

## **Application for accreditation of the master study program**

The application has been prepared in accordance with Guidelines of Ministry of Education no. 42/1999

### **BASIC INFORMATION**

**Applicant:** University of South Bohemia in České Budějovice  
**Address:** Branišovská 31, CZ-370 05 České Budějovice  
**Type of institution:** university  
**Type of subject:** public university

*The scientific council of the Faculty of Science of the University of South Bohemia in České Budějovice has approved the proposal for the master study program of "Biological Chemistry".*

*Due to: 7. 5. 2009*

### **STUDY PROGRAM**

**Name of the study program:** Biochemistry  
**Field of study:** Biological chemistry\*  
**Type of the study program:** Master's of Science study program (M.S.)  
**Study period:** 2.5 years (5 semesters)  
**Form:** full-time\*\*  
**Language:** English

### **NOTA BENE:**

\* Currently the study program contains single field of study. The study program and field of study formal and legal accreditation requirements (Guidelines of the Ministry of Education no. 42/1999), therefore, do coincide. In the following text, the "program" and "field of study" are frequently inter-changed.

\*\* The study program is implemented as part of bilateral cross-border collaboration between the Johannes Kepler University in Linz and the Faculty of Science of the University of South Bohemia in České Budějovice. The program is put through accreditation process by the Czech and Austrian governments. The administration of the study program is designed to fulfill the requirements of internal guidelines for both universities. Technical details of the study program organization and legal issues are given in the following text.

### **Program mission**

The success in the area of biological and biochemical research and biotechnologies today depends on the application of the right approach and on the sound knowledge of both chemical and biological disciplines. The proposed study program aims at training laboratory executives and research associates to become familiar with these new requirements in order to assure their successful professional future.

The primary goal of the proposed study program is to provide state-of-the-art education that encompasses molecular and cellular biology, biochemistry and biophysics. The program represents an alternative extension of the modern molecular, cellular and structural biology towards biochemistry, bio-organic chemistry and biophysics.

### **Admission**

Admission to the study program is based primarily on the applicant's academic credentials and his/her knowledge of biology/chemistry/biophysics and the English language. Admission is granted without regard to sex, age, religion, race, color, national origin, sexual orientation or marital status. The master's "Biological Chemistry" study program welcomes qualified candidates for transfer admission from accredited universities with completed bachelor degree in molecular and cellular biology, chemistry, biochemistry, biophysics or related fields (*vide infra* – *Transfer policy*).

### ***Admission requirements***

Admission to the biological chemistry study program is competitive. Primary consideration is given to the candidate's academic preparation.

The general requirements to be considered for admission are:

1. Completed bachelor degree in molecular and cellular biology, biological chemistry, chemistry, biochemistry, biophysics or related fields from an accredited university or its equivalent, as shown by the applicant's diploma or examination records.
2. An official TOEFL score of 180 (computer-based test) or above, or score of 500 (paper-based test) or above. The candidates without an official TOEFL score are required to pass the internal English test at the Faculty of Science, University of South Bohemia (FS USB).
3. The passage of an entrance exam from general chemistry, biochemistry, and molecular and cell biology with an overall grade of "C+" or higher. Students of the bachelor's biological chemistry curriculum with a cumulative grade point average (G.P.A.) of 3.00 are admitted to the master program without an entrance exam (for definition of G.P.A – *vide infra*)

The application to the biological chemistry study program does not require supplemental documents to those needed to complete an FS USB application form. However, candidates may enhance their application by providing a variety of additional information, to include, but not limited to: senior mid-year grades; recommendations from university guidance counselors or supervisors; resume of university activities, honors, awards, leadership positions; and letters of

recommendation from academic teachers. These materials should be sent along with the candidate's application form.

### **Tuition fee**

According to the guidelines of the Ministry of Education of the Czech Republic, students are required to pay a tuition fee. The tuition fee reflects extra administration and operational costs connected with running the study program in a foreign language (estimated to be around 100 EUR per student). The precise amount will be declared by the dean of the Faculty of Science at the beginning of each calendar year, in accordance with *Study and Exam Guidelines of the University of South Bohemia in České Budějovice*.

### **Requirements for successful completion of studies**

The requirements follow the *Internal guidelines of University of South Bohemia in České Budějovice*. Further requirements are specified in the *Internal guidelines of Faculty of Science of the University of South Bohemia in České Budějovice*. To complete the master's study program in Biological Chemistry, four basic requirements have to be fulfilled. The student has to pass all required exams and acquire a sufficient amount of credits ( $\geq 150$ ). The student is also required to defend a master's thesis and subsequently pass a final oral exam.

## **POLICES & REGULATIONS**

### **Courses**

Students register for classes at the beginning of every semester and attendance is mandatory for seminars and exercises.

The academic year is divided as follows:

- \* Winter Semester (October - January)
- \* Summer Semester (February - June)

Most courses are assigned three to four academic credits (depending on the course) and fall into two categories:

1. Compulsory Courses Module: Modules of mandatory courses at each university must be taken to complete the program. LC – Compulsory module in Linz, BC – Compulsory module in České Budějovice.

2. Selective Courses Modules: At each university, three Selective Courses Modules are offered in respect to a study field orientation. One of three Selective modules is chosen at each university by the students according to their particular interest. These modules are in Linz:

- LS1 - Advanced Chemistry Module;
- LS2 - Advanced Physical Chemistry Module;
- LS3 - Structural Biochemistry Module;

in České Budějovice:

BS1 - Structural Biology Techniques Module;

BS2 – Advances in Biological Systems Module;

BS3 - Molecular and Developmental Biology Module.

### **Course Prerequisites**

Many courses have prerequisites, which prepare students for more advanced and upper level courses. Students are not permitted to register for courses without having completed the required prerequisite(s). A grade of C- or higher is required in all prerequisite courses. Prerequisite requirements may be fulfilled in the form of course credits earned at FS USB/JKU, transferred from another college or university, or by examination.

### **Unit of academic credit**

The principle that 60 credits measure the workload of a full-time student during one academic year is applied in accordance with the European Credit Transfer and Accumulation System (ECTS). Credits can only be obtained after the successful completion of the work required and the appropriate assessment of the learning outcomes is given. Learning outcomes are sets of competences, expressing what the student knows, understands or is able to do after completing the learning process. Student workload consists of the time required to complete all planned learning activities such as attending lectures, seminars, independent and private study, preparation of projects and examinations.

### **Grading system**

Student performance is evaluated by the following letter grades:

A or A- outstanding work exhibiting a high level of excellence

B+, B or B- good work, which is distinctly above average

C+, C or C- acceptable work that is neither distinctly above nor below what is expected from the average student

D+, D, or D- passing work that is significantly below average

E work, which does not meet the minimum standards for passing the course.

### **Grade Point Average (G.P.A)**

Semester and cumulative grade point averages (G.P.A), the basis for assessing a student's academic standing and their graduation eligibility, are derived as follows: each credit graded "A" through "E" is given a corresponding numerical value called "quality points".

The following chart shows the quality points earned by one credit:

A	4.00	B-	2.67	D+	1.33
A-	3.67	C+	2.33	D	1.00
B+	3.33	C	2.00	D-	0.67
B	3.00	C-	1.67	E	0.00

The grade point average is determined by dividing the credits graded "A" through "F" into the number of quality points earned. The semester G.P.A. includes the credits and quality points for that semester. The cumulative G.P.A. is based upon the combined total of all the semesters.

### Good Academic Standing

A student with a cumulative grade point average (G.P.A.) of 2.00 or higher is considered to be "in good academic standing".

### Conversion table between applied grading system and ECTS

(The table is a mandatory part of diploma supplement)

<i>Applied</i>	<i>A</i>	<i>A-</i>	<i>B+</i>	<i>B</i>	<i>B-</i>	<i>C+</i>	<i>C</i>	<i>C-</i>	<i>D+</i>	<i>D</i>	<i>D-</i>	<i>E</i>
ECTS	<i>A</i>		<i>B</i>			<i>C</i>			<i>D</i>		<i>E</i>	<i>F</i>

### Academic Honesty

Students are expected to maintain the highest standards of honesty in their course work. All homework assignments, projects, papers and examinations submitted for a course are expected to be students' own work.

Cheating, forgery, and plagiarism are serious offenses, and students found guilty of any form of academic dishonesty are subject to disciplinary action, including dismissal from both universities (USB/JKU).

### Transfer Policy

The master's biological chemistry study program welcomes qualified candidates for transfer admission from accredited universities with completed bachelor degree in molecular and cellular biology, chemistry, biochemistry, biophysics or related fields (*vide infra*). Transfer candidates must present a competitive grade point average for ALL previously completed accredited university work to be considered for admission. Transfer candidates in good academic standing with fewer than 25 credits must submit, in addition to the official university transcript, an official TOEFL test score above 180 (computer-based test) or 500 (paper-based test) or pass through the internal English test at the Faculty of Science, University of South Bohemia (FS USB).

The biological chemistry study program allows for the transfer of a maximum of 30 credits from another university. A maximum of 15 non-liberal arts course work (credits) may be awarded in transfer. The program will not award credit for any course with a grade of "C-" or below.

### Degree Requirements

Listed below are the degree requirements for students choosing to complete their studies in biological chemistry study program:

1. Completion of a minimum of 150 academic credits.
2. Completion of ALL mandatory courses.
3. A minimum cumulative grade point average of a "C" (2.00 on a 4.00 grading scale).
4. Completion of master's thesis work.
5. Completion of final oral exams.

### The graduate's profile – skills and abilities

The graduates will have acquired knowledge and skills allowing them to pursue a broad range of positions at biotechnological companies and chemical/biological laboratories. At the same time, the graduates will possess sufficient knowledge allowing them to continue

their studies in advanced study (Ph.D.) programs of Biological Chemistry, Biochemistry, Molecular Biology, Biophysics, and Bio-organic Chemistry.

- Biochemistry/Chemistry/Biophysics/Molecular and Cellular Biology– graduates are expected to have an advanced knowledge of inorganic, organic, physical and analytical chemistry, and bioinformatics. Graduates will be intensively trained in both the theoretical and practical aspects of biochemistry, biophysics, molecular and cellular biology. The graduates are expected to understand the chemical processes of living systems and the relationships between functions and structures of their molecular components. The design of the study program strongly focuses on the development of the graduate's practical skills. Therefore, the graduates are expected to be well trained in most of the modern laboratory methods in molecular biology and biochemistry. Special focus in the student's training will be given to the manipulation with biological material including its isolation, cultivation, chemical and biological analysis, and genetic modification.
- Language skills– the graduates are expected to be fluent in both spoken and written English. All lectures, seminar, and exercises will be held in English. The study literature, student presentations examines, the diploma work and its defense will be elaborated or held in English. During their studies, the students will be also strongly encouraged to acquire the basics of German (Czech for Austrians).
- Rhetorics/Communication: During the studies, the students will be required to attend and actively participate in specialized seminars as well as lectures for broad scientific community. This requirement should allow the opportunity to acquire communication skills, which are necessary for presentations of the scientific results in front of scientific community and public.

#### **Compatibility/Adaptability of the graduate-profile with/to the job market**

The study program design provides the graduates with a sufficient degree of freedom in selecting their future specialization. The individual subjects are designed to emphasize the development of the graduate's creativity. The student is also required to demonstrate the abilities and flexibility to work within international team. In parallel, the student is trained in solving problems and making decisions independently. Since the study program is organized in English, and both students and teachers are recruited from at least two countries, the graduates will be prepared to work in an international environment with sufficient language skills.

#### **Characterization of professions and institutions fitting the graduate's profile**

1. Diagnostic laboratories (medical, forensic, hygienic, environmental, quality/output - control) requiring methods and techniques of molecular biology, analytical chemistry, and biochemistry (research assistant, executive management, analysis supervisor)
2. Biotechnological and pharmaceutical companies (research associate and executive, sales/service manager)
3. Applied research laboratories and development (research associate/executive)
4. Academic institutions – (research associate/executive)

In addition, the graduates may continue their studies in advanced study programs (Ph.D.) in Biological Chemistry, Biochemistry, Molecular Biology, Biophysics, and Bio-organic Chemistry.

**Final exam:**

Structure of the final state exam is chosen to cover the major fields, which students are required to master during their studies. The final exam comprises three parts:

- 1) General Chemistry {Physical, Inorganic, Organic, and Analytical chemistry}
- 2) Biochemistry
- 3) Molecular and Cell Biology

*The master's thesis is an integral part of the final exam.*

**Master's thesis**

The *master's thesis* is to demonstrate the student's creativity and ability to approach problems and making decisions independently. In parallel, the work is supposed to test student's ability to work with electronic informational resources and literature and substantiate theoretically acquired knowledge with laboratory practice.

The master's thesis will be conducted at: i) Faculty of Sciences, University of South Bohemia, b) Johannes Kepler University in Linz, c) Biology centre –Academy of Sciences of the Czech republic.

**Schedule**

Master's thesis specification - at the beginning of the 4<sup>th</sup> semester

Master's thesis submission to editorial office - end of October (in 5<sup>th</sup> semester)

**Examples of possible topics for master's theses:**

Influence of post-translational modifications on protein structure

Influence of cellular environment on conformation of RNA and DNA aptamers

Application siRNA in gene silencing

Fotochemical stability of biopolymers

Metabolic flux investigation using *in vivo* NMR spectroscopy

Protein crystallization studies

Mechanism of glycosylation in model organisms (insect, plants, etc ...)

Application of computational methods of quantum chemistry for prediction of NMR parameters

**Study plan**

The study plan is mainly based on the instruction of the graduates in both the biological and the chemical disciplines. Conventional university study programs of *Biochemistry*, the closest related subject to *Biological Chemistry*, are usually designed less symmetrically, putting stronger emphasis on either chemistry or biology. The proposed study program of Biological Chemistry is designed to: 1) balance the role of biology and chemistry, and 2) extend the traditional concepts for biophysics and bioinformatics. This concept, however, implies a prevalence of mandatory subjects in the study plan. While usual bachelor's "Biological Chemistry" study programs provides a solid general background in chemistry, in its extension – master's study program allows students to specialize in disciplines: **a) Molecular spectroscopy and biophysics; b) Structural biology and relevant techniques; c) Molecular principles of biological systems.** The following tables summarize the study program structure over its entire period. The time requirements for both lectures and practical training courses in individual subjects are

stated. The time requirement reflects the maximal teaching load of 30 hours per week. This corresponds to 30 credit points per semester (according to *Study and Exam Guidelines of the University of South Bohemia in České Budějovice*). In total, 150 credit points are required in the proposed three-year study program.

In the first year of their master's studies, the students will acquire knowledge in specialized chemical disciplines. The courses will provide them with the necessary background for the subsequent subjects directing their specialization. In the second and third year, focus will be given on instruction in subjects that integrate their knowledge from biology, molecular biology and biochemistry together with chemistry and physics, extending their scientific background, and preparing them for their future professional careers with a strong emphasize on practical and methodological training.

### Study plan of the master study program

#### Study program time-table (in weeks)

<i>Year</i>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Total</b>
Teaching period	28	28	14	70
Exam's period	10	10	5	25
Industrial practical training	0	0	0	0
Vacation	10	10	4	24

The whole detailed three year study plan is in separated file.

## FINANCIAL COVERAGE OF THE STUDY PROGRAM

### A. Estimation of study program running expenses

(on behalf of University of South Bohemia)

<i>/in 1K EUR/</i>	<b>1. year*</b>	<b>2. year**</b>	<b>3. year**</b>
Investments	0	20	10
Personal costs	0	40	24
Other costs	0	12	6

\*In the 1<sup>st</sup> year running expenses will be covered by Austrian partner/running expenses in the 3<sup>rd</sup> year the expenses are distributed between JKU and SBU

\*\*calculation is based on 20 students

### B. Estimation of study program running costs per student

(on behalf of University of South Bohemia)

<i>/in 1K EUR/</i>	<b>1. year*</b>	<b>2. year</b>	<b>3. year</b>
Investments	0	1	0.5
Personal costs	0	2	1.2
Other costs	0	0.3	0.3

\*In the 1<sup>st</sup> year running expenses will be covered by Austrian partner/running expenses in the 3<sup>rd</sup> year the expenses are distributed between JKU and SBU



**C. Estimation of running costs covering activities in research and development related to realization of the study program:**

(on behalf of University of South Bohemia)

<i>/in 1K EUR/</i>	<i>1. year*</i>	<i>2. year**</i>	<i>3. year**</i>
Investments	0	5	5
Personal costs	0	8	16
Other costs	0	5	14

\*In the 1<sup>st</sup> year, running expenses will be covered by Austrian partner/running expenses in the 3<sup>rd</sup> year the expenses are distributed between JKU and SBU

\*\*calculation is based on 20 students

**Plan of the study program development**

The presented study program follows long-term plan to establish the biologically oriented inter-disciplinary research at the Faculty of Science (USB). The biological chemistry connects with the research at the Faculty of Science in closely related fields such as biophysics, biomathematics, structural and molecular biology, and genetic engineering. The program development is also tightly connected with a plan to establish the center for proteomics and bio-nanotechnology at the Faculty of Science (USB).

**Evaluation of the study program quality and the feedback:**

The study program quality will be evaluated according to EU guidelines in the framework of the program REFLEX – supervised by the Ministry of Education in both the Czech Republic and Austria. Based on results, interactive changes, approved by the accreditation committee, will be made. In addition, the scheme for the maintenance of the study program quality involves:

- active and continuous training of teachers in modern methods and approaches in the field of their specializations via support of sabbatical stays at foreign universities, specialized courses, etc.
- requirement for teachers to be actively involved in research
- access to most recent literature
- lecture quality evaluation by students

**Institutions directly collaborating in the study program realization:**

- Academy of Sciences of the Czech Republic (Biology Centre, v.v.i. in Ceske Budejovice)
- Johannes Kepler University in Linz (Austria)

The students have access to research facilities, scientific literature and informational resources from both institutions. Both institutions make their facilities available for students' instructions.

**Other collaborations:**

Currently, the Faculty of Sciences actively collaborates with more than 20 foreign universities. These collaborations involve student and technology inter-change.

List of selected foreign partners follows:

- University of California, Irvine, USA
- Harvard Medical School, Boston, USA

- University of Arizona, USA
- University of Georgia, USA
- Utrecht University, Netherlands
- Lund University, Sweden
- Bayreuth University, Germany
- Innsbruck University, Austria
- Goethe University, Frankfurt, Germany
- Max-Planck Institute for Molecular Physiology, Dortmund, Germany

### **Study program justification**

The study program aims to train specialists for bio-tech companies, government and private laboratories and research institutions, who will be able to cover gaps in the job market in the South Bohemia, Upper Austria, and Bavarian (Germany) regions.

It is noteworthy that the study program is the first of its kind in the South and West Bohemia, Upper Austria, and Bavarian (Germany) regions. At the same time the program follows long-term plan for the development of University of South Bohemia. This plan involves progressive introduction of chemical, physical, mathematical and informatics study programs and the establishment of active collaborations with foreign research institutions and universities.

Please, find enclosed “Letter of support” from the Chamber of commerce of the South Bohemian region. The letter expresses the interest of the business sector for study program graduates and provides an overview of the business enterprises in South Bohemian region providing job openings in the specializations covered by the presented study program.

### **ESTIMATED NUMBER OF STUDENTS ACCEPTED INTO THE SP**

<i><b>Year</b></i>	<i><b>2010/2011</b></i>	<i><b>2011/2012</b></i>	<i><b>2012/2013</b></i>
Number of accepted students	15	15	15