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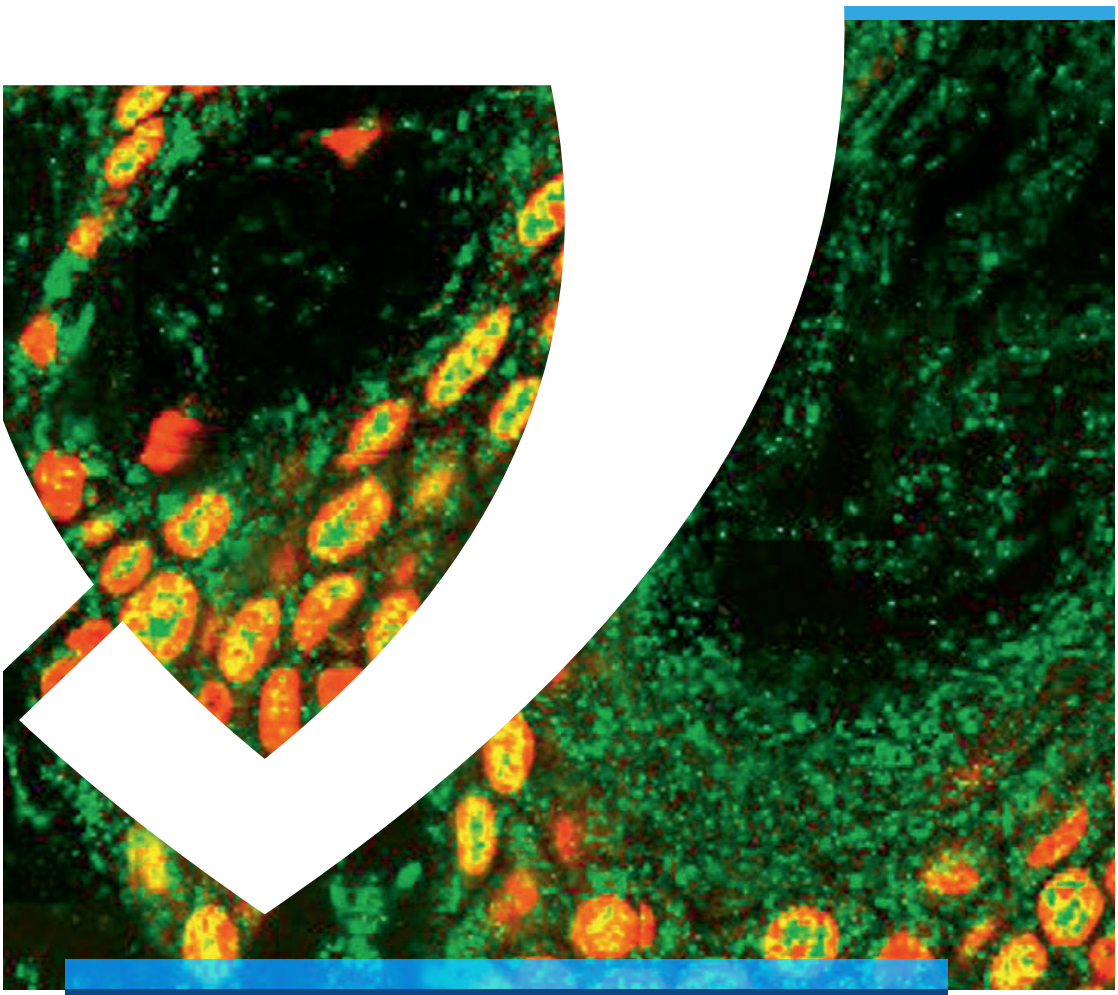


Study Program Handbook

Biochemistry and Cell Biology

Bachelor of Science

Subject-specific Examination Regulations for Biochemistry and Cell Biology (Fachspezifische Prüfungsordnung)

The subject-specific examination regulations for Biochemistry and Cell Biology are defined by this program handbook and are valid only in combination with the General Examination Regulations for Undergraduate degree programs (General Examination Regulations = Rahmenprüfungsordnung). This handbook also contains the program-specific Mandatory Module and Examination Plans (Appendix 1a / 1b).

Upon graduation, students in this program will receive a Bachelor of Science (BSc) degree with a scope of 180 ECTS (for specifics see chapter 3 of this handbook).

Version	Valid as of	Decision	Details
Fall 2016 - V1	01.09.16	AB August 2016	Master Version
Fall 2016 - V2	01.09.17	AB August 2017	2.2. revised, 2.5 added
Fall 2016 - V3	01.09.18	Academic Senate August 29, 2018	Figure 3 updated

Contents

1 The Biochemistry and Cell Biology (BCCB) Study Program

1.1 Concept

Biochemistry is the study of molecules and chemical processes in living organisms, while in Cell Biology you learn about the structure and physiology of cells, their components and interactions with the environment. The two fields are combined in one comprehensive degree program, which will give you a broad understanding of the molecular and cellular mechanisms that form the basis of life. You will not only get the theoretical background of these core areas but also be involved in hands-on research right from the start of your studies.

1.2 Specific Advantages of the BCCB Program at Jacobs University

- The BCCB program at Jacobs University combines biochemistry, cell biology, and genetics from the first day of study such that the connections between them become clear. In the first year, students rapidly obtain an overview of the entire field of molecular life science; this helps them to identify their own area of interest.

- The BCCB program covers human and animal biochemistry, cell biology, and genetics, but is also strong in plant and microbial life science. The wide experience of Jacobs life sciences faculty, and the courses they offer, allow students to also explore related subjects such as biotechnology, biophysics, bioinformatics, organic chemistry, drug design, and others.

- The BCCB program has a very strong practical component, with excellent laboratory courses. This helps students to gain hands-on experience that they need to apply for high-level internships and graduate school positions. The Bachelor theses consist of research work in the research groups of life sciences faculty.

- In the first ten years of its existence, the BCCB program has been spectacularly successful with many students going on to graduate school at high-level institutions worldwide.

1.3 Program-Specific Qualification Aims

- Throughout their studies BCCB students acquire profound theoretical knowledge in the fields of biochemistry, molecular biology and cell biology, thereby gaining thorough understanding of principal concepts in these research areas. Furthermore, students learn how to abstract and transfer their knowledge onto new research areas, an essential skill in modern life sciences.

- Presentation skills will be developed through scientific poster preparation and oral presentations. In this context, students will be exposed to primary scientific literature and are eventually guided towards the development of research strategies, e.g. for a PhD project.

- The theoretical education is complemented by rigorous practical training in comprehensive laboratory courses (already starting in the first semester) in the fields of biochemistry, cell biology, molecular biology and microbiology. In these courses students will not only acquire excellent technical skills and employ state-of-the-art methods, but also learn how to accurately document and analyze scientific data through the writing of lab reports and the bachelor's thesis, all following publication-style rules.

- Through further involvement in life science research conducted at Jacobs University Bremen will experience an authentic research environment and acquire an early perspective on prospective job careers.

1.4 Career Options

Since 2004, on average 20 BCCB students per year have graduated. Most of our graduates continue their studies to pursue a master's or PhD degree. The students have, however, specialized in very different fields within BCCB, including neuroscience, developmental biology, molecular biology and genetics, biomedicine, medical microbiology, marine microbiology, biotechnology. In all of these areas, BCCB graduates have been admitted to excellent universities world-wide for graduate studies (MSc or PhD). Universities that have admitted BCCB students from Jacobs University include the Universities of Oxford and Cambridge, Harvard University, ETH Zurich, European Molecular Laboratories (EMBL) and International Max-Planck Research Schools (IMPRS). After graduation from MSc or PhD programs, students then either continue with postdoctoral positions in academia or acquire junior / senior positions in companies affiliated with life science, biomedical topics or biotechnology.

1.5 The Jacobs University Employability and Personal Development Concept

Jacobs University's educational concept aims at fostering employability which refers to skills, capacities, and competencies which transcend disciplinary knowledge and allow graduates to quickly adapt to professional contexts. Jacobs University defines employability as encompassing not just technical skills and understanding but also personal attributes and qualities enabling students to become responsible members of their professional and academic fields as well as of the societies they live in.

Graduates of JU will be equipped with the ability to find employment and to pursue a successful professional career, which means that

- graduates possess the ability to acquire knowledge rapidly, to assess information and to evaluate new concepts critically;

- graduates have communicative competences which allow them to present themselves and their ideas and to negotiate successfully;

- graduates are familiar with business-related processes and management skills and are able to manage projects efficiently and independently.

Graduates of JU will also be equipped with a foundation to become globally responsible citizens, which includes the following attributes and qualities:

- graduates have gained intercultural competence; they are aware of intercultural differences and possess skills to deal with intercultural challenges; they are familiar with the concept of tolerance;

- graduates can apply problem-solving skills in negotiating and mediating between different points of view;

- graduates can rely on basic civic knowledge and have an understanding for ethical reasoning; students are familiar with the requirements for taking on responsibility.

1.6 More Information and Contact

For more information please contact the study program coordinator:

Prof. Dr. Christian Hammann
Professor of Biochemistry
Email: c.hammann@jacobs-university.de
Tel:+49 421 200-3247

or visit our program website: www.jacobs-university.de/bccb-program

2 The Curricular Structure

2.1 General

The undergraduate education at Jacobs University equips students with the key qualifications necessary for a successful academic, as well as professional career. By combining disciplinary depth and transdisciplinary breadth, supplemented by skills education and extracurricular elements, students are prepared to be responsible and successful citizens within the societies they work and live in.

The curricular structure provides multiple elements enhancing employability, transdisciplinarity, and internationality. The unique Jacobs Track, offered across all study programs, provides a broad range of tailor-made courses designed to foster career competencies. These include courses which promote communication, technology, business, (German) language, and management skills. The World Track, included in the third year of study, provides extended company internships or study abroad options. Thus students gain training on the job and intercultural experiences. All undergraduate programs at Jacobs University are based on a coherently modularized structure, which provides students with a broad and flexible choice of study plans to meet their major as well as minor study interests.

The policies and procedures regulating undergraduate study programs at Jacobs University in general can be found on the website.

2.2 The Jacobs University 3C-Model

Jacobs University offers study programs according to the regulations of the European Higher Education Area. All study programs are structured along the European Credit Transfer System (ECTS), which facilitates credit transfer between academic institutions. The three-year undergraduate program involves six semesters of study with a total of 180 ECTS credits. The curricular structure follows an innovative and student-centered modularization scheme - the 3C-Model - which groups the disciplinary content of the three study years according to overarching themes:

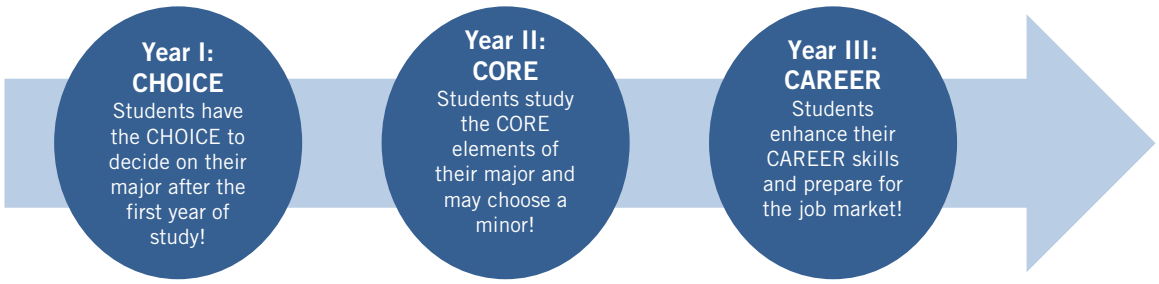


Figure 1: The Jacobs University 3C-Model

2.2.1 YEAR 1 - CHOICE

The first study year is characterized by a broad offer in disciplinary and interdisciplinary education. Students select three CHOICE modules from a variety of study programs. As a unique asset, our curricula allow students to select their study program freely from among the three selected CHOICE modules during their first year of study.

2.2.2 YEAR 2 - CORE

In the second year, students take three in-depth, discipline-specific CORE modules. One CORE module can also be taken from a second, complementary discipline, which allows students to incorporate a minor study track into their undergraduate education. Students will generally qualify for a minor if they have successfully taken at least one CHOICE module and one CORE module in a second field, and this extra qualification will be highlighted in the transcript.

2.2.3 YEAR 3 - CAREER

During their third year, students must decide on their career after graduation. In order to facilitate this decision, the fifth semester introduces two separate tracks. By default students are registered for the World Track.

1. **The World Track**
   In this track there are two mandatory elective options:
   - **Internship**
     The internship program is a core element of Jacobs Universitys employability approach. It includes a mandatory semester-long internship off-campus (minimum 16 weeks in full-time) which provides insight into the labor market as well as practical work experience related to the respective area of study. Successful internships may initiate career opportunities for students. For more information, please contact the Career Services Center (http://www.jacobs- university.de/career-services/contact).
   - **Study Abroad**
     Students can take the opportunity to study abroad at one of our partner universities. Courses recognized as study abroad credits need to be pre-approved according to the Jacobs University study abroad procedures and carry minimum of 20 ECTS credits in total. Several exchange programs allow you to be directly enrolled at prestigious partner institutions worldwide. Jacobs University's participation in Erasmus+, the European Unions exchange program, provides an exchange semester at a number of European universities including Erasmus study abroad funding. For more information, please contact the International Office
     (http://intoffice.user.jacobs-university.de/outgoing/).
2. **The Campus Track**
   Alternatively, students may also opt to follow the Campus Track by continuing their undergraduate education at Jacobs, namely by selecting an additional CORE module during their third year and redistributing the remaining courses and modules across the

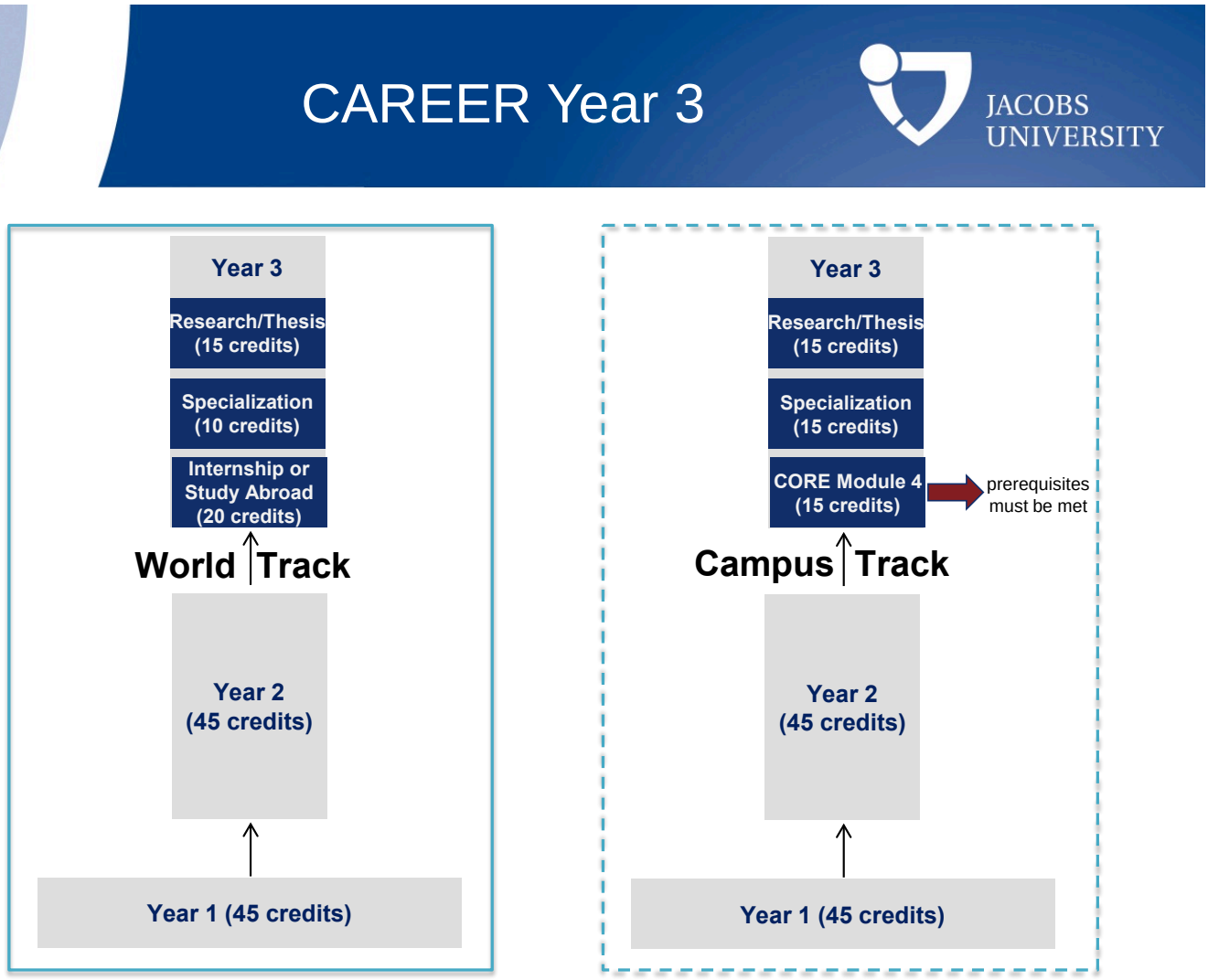


Figure 2: World Track versus Campus Track

Career Advising

Is a mandatory component of the Jacobs University's Advising and Counseling Scheme. Further components are "Academic Advising" and "Psychological Counseling and Intercultural Services". Throughout their studies all students attend a mandatory set of career skills events. The mandatory "Career Skills Advising" prepares all undergraduate students at Jacobs University for the transition from student life to working life as well as for their future career. Skills, knowledge and information which are fundamental for participation in an internship or a semester abroad will be conveyed concurrently. Essential components include information sessions, compulsory workshops on various career-relevant topics as well as participation in the annual Jacobs Career Fair.

All undergraduate students will be automatically registered for "Career Skills Advising". However, every student has to keep track of his/her individual fulfillment of requirements and has to register on CampusNet for all workshops and sessions during the official registration period at the beginning of each semester. An overview of the sequence in which events should be attended is shown in the table below.

CAREER SKILLS MODULE For Undergraduate Students matriculated Fall 2015 and Fall 2016

SEMESTER	1	2	3	4	5	6
MANDATORY BASICS	CSC-INFO Session: "CSC Services" CA01-990000		CSC-INFO Session: "World Track" CA01-990026			
MANDATORY SEMINARS	Both seminars have to be attended in your first or second semester: CSC-APPLICATION TRAINING CA01-990001 CSC-RESEARCHING & CONTACTING EMPLOYERS CA01-990004					
MANDATORY ELECTIVE SEMINARS (seminar program subject to availability)			Attend 2 out of several career skills seminars and workshops. i.e. ▪ Business Etiquette ▪ Presentation Skills ▪ Communication Skills ▪ Grad School Application Training ▪ Self-Management ▪ Time-Management ▪ Decision Making ▪ Preparing for an Interview ▪ Introduction to Project Management			
OTHER MANDATORY COMPONENTS				CSC-JACOBS CAREER FAIR in February, on campus CA01-990003	INTERNSHIP or STUDY ABROAD or CAMPUS TRACK	INTERNSHIP & STUDY ABROAD EVENT Online CSC-CAREER SURVEY CA01-990002

Figure 3: Career Advising

2.3 The Jacobs Track

The Jacobs Track, another stand-alone feature of Jacobs University, runs parallel to the disciplinary CHOICE, CORE, and CAREER modules across all study years and is an integral part of all study programs. It reflects our commitment to an in-depth methodological education, it fosters our transdisciplinary approach, it enhances employability, and equips students with extra skills desirable in your general field of study. Additionally, it integrates essential language courses.

Mathematics, statistics, and other methods courses are offered to all students within a comprehensive Methods Module. This module provides students with general foundations and transferable techniques which are invaluable to follow the study content not only in the study program itself but also in related fields.

The Skills Module equips students with general academic skills which are indispensable for their chosen area of study. These could be, for example, programming, data handling, presentation skills, and academic writing, scientific and experimental skills.

The transdisciplinary Triangle Module offers courses with a focus on at least one of the areas of business, technology and innovation, and societal context. The offerings comprise essential knowledge of these fields for students from other majors as well as problem-based courses that tackle global challenges from different disciplinary backgrounds. Working together with students from different disciplines and cultural backgrounds in these courses broadens the students horizon by crossing the boundaries of traditional disciplines.

Foreign languages are integrated within the Language Module. Communicative skills and foreign language competence foster students intercultural awareness and enhance their employability in a globalized and interconnected world. Jacobs University supports its students in acquiring and improving these skills by offering a variety of language courses at all proficiency levels. Emphasis is put on fostering German language skills, as they are an important prerequisite for students to learn about, explore, and eventually integrate into their host country. Hence, acquiring 10 ECTS credits in German is a requirement for all students. Students who meet the requirements of the German proficiency level (e.g. native speakers) are required to select courses in any other language program offered.

2.4 Modularization of the Biochemistry and Cell Biology Program

2.4.1 Content

Year 1
Take two mandatory modules listed below and select one further CHOICE module from a different study area.

Biochemistry and Molecular Biology (CH02-BioChem)
Biochemistry and Molecular Biology is a first year module that explains how the structure of biological molecules (proteins, sugars, lipids, nucleic acids) defines their biochemical properties and cellular functions. Students will be introduced to the basics of thermodynamics and molecular kinetics to understand key biomolecular concepts, e.g., protein folding, metabolism, and gene expression. Each of the two 5-ECTS-lectures is complemented by a 2.5 ECTS lab course offering practical training in key techniques applied in biochemistry and molecular biology. This module provides the foundation for the CORE modules ”Molecular Biology” and ”Chemical Biology”.

Cell Biology (CH01-CellBio)
Cell Biology is an introductory module giving a comprehensive overview about cellular structure and physiology. It will explain cellular architecture and organization and how cells need to interact and communicate in multicellular organisms. This module will thus provide insight into both, the organismal organization and specialization of cells as well as the underlying molecular processes, e.g., gene expression and intracellular transport. Both 5-ECTS-lectures are complemented by a 2.5-ECTS lab course each, offering practical training in key techniques applied in modern molecular cell biology. This module provides the foundation from which you may progress to the higher level modules ”Biomedicine” and ”Infection and Immunity”.

Year 2
Take all three modules or replace one with a CORE module from a different study program.

Biomedicine (CO01-Biomed)
Biomedicine is an advanced model that builds on the CHOICE module Cell Biology. Biomedicine first expands knowledge on key cellular processes often affected in diseases, e.g. gene expression, cell proliferation, intracellular trafficking, signal transduction and general turnover of cellular compounds. The module will address how these processes become altered in different diseases, e.g., cancer and neurodegenerative diseases, and how diagnostic tools and therapies (ranging from chemical to cell-based approaches) can be developed according to a disease’s molecular origin. Two lectures are complemented by a 5 ECTS lab course that introduces students to modern methodology in cell biological research and biomedicine.

Infection and Immunity (CO02-InflImm)
Infection and Immunity is an advanced module that builds on both BCCB CHOICE modules (”Cell Biology” and ”Biochemistry and Molecular Biology”). It combines the fundamentals of microbiology with an overview about the human immune system. Students will learn how microbes act in the environment and on human health, and how scientists investigate and control microbial pathogens. The immune system will be explained and how identifies and eliminates

cancer cells, viruses, bacteria, and parasites. Immune evasion mechanisms of pathogens will be elucidated as well as therapeutic approaches. In the 5 ECTS lab course, students will learn to isolate, handle, characterize, and taxonomically identify microorganisms using classical and state-of-the-art technologies.

Molecular Biology (CO03-MolBio)
Molecular Biology is an advanced module that builds on the CHOICE module Biochemistry and Molecular Biology. This module introduces the molecular basis of the flow of genetic information with special emphasis on regulatory mechanisms. Students will also learn about principles governing molecular evolution, i.e. types of mutations, causes and consequences of mutations, and how mutations of genes shape a populations adaptation to environmental changes. The 5 ECTS lab course provides an integrated view on the molecular analysis of biomolecules involved in molecular information pathways.

Some CORE Modules require students to have taken a specific CHOICE Module. Please see the Module Handbook for details regarding pre-requisites.

Year 3
In the 3rd year students follow the World Track by default:

1. **World Track**
   5th Semester
   - Internship / study abroad

   6th Semester
   - Biochemistry and Cell Biology Project / Thesis Module
   - Program-specific Specialization Module
     Exemplary course offering:
     - Ribogenetics
     - Binding and Enzyme Assays
     - Concepts and Applications of Metabolism
     - Current Topics in the Molecular Life Sciences
     - Research Approaches in Molecular Life Science
2. **Campus Track**
   Students who do not enter the World Track follow the Campus Track.
   5th and 6th Semester

   - Program-specific Project / Thesis Module
   - Program-specific Specialization Module
     (please see World Track for exemplary course offering)
   - Additional CORE Module

2.5 The Bachelor Thesis / Project

This module is a mandatory graduation requirement for all undergraduate students. It consists of two components in the major study program guided by a Jacobs Faculty member:

1. **A Research Project** (5 ECTS)
   and
2. **The Bachelor Thesis** (10 ECTS)

The workload for the project component is about 125 hours and for the thesis component about 250 hours.The title of the thesis will be shown on the transcript.

2.5.1 Aims

Within this module, students apply knowledge they have acquired about their major discipline, skills, and methods to become acquainted with actual research topics, ranging from the identification of suitable (short-term) research projects, preparatory literature searches, the realization of discipline-specific research, and the documentation, discussion, and interpretation of the results. Research results obtained from the Research Project can be embedded in the Bachelor Thesis.

2.5.2 Intended Learning Outcomes

1. Research Project
   This module component consists of a guided research project in the major study program. The well-defined research task must be completed and documented according to the scientific standards in the respective discipline. It involves a high degree of independence, supported by individualized instructor feedback and guidance.
2. Bachelor Thesis
   With their Bachelor Thesis students should demonstrate mastery of the contents and methods of the major specific research field. Furthermore, students should show the ability to analyze and solve a well-defined problem with scientific approaches, a critical reflection of the status quo in scientific literature, and an original development of their own ideas.

Both, the Research Project and the Bachelor Thesis, can also have an inter- or transdisciplinary nature - with the explicit permission of the supervisor.

2.5.3 Supervision

Both module components can be performed with the same Jacobs faculty member, or different ones, the latter in order to allow a broader research experience. Students are required to choose a supervisor, at the latest, by the end of the drop-add period of the semester in which the module component is taken. **The selected supervisor(s) must approve the Project topic and Bachelor Thesis topic before the student starts to work towards the module component.** The respective study program coordinators will assist in the search for prospective supervisor(s).

2.5.4 Registration

World Track students register for both components, at the earliest, in their 6th semester.
Campus Track students register for the Project component in the 5th and for the Bachelor Thesis component, at the earliest, in their 6th semester.

The registrations must be made before the end of the respective drop/add periods.

Later enrolment is possible for those students pursuing a second major or those who graduate late for other reasons. These students perform their (second) thesis earliest in the 7th semester of their studies. They have to contact the Student Records Office for individual registration.

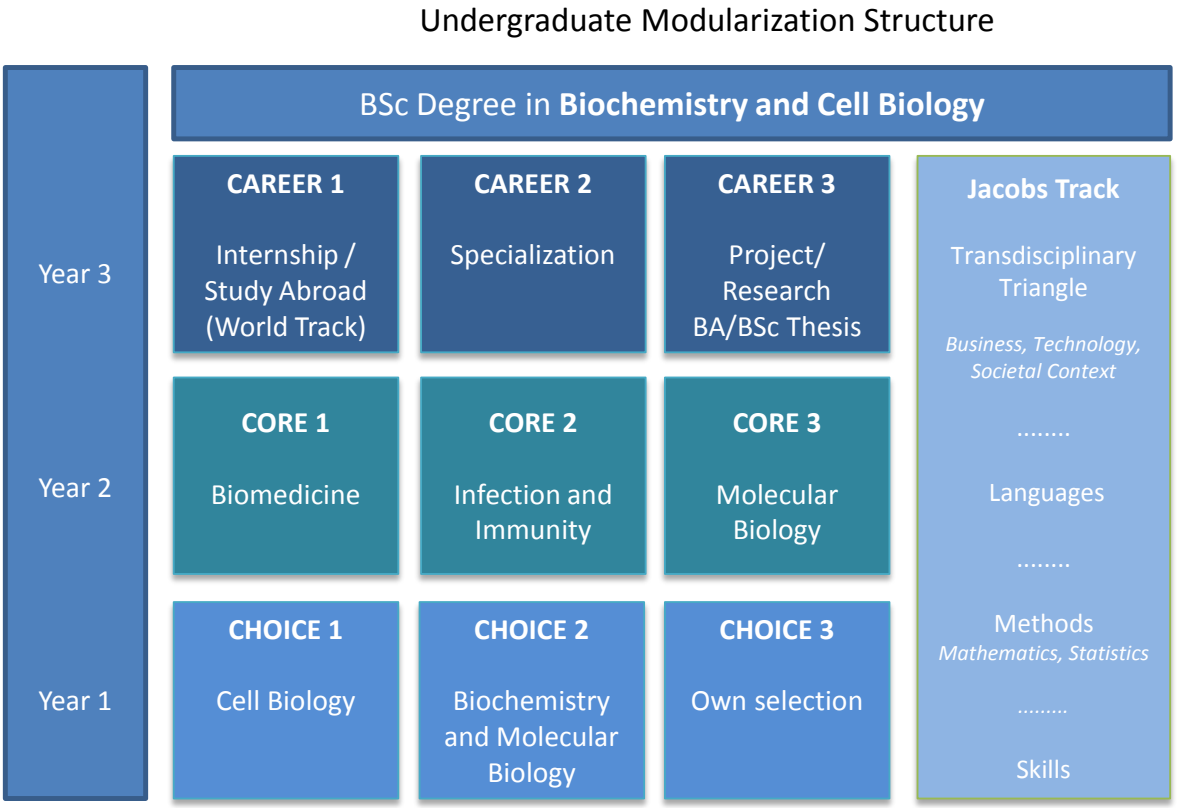
Students are allowed to extend their thesis related work into the intersession or summer break upon approval of the thesis supervisor and Student Records. Students are not allowed to register for different Bachelor Thesis courses in the same semester.

2.5.5 Formal Regulations for the Bachelor Thesis

- Timing
  The Thesis work has to be generated within the semester of registration. The semester period has 14 weeks.
- Extent
  The document must be between 15-25 pages in length, including references, but excluding appendices or supporting information. Deviations in length and format can be determined within individual study programs and should be communicated to all registered students by the study program coordinator.
- Cover page
  The cover page must show the title of the Bachelor Thesis, the university's name, the month and year of submission, the name of the student and the name of the supervisor.
- Statutory Declaration
  Each Bachelor Thesis must include a statutory declaration signed by the student confirming it is their own independent work and that it has not been submitted elsewhere. The respective form can be found on the Student Records Office website.
- Submission
  The Bachelor Thesis must be submitted as a hard copy (pdf-file) to the supervisor and additionally to the Student Records Office via online form on the Student Records Office website.

  Deadline for submission of the Bachelor Thesis is May 15 (unless specified otherwise by the Student Records Office).

2.5.6 Structure



YEAR 1 *Take three CHOICE modules, one free selection*
YEAR 2 *Take three CORE modules, one CORE module can be substituted by a CORE module from a second study program to pursue a minor*
YEAR 3 *Alternatively Campus Track with a 4th CORE module instead of internship/study abroad module*

Figure 4: Biochemistry and Cell Biology Module Structure

3 Appendix 1a/1b: Mandatory Module and Examination Plans for World Track and Campus Track

Jacobs University Bremen reserves the right to substitute courses by replacements and/or reduce the number of mandatory/mandatory elective courses offered.

4 Appendix 2: Course Data for Program-Specific CHOICE and CORE Courses

All course data stated in the appendix is based on the previous study year and subject to change.

Appendix 1a - Mandatory Module and Examination Plan for World Track

Biochemistry and Cell Biology – World Track

Matriculation Fall 2016

	Program-Specific Modules	Type	Status[1]	Semester	Credits		Jacobs Track Modules (General Education)	Type	Status[1]	Semester	Credits
Year 1 - CHOICE					**45**						**20**
Take the two mandatory CHOICE modules listed below, these are a requirement for the BCCB program.											
CH02-BioChem	**Module: Biochemistry and Molecular Biology**		**m**		**15**		**JT-ME-MethodsMath**	**Module: Methods / Mathematics**		**m**		**7,5**
CH02-520101	General Biochemistry and Molecular Biology I	Lecture	m	1	5		JT-ME-120106	Applied Calculus I	Lecture	m	1	2,5
CH02-520111	General Biochemistry and Molecular Biology I Lab	Lab	m	1	2,5		JT-ME-120107	Applied Calculus II	Lecture	m	1	2,5
CH02-520201	General Biochemistry and Molecular Biology II	Lecture	m	2	5		JT-ME-120101	Mathematical Concepts in the Sciences	Lecture	m	2	2,5
CH02-520121	General Biochemistry and Molecular Biology II Lab	Lab	m	2	2,5		**JT-SK-Skills**	**Module: Skills**		**m**		**2,5**
CH01-CellBio	**Module: Cell Biology**		**m**		**15**		JT-SK-990103	Scientific and Experimental Skills	Lecture	m	1	2,5
CH01-520122	From Cells to Tissues and Body Functions	Lecture	m	1	5							
CH01-520123	General (Cell) Biology Lab	Lab	m	1	2,5		**JT-TA-TriArea**	**Module: Triangle Area**		**m**		**5**
CH01-520102	General Molecular Cell Biology	Lecture	m	2	5			Take two courses from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS [3]		me	1/2	5
CH01-520112	General Molecular Cell Biology Lab	Lab	m	2	2,5							
	Module: CHOICE (own selection)		**e**	**1/2**	**15**		**JT-LA-Language**	**Module: Language**		**m**		**5**
Students take one further CHOICE module from those offered for all other study programs. [2]								Take two German courses (2,5 ECTS each). Native German speakers take courses in another offered language	Seminar	me	1/2	5
Year 2 - CORE					**45**						**20**
Take all three modules or replace one with a CORE module from a different study program. [2]											
CO03-MolBio	**Module: Molecular Biology**		**me**		**15**		**JT-ME-MethodsMath**	**Module: Methods / Mathematics**		**m**		**7,5**
CO03-520224	Molecular Information Pathways	Lecture	m	3	5			Take three Methods (mandatory) elective courses (2,5 ECTS each). [2]	Lecture	me	3/4	7,5
CO03-530661	Molecular Evolution	Lecture	m	4	5							
CO03-520225	Molecular Biology Lab	Lab	m	3	5							
CO02-InflImm	**Module: Infection and Immunity**		**me**		**15**		**JT-TA-TriArea**	**Module: Triangle Area**		**m**		**7,5**
CO02-520233	Microbes and Infection	Lecture	m	3	5			Take three courses from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS [3]		me	3/4	7,5
CO02-520322	Immunology	Lecture	m	4	5							
CO02-520221	Microbiology Lab	Lab	m	4	5		**JT-LA-Language**	**Module: Language**		**m**		**5**
CO01-Biomed	**Module: Biomedicine**		**me**		**15**			Take two German courses (2,5 ECTS each). Native German speakers take courses in another offered language	Seminar	me	3/4	5
CO01-520234	Advanced Molecular Cell Biology	Lecture	m	3	5							
CO01-520235	Molecular Mechanisms of Disease, Diagnostics and Therapy	Lecture	m	4	5							
CO01-520241	Advanced Molecular Cell Biology Lab (Intersession)	Lab	m	3	5							
Year 3 - CAREER					**45**						**5**
CA02 / CA03	**Module: Internship / Study Abroad**		**m**	**5**	**20**		**JT-SK-Skills**	**Module: Skills**		**m**		**2,5**
CA01-CarSkills	**Module: Career Skills**		**m**					Advanced Scientific and Experimental Skills	Lecture	m	6	2,5
CA05-BCCB	**Module: Project/Thesis BCCB**		**m**		**15**		**JT-TA-TriArea**	**Module: Triangle Area**		**m**		**2,5**
CA05-520305	Project BCCB		m	6	5		JT-SK-990104	Take one course from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS [3]		me	6	2,5
CA05-520306	Thesis BCCB		m	6	10							
CAS-WT-BCCB	**Module: Specialization Area BCCB**		**m**		**10**							
	Take four specialization courses (2.5 ECTS each) [2]		me	5/6	10							
Total ECTS												**180**

[1] Status (m = mandatory, e = elective, me = mandatory elective)

[2] For a full listing of all CHOICE / CORE / CAREER / Jacobs Track modules please consult the **CampusNet online catalogue** and / or the module handbook (on our website).

[3] You are required to take six Triangle Area courses in total. Select two from each of the three triangle areas (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT).

Appendix 1b - Mandatory Module and Examination Plan for Campus Track

Biochemistry and Cell Biology – Campus Track

Matriculation Fall 2016

	Program-Specific Modules	Type	Status[1]	Semester	Credits		Jacobs Track Modules (General Education)	Type	Status[1]	Semester	Credits
Year 1 - CHOICE					**45**						**20**
Take the two mandatory CHOICE modules listed below, these are a requirement for the BCCB program.											
CH02-BioChem	**Module: Biochemistry and Molecular Biology**		**m**		**15**		**JT-ME-MethodsMath**	**Module: Methods / Mathematics**		**m**		**7,5**
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CH02-520111	General Biochemistry and Molecular Biology I Lab	Lab	m	1	2,5		JT-ME-120107	Applied Calculus II	Lecture	m	1	2,5
CH02-520201	General Biochemistry and Molecular Biology II	Lecture	m	2	5		JT-ME-120101	Mathematical Concepts in the Sciences	Lecture	m	2	2,5
CH02-520121	General Biochemistry and Molecular Biology II Lab	Lab	m	2	2,5		**JT-SK-Skills**	**Module: Skills**		**m**		**2,5**
CH01-CellBio	**Module: Cell Biology**		**m**		**15**		JT-SK-990103	Scientific and Experimental Skills	Lecture	m	1	2,5
CH01-520122	From Cells to Tissues and Body Functions	Lecture	m	1	5							
CH01-520123	General (Cell) Biology Lab	Lab	m	1	2,5		**JT-TA-TriArea**	**Module: Triangle Area**		**m**		**5**
CH01-520102	General Molecular Cell Biology	Lecture	m	2	5			Take two courses from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS [3]		me	1/2	5
CH01-520112	General Molecular Cell Biology Lab	Lab	m	2	2,5							
	Module: CHOICE (own selection)		**e**	**1/2**	**15**		**JT-LA-Language**	**Module: Language**		**m**		**5**
Students take one further CHOICE module from those offered for all other study programs. [2]								Take two German courses (2,5 ECTS each). Native German speakers take courses in another offered language	Seminar	me	1/2	5
Year 2 - CORE					**45**						**20**
Take all three modules or replace one with a CORE module from a different study program. [2]											
CO03-MolBio	**Module: Molecular Biology**		**me**		**15**		**JT-ME-MethodsMath**	**Module: Methods / Mathematics**		**m**		**7,5**
CO03-520224	Molecular Information Pathways	Lecture	m	3	5			Take three Methods (mandatory) elective courses (2,5 ECTS each). [2]	Lecture	me	3/4	7,5
CO03-530661	Molecular Evolution	Lecture	m	4	5							
CO03-520225	Molecular Biology Lab	Lab	m	3	5							
CO02-InflImm	**Module: Infection and Immunity**		**me**		**15**		**JT-TA-TriArea**	**Module: Triangle Area**		**m**		**7,5**
CO02-520233	Microbes and Infection	Lecture	m	3	5			Take three courses from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS [3]		me	3/4	7,5
CO02-520322	Immunology	Lecture	m	4	5							
CO02-520221	Microbiology Lab	Lab	m	4	5		**JT-LA-Language**	**Module: Language**		**m**		**5**
CO01-Biomed	**Module: Biomedicine**		**me**		**15**			Take two German courses (2,5 ECTS each). Native German speakers take courses in another offered language	Seminar	me	3/4	5
CO01-520234	Advanced Molecular Cell Biology	Lecture	m	3	5							
CO01-520235	Molecular Mechanisms of Disease, Diagnostics and Therapy	Lecture	m	4	5							
CO01-520241	Advanced Molecular Cell Biology Lab (Intersession)	Lab	m	3	5							
Year 3 - CAREER					**45**						**5**
COXX	**Module: Additional (4th) CORE module**		**m**	**5/6**	**15**		**JT-SK-Skills**	**Module: Skills**		**m**		**2,5**
CA01-CarSkills	**Module: Career Skills**		**m**				JT-SK-990104	Advanced Scientific and Experimental Skills	Lecture	m	6	2,5
CA05-BCCB	**Module: Project/Thesis BCCB**		**m**		**15**		**JT-TA-TriArea**	**Module: Triangle Area**		**m**		**2,5**
CA05-520305	Project BCCB		m	5	5			Take one course from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS [3]		me	5	2,5
CA05-520306	Thesis BCCB		m	6	10							
CAS-CT-BCCB	**Module: Specialization Area BCCB**		**m**		**15**							
	Take **six** specialization courses (2.5 ECTS each) [2]		me	5/6	15							
Total ECTS												**180**

[1] Status (m = mandatory, e = elective, me = mandatory elective)

[2] For a full listing of all CHOICE / CORE / CAREER / Jacobs Track modules please consult the **CampusNet online catalogue** and / or the module handbook (on our website).

[3] You are required to take six Triangle Area courses in total. Select two from each of the three triangle areas (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT).

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
From Cells to Tissues and Body Functions	CH01-520122	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH01-CellBio Cell Biology CO44-CelluBio Cellular Biology	125	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This lecture course will focus on explaining life from molecules through cells to tissues and organisms. The diversity of eukaryotic cell types and the complexity of cellular differentiation programs will be introduced at the molecular, structural, and functional levels. Students will learn about stem cells and how various cell types are integrated into tissues thereby building the organs of the body that enable physiologic functionality. We will discuss junctional complexes between cells in tissues and will understand how cells communicate with their environment by signal transduction processes. Based on the complex differentiation programs, developmental and morphogenetic processes generate body plans that are both, typical and characteristic for each organisms. At the end of the lecture students will have acquired a thorough understanding on how the cells and tissues found in round worms, fish, flies, rodents and humans are strikingly similar although different species are coping with the diverse environments they live in. The course will emphasize the principles of cellular and developmental biology, thereby highlighting physiology and also covering pathophysiology leading to disorders and disease.

Methods of Assessment

Name	Weighting
4 Quizz(es) (5 will be offered, 4 best will count)	50%
Final Exam	50%

Course Name	***Course No***	***ECTS***
General Cell Biology Lab	CH01-520123	2,5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH01-CellBio Cell Biology	62,5	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This laboratory course accompanies the lecture "From cells to tissues and body functions". It introduces students to the microscopic investigation of cells and tissues. In-lab seminars will discuss the theory behind the experiments and the expected outcomes. The students will document and discuss their experimental data in publication-style reports and posters. Theoretical preparation will be tested for by quizzes and the preparation of material safety data sheets (MSDS).

Methods of Assessment

Name	Weighting
1 Poster	25%
4 Lab Reports (incl. MSDS's)	50%
5 Quizz(es) in Lab	15%
Active Participation	10%

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
General Molecular Cell Biology	CH01-520102	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH01-CellBio Cell Biology CO44-CelluBio Cellular Biology	125	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This lecture course will focus on the molecular architecture of cells and will address more complex cell biological topics. Students will learn how genetic information is encoded and organized, how cellular compounds are synthesized, delivered and degraded within the cell and how these processes govern cellular physiology. A comprehensive overview about the field of molecular cell biology will be provided through a combination of historical outlines, information about experimental approaches in the molecular life sciences and the analysis of key cellular processes: DNA replication, protein synthesis, intracellular transport, cell division, cellular movements, signal transduction, cellular communication and the biology of neurons. Finally, students will learn how alterations in molecules, e.g. by mutation, may lead to diseases, such as cancer and neurodegenerative diseases. At the end of this lecture students will have acquired a thorough understanding of the general principles underlying cellular processes.

Methods of Assessment

Name	Weighting
Final Exam	40%
Quizz(es)	60%

Course Name	***Course No***	***ECTS***
General Molecular Cell Biology Lab	CH01-520112	2,5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH01-CellBio Cell Biology	62,5	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This laboratory course accompanies the lecture "General Molecular Cell Biology". It introduces students to the molecular investigation of cells. Student will apply basic DNA-based techniques to analyze DNA by restriction enzyme analysis and amplify microsatellite DNA via polymerase chain reaction (PCR), a core technique in molecular genetics. Furthermore, the effect of oxidative stress on yeast cells will be analyzed. In-lab seminars will discuss the theory behind the experiments and the expected outcomes. The students will document and discuss their experimental data in publication-style reports. Theoretical preparation will be tested for by quizzes and the preparation of material safety data sheets (MSDS).

Methods of Assessment

Name	Weighting
5 Lab Reports	70%
5 Quizz(es) in Lab	20%
MSDS Preparation	10%

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
General Biochemistry and Molecular Biology I	CH02-520101	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH02-BioChem Biochemistry and Molecular Biology	125	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This is a unique course that gives, over the first year of your studies at Jacobs University, a comprehensive introduction to biochemistry and molecular biology. At the end of the course, you will have gained knowledge of the foundations and the scope of the subject and of the specific scientific reasoning that underlies research in this field. Topics covered will be the chemical basics of the life sciences; the major classes of biological molecules (such as amino acids, proteins, carbohydrates, and lipids); the structure and function of proteins; the nature and regulation of metabolism; and the acquisition, conversion, and use of energy by cells. Information about the techniques and strategies to obtain knowledge and to ask questions in molecular life science, as well as historical outlines, will accompany each topic. This course requires solid High School knowledge of both biology and chemistry, or the willingness to acquire it at Jacobs University.

Methods of Assessment

Name	Weighting
Final Exam	40%
Quizz(es)	60%

Course Name	***Course No***	***ECTS***
General Biochemistry and Molecular Biology I Lab	CH02-520111	2,5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH02-BioChem Biochemistry and Molecular Biology	62,5	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This laboratory course accompanies the lecture "General Biochemistry and Molecular Biology". It aims at introducing students to the experimental analysis of the four major classes of biomolecules: carbohydrates, proteins, lipids and nucleic acids. Students will apply basic techniques (e.g., pipetting, dilution series preparation, spectrophotometry, thin layer chromatography) and learn how different biomolecules can be characterized by their specific biochemical properties. In-lab seminars will discuss the theory behind the experiments and the expected outcomes. The students will document and discuss their experimental data in publication-style reports. Theoretical preparation will be tested for by quizzes and the preparation of material safety data sheets (MSDS).

Methods of Assessment

Name	Weighting
5 Lab Reports	70%
6 Quizz(es) in Lab	20%
MSDS Preparation	10%

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
General Biochemistry and Molecular Biology II Lab	CH02-520121	2,5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH02-BioChem Biochemistry and Molecular Biology	62,5	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This laboratory course accompanies the lecture "General Biochemistry and Molecular Biology". It aims at introducing students to the experimental analysis of the four major classes of biomolecules: carbohydrates, proteins, lipids and nucleic acids. Students will apply basic techniques (e.g., pipetting, dilution series preparation, spectrophotometry, thin layer chromatography) and learn how different biomolecules can be characterized by their specific biochemical properties. In-lab seminars will discuss the theory behind the experiments and the expected outcomes. The students will document and discuss their experimental data in publication-style reports. Theoretical preparation will be tested for by quizzes and the preparation of material safety data sheets (MSDS).

Methods of Assessment

Name	Weighting
5 Lab Reports	70%
5 Quizz(es)	20%
Active Participation	10%

Course Name	***Course No***	***ECTS***
General Biochemistry and Molecular Biology II	CH02-520201	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CH02-BioChem Biochemistry and Molecular Biology	125	Bachelor 1st Year CHOICE

Course Description / Content / Aims

This is a unique course that gives, over the first year of your studies at Jacobs University, a comprehensive introduction to biochemistry and molecular biology. At the end of the course, you will have gained knowledge of the foundations and the scope of the subject and of the specific scientific reasoning that underlies research in this field. Topics covered will be the chemical basics of the life sciences; the major classes of biological molecules (such as amino acids, proteins, carbohydrates, and lipids); the structure and function of proteins; the nature and regulation of metabolism; and the acquisition, conversion, and use of energy by cells. Information about the techniques and strategies to obtain knowledge and to ask questions in molecular life science, as well as historical outlines, will accompany each topic. This course requires solid High School knowledge of both biology and chemistry, or the willingness to acquire it at Jacobs University.

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
Advanced Molecular Cell Biology	CO01-520234	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO01-Biomed Biomedicine	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

This lecture builds on the CHOICE module "Cell Biology". The course intends to give a more detailed and advanced understanding of cell biology on the basis of the biochemical features of cellular macromolecules. The biogenesis and molecular architecture of cellular compartments will be discussed in light of their function to enable and optimize biochemical reactions, which are necessary for all cells to perform their biological functions. Furthermore, the focus will be on the regulation of cellular processes and their integration in tissue formation and the evolution of multicellular organisms. Key processes include: gene expression and protein synthesis, protein folding and delivery, cell division, signal transduction, repair mechanisms, apoptosis and degradation. Finally, the complexity of cellular systems and the importance of their macromolecular constituents become most obvious upon loss of function, either during aging or in certain disorders that have been characterized on the molecular level. Therefore, biomedical implications will be included wherever possible.

Methods of Assessment

Name	Weighting
6 Quizz(es)	50%
Final Exam	50%

Course Name	***Course No***	***ECTS***
Advanced Molecular Cell Biology Lab (Intersession)	CO01-520241	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO01-Biomed Biomedicine	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

This laboratory course focuses on the cellular architecture and targeting of proteins. The lab course has three major parts. CHO cells are transfected with plasmids coding for targeted and non-targeted GFP. Then, the localization of these proteins is investigated by miscroscopy and subcellular fractionations followed by SDS-PAGE and immunoblot. In the third part, normal CHO cells are vital-stained and subjected to trafficking studies by classical intervention studies. Mouse tissue sections are prepared and immunolabeled to complement histological aspects. Conventional and confocal fluorescence microscopy is performed on the microscopic specimen. In-lab seminars will discuss the theory behind the experiments and the expected outcomes. Trouble-shooting sessions will solve problems on the spot. The students will document and discuss their experimental data in publication-style reports. Theoretical preparation will be tested for by quizzes and the preparation of material safety data sheets (MSDS).

Methods of Assessment

Name	Weighting
1 Lab Report	60%
2 Quizzes in Lab	15%
Active Participation	15%
MSDS sheets	10%

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
Molecular Mechanisms of Disease, Diagnostics and Therapy	CO01-520235	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO01-Biomed Biomedicine	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

This lecture course will focus on the various aspects of biomedical research. Understanding the underlying molecular principles and cellular mechanisms that enable cells, tissues, and bodies to maintain their function will be of central interest. Since the complexity of biological systems becomes most obvious under challenging conditions, biomedical research has largely focused on chronic degenerative diseases and the pathology of aging, e.g., atherosclerosis, neurodegenerative diseases, muscular dystrophy and cancer. In this course, we will discuss model organisms to which molecular medicine refers, experimental approaches taken to challenge biological functions, and we will talk about animal models for human diseases. We will introduce therapeutic approaches targeting cellular processes, e.g. gene expression and molecular repair, as well as cell-based strategies in replacement therapy. In this context, we will also discuss leading-edge approaches like organs-on-a-chip as well as ethical considerations. Finally, results of clinical trials aiming at targeted therapy of human disorders will be analyzed. The course is updated in order to follow recent developments in molecular medicine, therefore slight variations in topics are to be expected. Students will learn how disease is brought about, studied, and tackled by translational approaches that use the knowledge from basic research for clinical application.

Methods of Assessment

Name	Weighting
4 Quizz(es)	40%
Essay on a disease	20%
Final Exam	40%

Course Name	***Course No***	***ECTS***
Microbes and Infection	CO02-520233	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO02-InfImm Infection and Immunity CO45-FoundMedII Foundations in Medicine II	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

There is no higher life form without microbes. But there are plenty of microbes without higher life forms. Microorganisms are present whereever life is possible – and their cell numbers outcompete the cell numbers of higher life forms by several orders of magnitude. This survey course introduces the principles of the world of microorganisms, their diversity, and how microbes act in the environment and on human health. Bacteria, archaea, fungi, protists, and viruses are covered with specific examples of high relevance in human health, environmental processes, or food manufacturing and preservation. The diverse biochemical life styles of microbes will be introducted, from photosynthesis via methanogenesis to pathogenicity. The course furthermore deals with the different ways on how to investigate and control microbial contaminations and pathogens, and how microbes impact our everyday life, political processes, history, and social behavior.

Methods of Assessment

Name	Weighting
2 Quizz(es)	10%
Active Participation	20%
Exam 1	30%
Exam 2	40%

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
Microbiology Lab	CO02-520221	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO02-InfImm Infection and Immunity	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

Microorganisms are conducting the most diverse biochemical and environmental processes and are found anywhere in our natural and man-made surrounding. In this lab course, students will learn how to sample, isolate, handle, characterize, and taxonomically identify unknown microorganisms using diverse classical and state-of-the-art technologies. Focus will be given to bacterial organisms found in aquatic habitats, their cellular characteristics, biochemical properties and capabilities, and their resistance or susceptibility towards different types of antibiotics. The course participants will learn how to biochemically characterize an unknown bacterium, how to determine its antibiotics spectrum, and how to measure the minimal inhibiting concentration of an antibiotics. Growth curve experiments will be conducted. Ultimately, the students are applying molecular techniques to amplify and visualize the taxonomic marker gene encoding for the 16S rRNA of the unknown microbe, for which the nucleotide sequence will be determined and compared with that of known bacterial organisms in order to identify the unknown isolate. Students are going to summarize their results in a manuscript-style lab report.

Methods of Assessment

Name	Weighting
Active Participation	20%
Exam	20%
Lab Report	60%

Course Name	***Course No***	***ECTS***
Immunology	CO02-520322	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO02-InfImm Infection and Immunity CO45-FoundMedII Foundations in Medicine II	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

This CORE course gives a thorough basic training in molecular, cellular, organismic, and clinical immunology, leading - in some aspects - up to the cutting edge of current research. We will use annotated slide files, textbooks, review articles, original literature, and presentations of original research data. Transferable skills: ?Through in-class discussions, peer instruction, and frequent quizzes, students learn to understand original research and its motivation and to discuss scientific contents.

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
Molecular Information Pathways	CO03-520224	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO03-MolBio Molecular Biology	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

This lecture course will concisely describe the molecular basis of the flow of genetic information from DNA to RNA and proteins. Special emphasis is given to regulatory principles in these processes. This course will also introduce students to the state-of-the-art methodology to investigate molecular information pathways. The students will become familiar with the make-up of genes and chromosomes, and how replication ensures genome integrity. We are going to study how epigenetic regulation influences gene expression, and the implications of epigenetic modifications in disorder and disease. The processes of transcription and translation will be discussed with a special emphasis on differences between bacteria and eukarya. This will allow to highlight approaches to combat bacteria by specific antibiotics and further drugs. For all processes described above, the interplay of regulatory principles will allow to obtain and integrated and holistic view on how cells and organisms orchestrate their Molecular Information pathways.

Methods of Assessment

Name	Weighting
Final Exam	40%
Midterm Exam	30%
Quizz(es)	30%

Course Name	***Course No***	***ECTS***
Molecular Biology Lab	CO03-520225	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO03-MolBio Molecular Biology	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

This advanced laboratory course provides an integrated view on the molecular analysis of biomolecules involved in Molecular Information pathways. Students will carry out all steps that are required to overexpress a protein, including experiments for the analysis of the DNA, RNA and protein molecules involved. Unlike in CHOICE lab courses, students will now be challenged with real, non-repetitive experimental research. The methods covered in this advanced lab course include primer design, polymerase chain reaction (PCR) , cloning, in vitro transcription, restriction digests, gel electrophoresis, real time PCR, various blotting techniques (Southern, Northern, Western), bacterial protein overexpression and immunological detection, as well as protein purification. At all steps, the quality of the obtained biomolecules involved in the molecular information pathways will be analysed and trouble-shouting sessions will help to solve problems immediately. The students will document and discuss their experimental data in publication-style reports. Theoretical preparation will be tested for by quizzes and the preparation of material safety data sheets (MSDS). Next to getting training in the listed techniques, this course will provide students with skills how to plan, to carry out and to document novel experiments

Methods of Assessment

Name	Weighting
Home Work Assignment	60%
MSDS	10%
Quizzes: weekly 10 min	30%

Appendix 2 - Course Data

Course Name	***Course No***	***ECTS***
Molecular Evolution	CO03-530661	5
Module Affiliation	***Workload (hrs / sem)***	***Level***
CO03-MolBio Molecular Biology	125	Bachelor 2nd Year CORE

Course Description / Content / Aims

Once molecular information pathways have been understood in principle and depth, the next emerging and stunning question should be how modifications of DNA and the corresponding subsequent changes in enzymes and cellular functions impact the evolution of organisms. This course will therfore introduce and describe the genetic processes and principles underlying and governing molecular evolution, i.e. the different types of mutations, their causes and consequences, and how mutations of genes shape an organism's population via adaptations to biotic or abiotic environmental stimuli. The course is further showing how mutational changes and horizontal transfer of genes or DNA fragments impact cellular and biochemical processes from generation to generation and how novel enzymatic functions evolve. Finally, distinct research examples are used to demonstrate the applicability of knowledge in molecular evolution in modern science and molecular biotechnology.

Methods of Assessment

Name	Weighting
2 Quizz(es)	20%
Active Participation	20%
Exam 1	30%
Exam 2	30%