Semester Package

FOOD SCIENCES and BIOTECHNOLOGY

University of Natural Resources and Life Sciences, Vienna

Bachelor Courses - Winter Term

Course	Course Number	ECTS	Prerequisite
Introduction to bioinformatics	894101	2	-
Industrial production of secondary metabolites and comparative biotechnology	790110	3	Basic knowledge in technical microbiology, organic chemistry, biochemistry, mechanical engineering
Fermentation processes in food industry	752102	2	Basic microbiology and biochemistry
Plant biotechnology	790111	3	Basic knowledge in Botany, proven by participation in corresponding lectures, e.g. Crop plant sciences
Biointerfaces, biomaterials and biophysics in nanobiosciences	803110	2	Basic knowledge in Biochemistry, Chemistry and Physics
Organisational behaviour	733104	3	Some knowledge about general processes in organisations is desirable (e.g. based on your work experience).

Bachelor Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Practical course in organic chemistry	773114	3	Basics in organic chemistry
Introduction to molecular biology	940105	2	-
Selected topics in biotechnology	790125	1,5	-
Biotechnological products	790129	2	-
Introduction to chemical food analysis	754105	2	-

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Master Courses - Winter Term

Course	Course Number	ECTS	Prerequisite
Human nutrition	976300	3	Basic knowledge of life science, esp. chemistry, biochemistry and nutrition science
Food toxicology	754345	2	-
Mechanical and thermal process technology II	893303	3	Lecture in Mechanical and Thermal Process Technology I (LVA 893.122)
Fat chemistry and technology	754354	2	-
Cereal technology	752327	2	Basics of the an-organic, organic and biochemistry, microbiology and processing technique (expected learning outcomes and achieved competences based on 217 Food- and Biotechnology, UG2002/13U, Bachelor curriculum)
Applied measurement and control systems	893308	3	Basic knowledge on measurement and control technology (VO MRT I)
Processes in enzyme technology	752332	2	-
Biochemical reaction engineering	752311	2	Participants will have to recall their knowledge from different lectures and disciplines in the field of biotechnology and create new connections
Food safety and risk management	754314	3	Fundamental food science, food chemistry, food microbiology and hygiene, quality management
Seminar in food technology	752314	2	-
Practical course in energy engineering	893306	3	Basic knowledge in energy technologies, but also in the fields of mechanics, fluid mechanics, thermodynamics and measurement engineering. Following LVA's are recommended for the practical course: 1) Process engineering I and II 2) Energy and environment engineering 3) Energy engineering

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Course	Course Number	ECTS	Prerequisite
Cell factories	790351	4	-
Biological nanosciences and nanotechnology	802300	2	Basic knowledge in mathematics, chemistry, physics and molecular biology
Applied mathematics and biostatistics	851314	2	Knowledge in basic mathematics and statistics as from the completed Bachelor programme Food Science and Biotechnology or equivalent
Applied mathematics and biostatistics exercises	851315	1	Knowledge in basic mathematics and statistics as from the completed Bachelor programme Food Science and Biotechnology or equivalent
Engineering of biotechnological production facilities	790380	2	-
Up- und downstream-processing	790357	3	Basics chemical engineering knowledge is requested. This includes basics in heat, mass, momentum transfer, and basics in thermodynamics. Solutions of differential equations (ODE solver). Furthermore basic knowledge in cell culture technology and cell biology is desirable
Products and processes in biotechnology	790360	2	This course is intended as a practical overview towards the end of the master curriculum. While there are no formal requirements, we suggest to pass Bioprocess Engineering, Cell Factories and Up- and Downstream Processing before
Process simulation	893312	2	basic knowledge of physics, chemistry and themodynamics is helpful
Biopolymers for sustainable utilization	774314	2	General concepts of chemistry have already been acquired
Cell and molecular biology II	940325	3	Basics in biochemistry, genetics, microbiology and molecular biology as covered in the bachelor programm food science and biotechnology and the lecture course Zell- und Molekularbiologie I (941319)
Clinical studies	790365	1	-

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Master Courses - Winter Term

Course	Course Number	ECTS	Prerequisite
Biological therapeutics	790368	2	Students should have passed already the examination cell factories but at least need knowledge about generation of recombinant cell lines and propagation of cell culture
Crop plant science	790361	2	Basics in Botany
Molecular plant breeding	957325	3	This is an advanced course for master and/or PhD students. Knowledge in classical and molecular genetics and cytogenetics is necessary for understanding this course. Knowledge in plant breeding and/or animal breeding is needed to understand this course
Structure and analysis of genomes	940301	3	Master level and above
Genetic control of secondary metabolites in perennial crop plants	958347	3	-
Environmental bioprocess engineering	790306	4	Basic knowledge of chemistry, biochemistry, microbiology and process engineering
Global waste management I	813300	3	Basic knowledge of environmental technologies
Renewable energy resources	893311	3	Fundamentals of physics and thermodynmacis
Microbial ecology and geomicrobiology	790387	2	basic microbiology (from bachelor studies)
Structure and function of proteins	752344	2	Sound knowledge in biochemistry
Antibody engineering	790398	3	The following lectures are highly recommended: 941105 Introduction to Molecular Biology (in Eng.) 772304 Protein chemistry and protein engineering (in Eng.) 791397 Protein engineering (in Eng.) 941319 Cell and molecular biology I (in Eng.) 791368 Biological Therapeutics (in Eng.)

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Master Courses - Winter Term

Course	Course Number	ECTS	Prerequisite
Glycobiology	772307	3	Good knowledge of biochemistry
Biochemistry of trace elements	772309	3	Knowledge of the fundamentals of static and dynamic biochemistry
Biochemical seminar	772325	2	Bachelor studies (nearly) completed; Basic knowledge in biochemistry on master level
Animal cell culture	790318	2	Basic knowledge of cell biology is recommended
Bayesian data analysis in the life sciences	790388	4	Students are advised to take the "Machine Learning and Pattern Recognition for Bioinformatics" lecture before attending this course. Knowledge of mathematics (linear algebra), statistics and elementary programming skills are essential
Efficient microarray data analysis using R and FSPMA	790391	1	The successful completion of the lecture depends on a basic knowledge of statistics and requires proficiency with using computers
Fluidization engineering	893329	4	Master-course: Bachelor-level knowledge in physics and engineering is expected The students know the main characteristics of fluidized systems and know about the relevant differences to fixed and moving bed systems. The students know the basic conditions for achieving a fluidized state. The students know the particle-Reynolds number and the Archimedes number. The students are able to define the gross dimensions of a fluidized bed for given fluid and solid parameters
Statistical thermodynamics and molecular simulation	894307	3	-
Molecular genetics of yeasts and hyphal fungi	940333	3	Basic knowledge of genetics, molecular genetics and biochemistry
Laboratory course in molecular genetics of yeasts and hyphal fungi	940334	3	Attendence of the accompanying lecture (will be held in parallel to the lab course) is mandatory

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Master Courses - Winter Term

Course	Course Number	ECTS	Prerequisite
Molecular phytopathology	940328	4	-
Seminar in molecular biology	940335	2	Good basic knowledge in molecular and cell biology is essential
Seminar in cell biology	940338	2	Solid basic knowledge in cell biology is expected
Biophysics	803301	4	Special knowledge in biology or biochemistry is not required. Some knowledge is physics, physical chemistry and mathematics will be an advantage
Methods in ultrastructure research	803302	3	-
Seminar in nanobiosciences and nanotechnology I	803304	2	Basic knowledge in Biochemistry, Chemistry and Physics. Basic knowledge in text editing and power point presentation
Bioprocess engineering I	790350	4	Basics chemical engineering knowledge is requested. This includes basics in heat, mass, momentum transfer, and basisc in thermodynamics. Solutions of diferential equations (ODE solver)
Cell and molecular biology I	940319	4	Basics in biochemistry, genetics, microbiology and molecular biology. According to the bachelor programm food science and biotechnology 033217
Molecular Phytopathology	940328	4	-
Infectious diseases and vaccines	790395	2	Basic knowledge in molecular and cell biology
Stem cells and tissue engineering	790367	3	Cell factories, Bioprocess Engineering, basic knowledge biochemistry
Methods in protein characterization	772328	4	Basic knowledge of biochemistry, in particular protein biochemistry

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Master Courses - Winter Term

Course	Course Number	ECTS	Prerequisite
Modern bioinformatics	790389	2	-
Molecular evolution and phylogenetics	790390	1	-
Protein engineering Lecture	790397	3	Basic knowledge in molecular biology and biochemistry Protein structure and function
Protein engineering Lecture and exercises	752339	2	Knowledge of microbiology/molecular biology

Master Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Biology, Chemistry and Microbiology for Civil Engineering	811357	3	-
Food Biotechnology	752324	5	Basic knowledge: microbiology, bio-chemistry, molecular biology
Food Packaging Technology	752325	3	Essentials of food processing and food technology
Crop production	951300	3	Basic knowledge of (plant) biology, physics at high school level
Specific and Emerging Topics in Food Microbiology	754315	3	Basic knowledge of food science
Biomaterial interfaces and interactions	802301	4	Basic knowledge in Biochemistry, Chemistry and Physics. Completion of the course “H802.300 Biological Nanoscience and Nanotchnology” is advantageous, but not required
Biophysical Chemistry	772300	3	Basic chemical and biochemical knowledge from BSc
European regulatory framework for organic production	933303	3	Agricultural background helps

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Master Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Molecular biology for food analysis	940304	3	Molecular Biology I (lab course) or an equivalent should have been done before.
Microbiological plant hygiene and safety	754350	2	Basic inorganic and organic chemistry and microbiology
Automatic identification technology in food industry	754335	3	-
Energy engineering	893360	3	Physics including thermodynamics (e.g. VO 892.104 + VO 893.103 or VO 892.105 + VO 893.112)
Open innovation strategies	735343	3	-
Enzyme technology seminar	752337	2	-
Practical course in measurement systems and applied programming	893325	3	-
Patent law and strategic patent management	736302	2	-
Introduction to programming	790396	3	-
Essentials for bioinformatics data analysis	790381	3	Basic knowledge in molecular biology. No previous Linux knowledge required
Modelling and simulation of biomolecules	894308	3	-
Introduction to metabolic modelling	790355	2	Some knowledge of linear algebra is advantageous is very helpful but not a prerequisite
High throughput sequencing and genome analysis	790382	3	Master and PhD students of biotechnology or related subjects (Bachelor students will not be accepted)
Machine learning and pattern recognition for bioinformatics	790384	4	Skills in Mathematics and Statistics which are provided in the compulsory courses in the Biotechnology bachelor and master curricula
Metabolic and cell engineering	790356	2	Biochemistry and cellular physiology. Metabolic pathways and metabolic regulation. Metabolic modelling
Protein chemistry and protein engineering	772304	4	Basic lectures in Organic Chemistry, Biochemistry and Molecular Biology

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Master Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Pathophysiology for biotechnologists	940326	2	Basic knowledge in biochemistry, cell and molecular biology
Oncology for biotechnologists	940327	2	Basic knowledge of biochemistry, cell and molecular biology
Preclinical studies	790364	1	-
Plant molecular biology	940321	3	-
Plant biochemistry and cell biology	940322	2,5	-
Safety aspects of plant biotechnology	790312	3	Botany, Plant Biotechnology
Practical course in plant biotechnology	790327	4,5	791111 Plant Biotechnology
Plant polysaccharide analysis	774305	2	The student has basic knowledge in organic and polysaccharide chemistry. Preferably the student has participated in 774314 "Biopolymers for sustainable utilization" or equivalent lectures The student has basic knowledge in organic and polysaccharide chemistry. Preferably the student has participated in 774314 "Biopolymers for sustainable utilization" or equivalent lectures
Methods in environmental biotechnology	970306	3	Practical experience and required skills for working in chemical and microbiological laboratories. Knowledge and awareness of safety regulations for laboratories. Students with insufficient lab skills may be excluded from the course!
Biotechnology for Sustainable Processes and Environmental Protection	970305	4	-
Industrial water management	811363	3	-
Fundamentals of Environmental Biotechnology	790386	3	Knowledege at bachelor-level in biochemistry, genetics, microbiology.
Environmental and biotechnological analysis	771303	3	It is strongly recommended that the course "Analytical Chemistry (771106)" is completed before undertaking in this course

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Master Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Introduction into crystallography and NMR spectroscopy of proteins	773311	3	Basic knowledge of biochemistry and spectroscopy. The lecture is recommended for advanced master study students and PhDs
Enzyme reactions: mechanisms and kinetics	752345	2	Knowledge of fundamental organic and biochemical reactions, protein and enzyme structure and basic kinetics
Applied biocatalysis	752346	3	Knowledge of enzymatic reactions, engineering and (bio-)chemistry
Organisational behaviour and gender issues	733321	3	-
From sequence to structure: prediction, modelling and molecular dynamics of protein structures	752312	3	-
Advanced instrumental analytical chemistry	771317	3	Knowledge in analytical chemistry
Project-based training on modern analytical techniques	771318	4	Knowledge of current analytical methods: 771108 Analytische Chemie VO. Practical experience in analytical chemistry: 771106 Instrumentelle Analytische und Physikalische Chemie UE
Proteomics	772306	3	-
Kinetics of Biochemical Reactions	772311	3	-
Bioorganic chemistry	773310	3	Fundamental knowledge of biochemistry and organic chemistry
Modern methods in structural analyses	773316	3	Basic knowledge in Analytical Chemistry and Spectroscopy
Antibodies and beyond - emerging fields in antibody engineering	790393	2	The following lectures are highly recommended: 941105 Introduction to Molecular Biology 791368 Biological Therapeutics
Automation of bioprocesses	790371	3	-
Strain improvement of microorganisms and higher eukaryotic cells	790304	3	-

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Master Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Microbial Plant Protection	790313	3	Phytopathology Botany
Seminar in biotechnology	790377	2	Basic understanding of biotechnology
Environmental biotechnology seminar	970309	2	-
Practical course in environmental biotechnology	970310	3	- Practical experience and required skills for working in chemical and microbiological laboratories - Awareness about hazards & risks and safety requirements in a lab Students with insufficient lab skills may be excluded from the course!
Flow cytometry and cell sorting in biotechnology	790325	3	Basic knowledge of cell biology strongly recommended! This course is recommended for master and PhD-students
Biology of Aging	790333	3	Basic knowledge of cell- and molecular biology is highly recommended!
Mechanisms of cell regulation in biotechnology	790370	2	While there are no formal requirements, a good background in biochemistry and molecular biology is expected
Sequencing data analysis	790394	3	Students should be familiar with Linux shell commands and with working from the command-line terminal. For example, the course “Essentials for bioinformatics data analysis” will cover the required skills
Digital Image Processing	803310	3	-
Microbiology and disease	802312	2	Basic knowledge of microbiology
Seminar in energy and process engineering	893327	2	-
Methods in cell biology	940339	3	-
Molecular Biology of Plant-Pathogen Interactions	940305	3	Basic knowledge of molecular biology
Developmental genetics	940307	3	Basics in molecular biology, genetics, cell biological methods
Cell biology	940311	3	-

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Master Courses - Summer Term

Course	Course Number	ECTS	Prerequisite
Genetically Modified Organisms in the Environment	940332	2	Basics in molecular biology and genetics
Prokaryotic glycoconjugates and disease	802302	3	General Microbiology, biochemistry, molecular biology
Biomimetic model lipid membranes	804302	3	Basic knowledge in biochemistry
Scattering techniques in nanomaterials science	892304	2	Physics and mathematics knowledge at university intoductory course level
Physical chemistry (soft matter dynamics)	803303	3	Basic knowledge in Biochemistry, Chemistry and Physics
Flow Cytometry and Cell Sorting in Biotechnology	790325	3	Basic knowledge of cell biology strongly recommended! This course is recommended for master and PhD-students
Prokaryotic Glycoconjugates and Disease	802302	3	General Microbiology, biochemistry, molecular biology
Immunobiology and vascular diseases	790363	2	-
Cell Factory - Plants	940331	3	Basic knowledge about cell and molecular biology; practical experience in labwork

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Master Courses - Winter and Summer Term

Course	Course Number	ECTS	Prerequisite
Practical course in food technology	752343	5	Basic knowledge on food processing would be useful.
Food Authenticity Practical Course	754310	3	Basic knowledge in food chemistry and molecular biology laboratory (e.g., accurate pipetting with micropipettes and graduated pipettes; handling of analytical balances; principles of "inoculation without contamination") as well as understanding of the fundamental aspects of "laboratory safety"
Laboratory course in molecular biology II	940323	3	
Practical course in enzyme technology	752338	3	Participants must be able to perform elementary practical routines like pipetting, buffer calculation and preparation, centrifugation and weighing. Theoretical knowledge is covered by the provided course script (on the Moodle pages), which has to be worked through before the course starts.
Practical course in biochemistry II	772305	5	Bachelors degree; fundamental biochemical knowledge; fundamental practical experience
Quality management in biotechnology	790353	3	General knowledge of Quality Management and application
Statistics with R	851309	2	-
Bioinformatics: Selected aspects	790383	3	A familiarity with computer based methods and concepts of data analysis will be helpful. We expect everyone to have a basic working knowledge of the "R" statistical data analysis language. For Boku students, we highly recommend the course "Statistics with R" to be completed in the same term or earlier terms

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Master Courses - Winter and Summer Term

Course	Course Number	ECTS	Prerequisite
Practical course in cell culture and fermentation	790369	3	Only master and PhD students are accepted. Bacchelorstudents are not accepted. Additionally, one of the following courses must be passed with a positive mark: Zellfabriken (791351) or Animal Cell Culture (791318) or Stem cells and tissue engineering (791367)
Practical course in protein engineering and technology	752347	5	Applicants are expected to have participated and finished most of the courses in the specialization of "Protein Engineering and Technology". Especially VU 772328 “Methods in Protein Characterization”, VU 894308 “Modelling and Simulation of Biomolecules” and VO 752345 “Enzyme Reactions: Mechanisms and Kinetics”. Please also study the available information on BOKUlearn (Moodle) carefully before our first, introductory meeting. You should: - be able to download, edit and save protein sequences - to perform basic homology modelling and use PyMol as a structure viewing program - have understood the principles of molecular docking - know how to use methods for protein analysis like DSC, CD, MS, SEC, Octet (biolayer interferometry) - be trained to measure enzyme kinetics (summer semester) or binding affinity (winter semester) - be highly motivated to collaborate with your colleagues - participate in the management of your research team
Advanced practical course in biochemistry	772326	3	Basic biochemical knowledge. 772.112 completed
Synthetic biology	804310	2	The basics of biochemistry are helpful for classifying the contents of this lecture
Practical course in cell biology	940337	3	-

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Master Courses - Winter and Summer Term

Course	Course Number	ECTS	Prerequisite
Exercises in molecular biology	940336	3	Theoretical background of molecular biology essential, practical experiences in molecular biological techniques are welcome
Synthetic bioarchitectures	804304	4	This lecture will base on fundamental understanding of molecular Biochemistry and basic Analytical methods. The background knowledge for this lecture is biochemistry - the organization and relation between the building blocks of life
Analysis of Bio-Hazards in Foods	970301	3	Basic knowledge in analytical chemistry, in particular of instrumental analytical chemistry
Bioinformatics lab rotation	790385	2	highly recommended that students are familiar with working on the command line in a Linux environment; this knowledge can be obtained by attending the course "Essentials for bioinformatics data analysis"
Using bioinformatics for expression profiling by next generation sequencing	790379	2	A familiarity with computer based methods and concepts of data analysis is highly recommended (eg. by completion of 791330)

How to look for courses:

boku.ac.at/int-in-boku-howtolookforcourses-en.html

For more information please contact

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