Degree Program Regulations
for the Bachelor of Science and Master of Science Degree Program in Bioinformatics

of 8 June 2006

Pursuant to section 66 of the Law on Saarland University (University Act) as amended in Law no. 1433 for Reforming the Saarland Higher Education Laws and for Amending Other Regulations Pertaining to Higher Education (2nd Higher Education Amendment Act) of 23 June 1999 (Official Gazette, p. 982), the Center for Bioinformatics hereby promulgates the following Degree Program Regulations:

Contents:

Section 1   General Provisions

(1)   These Degree Program Regulations govern the content and structure of the Bachelor of Science and Master of Science degree programs in Bioinformatics as based on the Examination Regulations covering these degree programs.

(2)   Bioinformatics extends to the development of algorithms and software for the simulation of biochemical processes and analysis of molecular biology data.

(3)   The content of the bioinformatics degree program focuses primarily on the theoretical fundamentals and methods of bioinformatics. The foundation for this is created by way of conveying the fundamentals and methods of the related disciplines of mathematics and computer science, the theoretical foundations of selected life science fields (general, organic and physical chemistry; biochemistry, molecular biology and microbiology; pharmacy and medical chemistry; and biophysics). Consolidating what is learned in practical courses (bioinformatics, computer science and life sciences) is indispensable and guides the student towards practical application in his occupation later on.

(4)   In the course of the bachelor's degree program, students obtain basic scientific training and the fundamental knowledge and skills in the subjects listed in section 1(3). By virtue of the modular nature of the program, students can pursue their studies in the two specializations detailed in section 4 in accordance with their skills and interests.

(5)   The master's degree program is more strongly research-oriented. The goal of the master's degree program is to build on the preceding bachelor's degree program by preparing students for demanding research and development work in bioinformatics at the national and international level or allowing them to continue their career in bioinformatics in the academic sector. In so doing, the object is to foster the students' methodology skills in order to enable them to develop innovative new methods.

Section 2   Proof of Academic Achievement/Credits

The type of proof and certificates to be furnished are detailed in the Examination Regulations and Module

Handbook.

Section 3   **Profile Development in the Bachelor of Science Degree Program**

In the course of the bachelor's degree program, students obtain basic scientific training in the biosciences (biochemistry, molecular biology, genetics, pharmacy, biotechnology, etc.), computer science and mathematics, in addition to fundamental knowledge and skills in bioinformatics. Those completing the bachelor's degree program should be able to understand bioscience problems and issues, engage in mathematical modeling, and apply scientific methods and bioinformatics findings to these problems. The bachelor's program is designed to prepare its graduates for their occupational work in bioinformatics. Part of those completing the bachelor's degree will learn to apply existing bioinformatics software and tools in their future day-to-day work for the purpose of gaining new biological knowledge (example: identification of new target molecules for treating specific illnesses and disorders, identifying new lead structures for developing medication, optimizing therapies, etc.). Another part of those completing the degree will develop and implement new bioinformatics methods and tools. Consequently, we distinguish here the occupations of "bioinformatics user" and "bioinformatics developer". The user needs more knowledge of life sciences and bioinformatics tools for his or her day-to-day work, whereas the development of new bioinformatics tools requires more in-depth knowledge of computer science methods and mathematics. The Bachelor of Science degree can thus be completed in two manners. The abbreviations of the two specializations Methodological Bioinformatics (CMB) and Applied Bioinformatics (BI) are taken from the terms commonly used in English: "Computational Molecular Biology" for bioinformatics emphasizing the development of methods and "Bioinformatics" for bioinformatics stressing the application of bioinformatics techniques. The bachelor's program enables students to acquire more credit points from the biology categories or the computer science categories respectively during the second half of their studies in order to guarantee that they receive the professional training dovetailing with these specializations and afford them more choice while completing their degree. The first profile corresponds to the occupation of "bioinformatics user", whereas the second one corresponds to the occupation of "bioinformatics developer". The latter more theory-oriented profile also prepares the student for an academic career as well as a management career in industry and is thus recommended for admission to the Master of Science degree program in Bioinformatics. We recommend that those completing the bachelor's degree who would first prefer to concentrate more on the biology side of bioinformatics and would nevertheless like to subsequently complete a master's degree decide in favor of a master's program in Biotechnology or Drug Design, for example. Emphasizing two different profiles not only means that the central requirement is satisfied of enabling those completing the bachelor's degree to obtain the requisite professional knowledge and skills, they are also afforded more choice and enabled to specialize in keeping with their interests (life sciences or IT) and skills.

Section 4   **Bachelor of Science Degree Program: Course Offerings and Degree Requirements**

(1)   The course offerings and degree requirements for the Bachelor of Science degree are compiled into module elements or modules (M). The content and frequency of each module are detailed in the module handbook. Only the concept of each module element (lecture (V), tutorial/introductory course (Ü), seminar (S) or proseminar (P), practical course and possible combination thereof) and the number of instruction units per week are given here.

The last column, entitled "Minimum requirements (CP) per category" contains a listing of the minimum number of credit points (broken down into more detail in the Examination Regulations) which have to be completed in this module category in the specializations CMB and BI (in accordance with sections 17(2) and 17(3) of the Examination Regulations). In the first category, the number in parentheses indicates the minimum number of credit points which must be obtained in introductory computer science lectures.

Module abbreviation	Module designation	Instruction units per week	CP	Minimum requirement: (CP) per category	
				CMB	BI
Lectures, mathematics fundamentals (graded)				51 (24)	33 (15)

M-B-1	Mathematics for Computer Scientists 1	V4 Ü2	9		
M-B-2	Mathematics for Computer Scientists 2	V4 Ü2	9		
M-B-3	Mathematics for Computer Scientists 3	V4 Ü2	9		
M-B-4	Analysis 1	V4 Ü2	9		
M-B-5	Linear Algebra 1	V4 Ü2	9		
Lectures, applied mathematics (graded)					
A-B-1	Practical Mathematics I	V4 Ü2	9		
A-B-2	Statistics for Biologists	V1	1		
Introductory lectures, computer science (graded)					
I-B-1	Programming 1	V4 Ü2	9		
I-B-2	Programming 2	V4 Ü2	9		
I-B-3	Fundamentals of Theoretical Computer Science	V4 Ü2	9		
I-B-4	Fundamentals of Data Structures and Algorithms	V2 Ü2	6		
Introductory lectures, chemistry and biosciences (graded)				15	15
C-B-1	General Chemistry	V5 (half term)	4		
C-B-2	Physical Chemistry	V2	3		
C-B-3	Molecular Biology	V2	3		
C-B-4	Organic Chemistry and Biochemistry	V6 (half term)	5		
C-B-5	Biochemistry	V4	6		
Lectures, biosciences (graded)				15	29
B-B-1	Biopharmacy and Drug Delivery	V2 Ü1	5		
B-B-2	Biophysics 1	V2	3		
B-B-3	Biophysics 2	V2	3		
B-B-4	Introduction to Biotechnology	V2	3		
B-B-5	Foundations of Genetics	V4	6		
B-B-6	Medical Chemistry and Drug Design	V2 Ü1	5		
B-B-7	Molecular Microbiology	V2	3		
B-B-8	Introduction to Cellular Biology	V3	5		
Courses, acquisition of key skills (ungraded)				1	1
E-BM-1	Organization of Scientific Research	V1	1		
E-BM-2	Project Management	V/Ü1	1		
E-BM-3	Patent Law and Bioethics	V/Ü1	1		
E-BM-4	Efficient Learning Methods	V1	1		
Lectures, bioinformatics (graded)				27	24
BI-B-1	Introduction to Bioinformatics, interdisciplinary lecture series	V2	3		
BI-B-2	Bioinformatics 1	V4 Ü2	9		
BI-B-3	Bioinformatics 2	V4 Ü2	9		
BI-B-5	Computational Chemistry	V2 Ü2	6		
BI-BM-1	Bioinformatics, special-topic lecture	V2 Ü1	5		
Practical course, computer science (ungraded)				9	9
PI-B-1	Software, practical course	V2 P4	9		
Practical courses, biosciences (ungraded)				8	8
PB-B-1	Biosciences, introductory practical course (2 weeks)	P2	4		
PB-B-2	Biosciences, advanced practical course (2 weeks)	P2	4		
Practical courses, bioinformatics (graded)				-	9
PBI-B-1	Software Tools Used in Bioinformatics	V2 P2	9		
Proseminar (graded)				5	5
S-B-1	Proseminar on Bioinformatics Topics	S2	5		
Bachelor's seminar (graded)				9	9

BS-B-1	Bachelor's Seminar on Bioinformatics Topics	S1 P2	9		
Total minimum requirements per category				140	142
Of which must be graded				122	124

Taking into account the bachelor's thesis (12 CP), there are 26 (BI) or 28 (CMB) credit points which can be combined from any course offerings of the approved categories, by heading a tutorial group associated with a lecture (teaching assistant or tutorship, 4 CP each), from English language courses (maximum of 6 CP), and from the foreign practical (14 CP).

(2)   The following restrictions apply to the option of combining modules in the bachelor's degree program:
In the "mathematics fundamentals lectures" category, only the following combinations are permissible: M-B-1 & M-B-2 or M-B-4 & M-B-5. In the "chemistry and biosciences introductory lectures" category, only C-B-4 or C-B-5 may be selected.

(3)   Each module element is offered at least once a year except for the "acquisition of key skills" courses, which are offered a minimum of every two years.

(4)   The course offerings in the various module categories can be supplemented by additional module elements for one or more terms; they are subject to approval by the board of examiners. These courses, their credit point weighting and allocation to one or more of the designated module categories are announced before the beginning of a term.

Section 5   Master of Science Degree Program: Course Offerings and Degree Requirements

(1)   Module elements and allocation to the module categories

The module elements of the Master of Science degree program are offered in English.

Module abbreviation	Module designation	Instruction units per week	CP	Minimum requirement: (CP) per category
Core lectures, computer science (graded)				18
I-M-1	Data Structures and Algorithms	V4 Ü2	9	
I-M-2	Computer Graphics	V4 Ü2	9	
I-M-3	Database Systems	V4 Ü2	9	
I-M-4	Information Retrieval	V4 Ü2	9	
I-M-5	Artificial Intelligence	V4 Ü2	9	
I-M-6	Optimization	V4 Ü2	9	
I-M-7	Geometric Modeling	V4 Ü2	9	
I-M-8	Introduction to Computational Logic	V4 Ü2	9	
I-M-9	Image Processing and Computer Vision	V4 Ü2	9	
I-M-10	Software Techniques	V4 Ü2	9	
Advanced lectures, biosciences (graded)				12
B-M-1	Molecular Biotechnology 2	V2	3	
B-M-2	Human Genome	V2	3	
B-M-3	Biophysics and Structural Biology	V2	3	
B-M-4	Functional Genomics and Metabolic Engineering	V2 Ü1 S1	6	
B-M-5	Bioreaction Engineering	V2 Ü1 S1	6	
B-M-6	Biosciences, special-topic lecture	V2 Ü1	5	
Advanced lectures, bioinformatics (graded)				19
BI-M-1	Bioinformatics 3	V4 Ü2	9	

BI-BM-1	Bioinformatics, special-topic lecture	V2 Ü1	5	
Courses, acquisition of key skills (ungraded)				-
E-BM-1	Organization of Scientific Research	V1	1	
E-BM-2	Project Management	V/Ü1	1	
E-BM-3	Patent Law and Bioethics	V/Ü1	1	
Advanced practical courses, biosciences (ungraded)				8
PB-M-1	Biosciences, advanced practical course	P3	8	
Seminar (graded)				7
S-M-1	Seminar on bioinformatics topics	S2	7	
Master's seminar (graded)				12
MS-M-1	Master's seminar on bioinformatics topics	S1 P3	12	
Total requirements				76
Of which must be graded				68

Taking into account the master's thesis (30 CP), there are 14 credit points which can be combined from any course offerings of the approved categories or by heading tutorial groups associated with lectures (teaching assistant or tutorship, 4 CP each).

(2)   Each of the lectures, practical courses and proseminars is offered at least once a year except for the "computer science core lectures" and "acquisition of key skills" courses, of which each is offered a minimum of every two years. At least two special-topic bioinformatics lectures are offered each term.

(3)   The course offerings in the various module categories can be supplemented by additional module elements for one or more terms; they are subject to approval by the board of examiners. These courses, their credit point weighting and allocation to one or more of the designated module categories are announced before the beginning of a term.

Section 6   Curriculum, Module Handbook

The Center for Bioinformatics prepares a module handbook on the basis of these Degree Program Regulations, the handbook detailing the type, scope, content, qualification objectives and instruction formats of the module elements, in addition to a curriculum containing recommendations for structuring the degree program and courses taken. The current version of the curriculum is published in a suitable form at the beginning of the term. The current course offerings in the various module categories are also announced in the course catalogue of the respective term.

Section 7   Academic Counseling

(1)   The faculty of the departments offering courses in the degree program are available to students as academic advisors. In particular, the professors of bioinformatics at the Center for Bioinformatics are available for questions pertaining to the bioinformatics programs. Students may also obtain advice from the academic counseling services offered by the departmental student representatives.

(2)   An orientation is offered to first-term students at the beginning of the term. It provides information on the program requirements and structure and the examination regulations.

Section 8   Entry into Force

These Degree Program Regulations of the Bachelor of Science and Master of Science Degree Programs in Bioinformatics enter into force upon being published in the Official Bulletin of Institutions of Higher

Learning of Saarland ("*Dienstblatt der Hochschulen des Saarlandes*"). Students having begun their bioinformatics degree at Saarland University prior to these Degree Program Regulations going into effect may complete their degree in accordance with the "old" degree program regulations of 19 February 2004 for a transition period of eight terms.

Saarbrücken, XX.XX.2006   Univ.-Prof. Dr. Margret Wintermantel
                                                                                    University President