenomena, unit operations, materials, reaction engineering etc. In the fourth year, the emphasis in the option Chemical Engineering is on integrated subjects of process system engineering, which are composed of process design, process dynamics, process optimization and development of processes. The emphasis in the option Biochemical Engineering is on special topics of biochemical engineering, like microbiology, cell physiology, toxicology, bioreactions etc. Students can choose one (option Chemical Engineering) or three (option Biochemical Engineering) elective courses from a broad variety of interesting courses. 2 months practice must be carried out in the study- period. The study is completed with the preparation of diploma thesis.

The curriculum for higher professional education has additional subjects concerning unit operations, process systems, safety and enterprise. Students can thus choose subjects from a range of alternative technologies. After 6 semesters of lectures and practice completed at the faculty, they are, according to regulation, in the fourth year required to absolve a 15 weeks practice in the industry and a diploma.

Postgraduate programs

The master's study takes 2 years. The structure of the study adopts the modular system, which allows students greater flexibility and control over their learning. Various elective courses are grouped into five modules: Chemical Engineering, Biochemical Engineering, Chemistry and Chemometrics, Materials in Chemistry, Chemical Environmental Protection and Sustainable Development. Student chooses, in consensus with the supervisor his/her own syllabus composed of the courses in the minimal amount of 75 ECTS. Up to 49 % of ECTS can be collected at other faculties in the country and abroad. The important part of the study is the master's thesis, which has a scientific character and has to be published in a reviewed international journal.

The doctoral study is individual. The doctoral degree can be obtained after the master's degree by publishing two papers in the journals cited by the Institute of Scientific Information's (SCI) and successful defense of doctoral thesis.

Students can also apply for doctoral degree directly after finishing the undergraduate university study. They have to include two compulsory courses into the syllabus (min 30 ECTS) and 3 elective courses from the modules mentioned above (min 45 ECTS). They have to publish at least 2 papers in SCI periodicals. The papers must be published or accepted for publication prior to the promotion of the Master's or Doctor's title.

ADMISSION REQUIREMENTS

Undergraduate university program: a successfully completed matura examination or professional matura with the fifth subject.
Professional higher education program: a successfully completed final examination.
In case of enrolment limitations, applicants are admitted according to their GPA on the matura examination (60 % of the points) and their overall GPA in the third and fourth year of secondary school (40 % of the points).
Postgraduate programs: a successfully completed undergraduate university program.

ACCESS TO FURTHER STUDY

Graduates in undergraduate university program can directly continue their studies at the post-graduate level in program leading to M.Sc. degree provided that they have obtained a GPA of at least 8. Students with a GPA below that can enroll if they successfully participated in research at their faculty during their undergraduate studies and can prove it by published articles and papers.
Graduates in undergraduate university program that have earned a GPA of at least 9.5 during their studies can directly continue their studies in a doctoral program.
Graduates in the professional higher education program can continue their study at the undergraduate university program. They can enroll in the third year provided that they have successfully accomplished differential examinations in Mathematics II and Process Balances as well as the selected laboratory exercises and additional examination in Material Science.

LANGUAGE AT THE FACULTY OF CHEMISTRY AND CHEMICAL ENGINEERING

The majority of the lectures and examinations at the Faculty of Chemistry and Chemical Engineering are held in Slovene. For transitional students consultations with the lecturers and examinations are offered also in English.

EXAMINATION AND ASSESSMENT REGULATIONS

The examinations are usually written and oral. Some of the courses involve the preparation of a seminar work which is usually defended by an oral presentation. The oral examination is usually preconditioned by laboratory attendance, the successful completion of the written examination and the seminar work presentation where required.

Timetables for examinations are issued yearly by the Faculty Senate at the beginning of the academic year and are published on the notice boards. There are at least 6 examinations for each course per academic year and students are free to choose the date of examination. The students need to register for examination 7 days before the examination date. The examination can be canceled no later than 3 days before the examination date. The use of calculators, literature and other items during the examination is determined by the lecturer and may vary from course to course.

The diploma work is presented publicly before an examination board composed of the Head of the Chair, the diploma work mentor and co-mentor.

The M.Sc. or PhD thesis are publicly presented and defended before an examination board, chaired by the Dean of the Faculty. The members of the Board are also the mentor, co-mentor and two to three internationally recognized academicians, who are experts in the field.

COURSE STRUCTURE DIAGRAM WITH CREDITS

Complete curricula of the undergraduate university program (options chemical engineering and biochemical engineering), the higher professional program chemical engineering and postgraduate programs are given in the following pages. The syllabus of the courses is given together with the semester of study, the total contact hours and the assigned number of ECTS credits. Brief descriptions of the teaching methods, prerequisites and examination rules are given. For the courses lasting 1 study year (2 semesters) the required personal work and the ECTS credits are given for each semester separately. The abbreviations in the curriculum have the following meaning:

L - Lectures
P - Practical
S - Seminar
CE - Option Chemical Engineering
BE - Option Biochemical Engineering

Undergraduate University Program of Chemical Engineering – Option Chemical Engineering

Course No.	Course Title	Hours / Semester L	S	P	Total Hours	ECTS Credits	Pg. in part B
Year 1, 1st Semester (Fall)							
0004	Machine Elements	30	45	-	75	5.5	3
0001	Mathematics I.	60	30	-	90	7.0	4
0079	Inorganic Chemistry	45	15	90	150	11.5	5
0002	Physics I.	60	15	-	75	6.0	6
				Total:	390	30	
Year 1, 2nd Semester (Spring)							
0001	Mathematics I.	60	30	-	90	6.0	4
0079	Inorganic Chemistry	60	15	-	75	5.5	5
0007	Physics II.	60	15	45	120	8.5	7
0009	Analytical Chemistry I.	60	-	90	150	10.0	8
				Total:	435	30	
Year 2, 3rd Semester (Fall)							
0006	Mathematics II.	75	45	-	120	8.0	9
0010	Analytical Chemistry II	60	-	90	150	10.0	8
0056	Physical Chemistry	60	-	-	60	4.0	10
0031	Process Balances	30	-	30	60	4.0	11
0088	Organic Chemistry	60	-	-	60	4.0	12
				Total:	450	30	
Year 2, 4th Semester (Spring)							
0056	Physical Chemistry	45	-	120	165	13.0	10
0031	Process Balances	30	-	30	60	4.5	11
0088	Organic Chemistry	45	-	120	165	12.5	12
				Total:	390	30	

Course No.	Course Title	Hours / Semester L	S	P	Total Hours	ECTS Credits	Pg. in part B
Year 3, 5th Semester (Fall)							
0091	Thermodynamics	60	-	60	120	9.0	14
0100	Transport Phenomena	90	-	60	150	11.0	15
0071	Process Dynamics	75	-	60	135	10.0	16
				Total:	405	30	
Year 3, 6th Semester (Spring)							
0037	Material Science	60	-	45	105	7.5	17
0042	Mass Transfer	45	-	30	75	5.5	18
0064	Separation Processes	60	-	60	120	8.5	19
0050	Biochemical Engineering	45	-	30	75	5.5	20
0099	Organic Synthesis	-	-	45	45	3.0	21
				Total:	420	30	
Year 4, 7th Semester (Fall)							
0063	Stagewise Processes	60	-	60	120	8.5	22
0073	Chemical Reaction Engineering	45	-	60	105	7.5	23
	* Elective Course	30	-	30	60	4.5	
0076	Economics	45	15	15	75	5.0	24
0075	Process Design I.	30	-	30	60	4.5	25
				Total:	420	30	
Year 4, 8th Semester (Spring)							
0075	Process Design II.	-	-	90	90	7.0	25
0110	Process Optimization	90	-	60	150	11.5	26
0117	Process Apparata	30	-	30	60	4.5	27
0062	Process Development	45	-	45	90	7.0	28
				Total:	390	30	

ELECTIVE COURSES:

Undergraduate University Program of Chemical Engineering – Option Biochemical Engineering

Course No.	Course Title	Hours / Semester L	S	P	Total Hours	ECTS Credits	Pg. in part B
Year 1, 1st Semester (Fall)							
0004	Machine Elements	30	45	-	75	5.5	3
0001	Mathematics I.	60	30	-	90	7.0	4
0079	Inorganic Chemistry	45	15	90	150	11.5	5
0002	Physics I.	60	15	-	75	6.0	6
				Total:	390	30	
Year 1, 2nd Semester (Spring)							
0001	Mathematics I.	60	30	-	90	6.0	4
0079	Inorganic Chemistry	60	15	-	75	5.5	5
0007	Physics II.	60	15	45	120	8.5	7
0009	Analytical Chemistry I.	60	-	90	150	10.0	8
				Total:	435	30	
Year 2, 3rd Semester (Fall)							
0006	Mathematics II.	75	45	-	120	8.0	9
0010	Analytical Chemistry II	60	-	90	150	10.0	8
0056	Physical Chemistry	60	-	-	60	4.0	10
0031	Process Balances	30	-	30	60	4.0	11
0088	Organic Chemistry	60	-	-	60	4.0	12
				Total:	450	30	
Year 2, 4th Semester (Spring)							
0056	Physical Chemistry	45	-	120	165	13.0	10
0031	Process Balances	30	-	30	60	4.5	11
0088	Organic Chemistry	45	-	120	165	12.5	12
				Total:	390	30	

Course No.	Course Title	Hours / Semester L	S	P	Total Hours	ECTS Credits	Pg. in part B
Year 3, 5th Semester (Fall)							
0118	Thermodynamics	60	-	30	90	7.0	14
0119	Transport Phenomena	90	-	60	150	11.0	15
0050	Biochemistry	45	-	30	75	5.5	29
0125	Microbiology	60	-	30	90	6.5	30
				Total:	405	30	
Year 3, 6th Semester (Spring)							
0121	Material Science	60	-	45	105	7.5	17
0122	Mass Transfer	45	-	30	75	5.5	18
0123	Separation Processes	60	-	45	105	7.5	19
0124	Cell Physiology	45	-	30	75	5.5	31
0126	Raw Materials for Bio- and Food Industries	45	-	15	60	4.0	32
				Total:	420	30	
Year 4, 7th Semester (Fall)							
0127	Stagewise Processes	60	-	60	120	8.5	22
0128	Chemical Reaction Engineering	45	-	60	105	7.5	23
0129	Economics	45	-	15	60	4.0	24
0130	Industrial Microbiology	45	30	-	75	5.5	33
0131	Process Integration I	30	-	30	60	4.5	34
				Total:	420	30	
Year 4, 8th Semester (Spring)							
0136	Biochemical Reaction Engineering	30	-	30	60	4.5	35
0133	Toxicology	15	15	-	30	2.5	36
0134	Molecular Biology & Gene Technology	45	-	15	60	4.5	37
0135	Process Integration II	30	-	30	60	5.0	39
	Elective Course I	30	30	-	60	4.5	
	Elective Course II	30	30	-	60	4.5	
	Elective Course III	30	30	-	60	4.5	
				Total:	390	30	

ELECTIVE COURSES:

Professional Higher Education Program of Chemical Engineering

Course No.	Course Title	Hours / Semester L	S	P	Total Hours	ECTS Credits	Pg. in part B
Year 1, 1st Semester (Fall)							
0001	Mathematics I.	60	30	-	90	8.5	4
0079	Inorganic Chemistry	45	15	90	150	14.5	5
0002	Physics I.	60	15	-	75	7.0	6
				Total:	315	30	
Year 1, 2nd Semester (Spring)							
0001	Mathematics I.	60	30	-	90	6.0	4
0079	Inorganic Chemistry	60	15	-	75	5.0	5
0007	Physics II.	60	15	45	120	8.5	7
0009	Analytical Chemistry I.	60	-	90	150	10.5	8
				Total:	435	30	
Year 2, 3rd Semester (Fall)							
0010	Analytical Chemistry II	60	-	90	150	11.5	8
0014	Process Safety	30	-	15	45	3.5	40
0032	Physical Chemistry	60	-	-	60	5.0	10
0109	Process Calculation	30	-	30	60	5.0	41
0088	Organic Chemistry	60	-	-	60	5.0	12
				Total:	375	30	
Year 2, 4th Semester (Spring)							
0032	Physical Chemistry	45	-	120	165	12.5	10
0109	Process Calculation	30	-	30	60	5.0	41
0088	Organic Chemistry	45	-	120	165	12.5	12
				Total:	390	30	

Course No.	Course Title	Hours / Semester L	S	P	Total Hours	ECTS Credits	Pg. in part B
Year 3, 5th Semester (Fall)							
0013	Process Analysis	60	-	90	150	12.0	42
0107	Material Science	45	-	30	75	6.0	43
0004	Machine Elements	30	45	-	75	6.0	3
0076	Economics	45	15	15	75	6.0	24
				Total:	375	30	
Year 3, 6th Semester (Spring)							
0112	Enterpreneurship	30	30	-	60	5.0	-
0019	Process Synthesis	75	-	75	150	12.5	44
0049	Proces Apparata	30	15	30	75	6.5	27
	Elective course	30	-	45	75	6.0	
				Total:	360	30	

ELECTIVE COURSES:

Course No.	Course Title	On Page
0026	Industrial Analytics	46
0022	Inorganic Technology	48
0023	Organic Technology	50
0025	Water Treatment	51
0024	Ecology	52

Postgraduate Program Chemistry and Chemical Engineering					
Course Title	**Hours**		**Total Hours**	**ECTS Credits**	**Pg. in part B**
	L	**S**			
Module: Compulsory Courses					
Mathematics Applied	45	45	90	15	–
Product Engineering	45	45	90	15	–
Chemical Engineering Education	45	45	90	15	–
System Synthesis	45	45	90	15	–
Numerical Methods in Chemistry and Chemical Engineering	45	45	90	15	–
Module: Chemical Engineering					
Process Thermodynamics	45	45	90	15	–
Reaction Engineering II	45	45	90	15	–
Process Cooling Engineering	45	45	90	15	–
Process Systems Engineering	45	45	90	15	–
Separation Processes	45	45	90	15	–
Energy Management	45	45	90	15	–
Transport Phenomena in Chemical Engineering	45	45	90	15	–
Process Management under Uncertainty	45	45	90	15	–
Chemical Process Safety	45	45	90	15	–
Process Management	45	45	90	15	–
Computer Programming	45	45	90	15	–
Methods of Artificial Intelligence in Chemistry and Chemical Engineering	45	45	90	15	–
Module: Biochemical Engineering					
Biocatalysis	45	45	90	15	–
Biotransformations	45	45	90	15	–
High Pressure Technologies	45	45	90	15	–
Mass Transport and Phase Equilibria	45	45	90	15	–
Food Chemistry	45	45	90	15	–

Course Title	Hours L	Hours S	Total Hours	ECTS Credits	Pg. in part B
Module: Chemistry and Chemometrics					
Synthesis and Characterisation of Organometallic Compounds	45	45	90	15	–
Chemometrical and Atatistical Methods in Analytical Chemistry	45	45	90	15	–
Measurements in Chemistry	45	45	90	15	–
Industrial Analysis	45	45	90	15	–
Electro Analytical Methods in Analytical Chemistry	45	45	90	15	–
Combinatorial Chemistry and Use of Polymer Supports in Chemistry	45	45	90	15	–
Metrology in Chemistry	45	45	90	15	–
Selected Chapters on Physical Chemistry	45	45	90	15	–
High-temperature Phase Equilibria	45	45	90	15	–
Module: Materials in Chemistry					
Selected Chapters on Cheramics	45	45	90	15	–
Sonochemical Methods	45	45	90	15	–
Syntheses and Properties of Nanoparticles	45	45	90	15	–
Nanotechnologies	45	45	90	15	–
Polymer Technology	45	45	90	15	–
Polymers and Polymeric Membranes	45	45	90	15	–
Module: Chemical Environmental Protection and Sustainable Development					
Measurements in Environment	45	45	90	15	–
Sustainable Development	45	45	90	15	–
Waste Water Treatment	45	45	90	15	–
Cleaner Production	45	45	90	15	–
Material in Closed Loop	45	45	90	15	–
Water Treatment Technology	45	45	90	15	–
Chemistry of Organic Pollutants	45	45	90	15	–