

**PŘÍLOHA P2 k závěrečné zprávě o řešení  
rozvojového projektu: Internacionalizace studijních  
programů VŠCHT Praha**

**Internacionalizovaný bakalářský studijní  
program**

***Food and Biochemical  
Technology***

**a studijní kurs**

***Food Technology and  
Biotechnology***

**Fakulty potravinářské a biochemické  
technologie**

Při řešení projektu na Fakultě potravinářské a biochemické technologie byla uvažována perspektiva dalšího vývoje studijních programů vyučovaných v českém jazyce. V současné době má fakulta akreditovány programy strukturovaného studia (bakalářské a magisterské) a jeden tzv. „nepokračující“ bakalářský program více zaměřený na fakultní oborové disciplíny. Studium podle nových programů teprve začíná a zatím není dostatek podkladů pro vyhodnocení a nasměrování dalšího rozvoje. Proto bylo po jednáních rozhodnuto vycházet při převodu do anglické verze ze základu představovaného současným nosným bakalářským programem *Potravinářská a biochemická technologie* akreditovaným v rámci tzv. strukturovaného studia.

Vedle úvah zabývajících se obsahem studia a perspektivami dalšího rozvoje fakulty a fakultou zajišťovaných studijních programů byly rovněž hledány cesty ke zvýšení efektivnosti zajištění výuky. Při řešení projektu řešitelé vycházeli ze zkušeností se zahraničními studenty přijíždějícími v rámci programu Erasmus/Sokrates a jejich zájmu o studované disciplíny, a současně ze snahy o efektivnost výuky a smysluplné využití pedagogických kapacit fakulty. Zejména u programů vyučovaných v jiných jazycích není alespoň okamžitě předpoklad velkého počtu studentů a vedení přednášek pro posluchače jednotlivce je neefektivní.

Z uvedeného je zřejmé, že internacionalizace studia bude dlouhodobý proces, který se bude dále vyvíjet podle dosažených zkušeností a potřeb. Během řešení projektu byly na základě současných zkušeností na fakultě zpracovány dvě varianty studia v angličtině:

1. **Jednoroční studijní kurz** s názvem ***Food Technology and Biotechnology***, který nabízí pokročilejším studentům průřezové kurzy kombinované ze všech tří fakultních studijních programů. Tento program byl vytvořen z toho důvodu, že mezi přijíždějícími studenty je významný podíl absolventů tří až čtyř ročníků vysokoškolského studia, kteří mají zájem o specializační kurzy. Avšak při celkově nízkých počtech zahraničních studentů byla snaha o jejich sloučení do skupiny, aby se omezilo na minimum časově náročné a neefektivní přednášení pro jednoho-dva studenty. Studenti po absolvování dostanou certifikát, zda ukončili kurz zkouškou. Tento způsob řešení se velmi osvědčil a bude dále rozvíjen. Seznam vyučovaných předmětů, počty kreditů a sylaby kurzů jsou uvedeny v příloze.

2. Se stoupajícím počtem přijíždějících zahraničních studentů v bakalářském stupni a s perspektivou nabídnout **ucelený studijní program** bylo přikročeno k přípravě celého bakalářského programu v angličtině. Vzhledem k tomu, že dosavadní zájem studentů jde napříč všemi nabízenými obory, byla v první fázi zvolena varianta jednoho nového bakalářského programu ***Food and Biochemical Technology***, ve kterém bude těžiště výuky posunuto od základních obecných předmětů více k problematice potravinářsko-biochemické. V anglickém programu je oproti české verzi omezen počet volitelných předmětů a rovněž náplň některých kurzů byla modifikována, např. kapitoly vztahující se k ryze českému prostředí (např. legislativa).

**Popis a náplň studijního kursu**

***Food Technology and  
Biotechnology***

Courses included in a study course  
***Food Technology and Biotechnology***

Subject	Semester*	Extent*	Credits
<b>Principles of food quality and</b>	w/s	2/1	5
<b>Advanced processes in food</b>	w/s	2/1	5
<b>Traditional Czech food</b>	w/s	2/1	5
<b>Food preservation and packaging</b>	w/s	2/1	5
<b>Foods, nutrition and health</b>	w/s	2/1	5
<b>Food microbiology</b>	w/s	2/1	5
<b>Trends in biotechnologies</b>	w/s	2/1	5
<b>Bioremediation</b>	w/s	2/1	5
<b>Bioactive natural compounds</b>	w/s	2/1	5
<b>Molecular biology</b>	w	2/1	5
<b>Genetic engineering</b>	w	2/1	5
<b>Bioengineering</b>	w/s	2/1	5

\* Semester: **Winter/Summer**

\* Extent: 2 hours of lectures + 1 hour of seminars/consultations in a week

The programme can be completed by laboratory training and/or individual projects.

# Courses syllabi

## **Principles of Chemical Food Quality and Safety**

Food components responsible for nutritional value - characterisation  
occurrence, changes  
during processing / storage  
Macronutrients (proteins, lipids, carbohydrates, minerals...), Maillard reaction,  
Autooxidation,  
the role of antioxidants, Essential components (vitamins, trace elements...)  
Flavour significant compounds - characteristics, formation  
Natural compounds with protective / health promoting properties -  
characteristics, reactions  
Glucosinolates, Plant phenolics, S-alk(en)ylcysteinsulfoxides, Phytoestrogens  
Natural toxins - characteristics of main groups, toxicology  
Glycoalkaloids, Toxins in edible mushrooms, Mycotoxins and bacterial toxins  
Food contaminants and other hazardous compounds - occurrence and  
dynamics in food  
chain, preventive measures  
Processing contaminants: 3-MCPD, Acrylamide  
Environmental pollutants: PCBs, dioxins and other halogenated compounds,  
Polycyclic  
aromatic hydrocarbons (PAHs), Modern pesticides, Toxic metals  
Food additives - overview of main groups, applications  
Legislation related to chemical food safety - national, international  
HACCP principles, Rapid alert system for food and feed (RASFF),  
Surveillance/compliance  
programs

## **Advanced processes in food technologies**

Mass transfer, Diffusion, Extraction  
Crystallization, Nucleation, Precipitation  
Crystal size distribution, Granulometric analysis  
Heat transfer, Unsteady-state heat transfer  
Heating, Cooling, Vaporization, Freeze and Hot-air drying  
Physical properties of foods  
Membrane processes, Electrodialysis  
Ion exchange, Preparative chromatography, Adsorption  
Rheology and texture, Basic model systems  
Rheology measurement, Instrumental methods  
Rheological behavior of foods, Non-Newtonian behavior  
Disintegration processes, Milling  
Sedimentation, Dispersion stabilization  
Centrifugation, Application in food industry

## **Traditional Czech Food Technologies**

Introduction to Food Technologies  
Basic Processes in Food Technologies  
Sugar Technology and Confectioneries  
Starch and Modified Starches  
Cereal Chemistry and Technology  
Dairy Technology and Biotechnology  
Technology of Edible Oils and Fats, Oleochemistry  
Technology of Surfactants, Detergents and Cosmetics  
Fundamentals of Food Preservation, Food Packaging  
Technology of Fruit and Vegetable Processing, Soft Drinks  
Meat and Eggs Technology  
Malting and Brewing  
Fermentation Chemistry and Technology (Spirits, Bakers Yeast)  
Production of Wine and Organic Acids  
Environmental Aspects of Food Production

## **Food preservation and packaging**

Principles of food preservation:

Mechanisms of spoilage of food products (physiological changes, Mechanical damage, temperature injuries, Enzymatic changes, Chemical changes, Microbiological changes),

Methods for preserving fresh and processed products

Prevention of physiological changes, Prevention of enzymatic reactions

Protection against microbial spoilage, Removing the microorganisms from food products (Washing, cleaning, disinfection, decontamination)

Direct inactivation of microorganisms – abiosis (Thermo-inactivation, Other physical methods of killing microorganisms, Chemosterilisation)

Indirect preservation methods – anabiosis (Osmoanabiosis, Chilling and Freezing, Chemoanabiosis, Cenoanabiosis)

Food packaging:

Protective role of food packaging. Modified atmosphere packaging, Active systems of packaging

Applications:

Fruit and vegetable processing, fruit juice processing, Thermal processing of fruit and vegetables and others

New trends in meat technology. Shelf life of meat products, BSE – a problem, Meat colour

Postharvest changes of fruit and vegetables, Modified atmosphere packaging of fruit and vegetables, Minimal treatment in processing of fruit and vegetables

## **Food, nutrition and health**

Introduction, terminology, nutritive quality of food

Nutrients – classification. Carbohydrates

Proteins and amino acids

Lipids. Dietary fiber. Water

Physiological principles of nutrition

Vitamins and minerals  
Recommended dietary allowance. Special physiological needs  
Alternative systems of nutrition.  
Chronic diseases dependent on nutrition  
Importance of individual groups of food in human nutrition (food of plant origin)  
Importance of individual groups of food in human nutrition (food of animal origin, beverages)  
Hygiene of nutrition. Microbiological risks from foods.  
Natural toxic compounds of foods  
Contaminants and additives. Functional foods

## **Food microbiology**

Importance and classification of food poisoning microorganisms  
Different types of contaminating bacteria and definition of indicator microorganisms  
Examining methods of food poisoning microbes and of food spoilage organisms  
Techniques of sampling and treatment of sample  
Evaluation of standard procedures and their comparison with ISO norms  
Rapid methods of microbiological examination  
Quality assurance and production control; Aspects of quality assurance  
The definition of quality, its achievement and cost  
Hazard analysis of food: critical control points and hazard categories of foods  
Cleaning and disinfection: methods and practical application  
Hygiene and training of personnel  
Legislation: food legislation in the Czech Republic and within the European Union  
Development of food legislation

## **Trends in biotechnologies**

History of biotechnology. Current trends. Biological, engineering and economical principles of biotechnology.  
Microbial technology - general fundamentals, production microorganisms, overproduction, primary and secondary metabolism.  
Bioreactors – design, monitoring, bioprocesses control, downstream processing.  
Malting and brewing. Wine technology. Ethanol production. Alcoholic beverages.  
Baker´s yeast production. Single cell protein production.  
Amino acids, extracellular polysaccharides, water-soluble and fat-soluble vitamins  
Organic solvents bioproduction  
Antibiotics  
Edible mushrooms production  
Algae production  
Tissue cultures cultivations

## **Bioremediation**

Introduction to the basic terms in environmental microbiology and environmental ecology, features, properties, physiology and biochemistry of environmentally important microorganisms.

Methodology – biochemical, molecular approaches of microbial development, growth and metabolic properties (degradation pathways of polycyclic aromatic hydrocarbons, polychlorinated biphenyls, nitroaromatic compounds, substituted aliphatic hydrocarbons, accumulation of heavy metals etc).

Issues in aquatic and soil microbiology and ecology, directed to biodegradation of harmful pollutants. Methods used for isolation of microbes, detection and quantification of their activities.

Molecular biology techniques of biodiversity and microbial community analysis (PCR, TGGE, RFLP).

Basic knowledge of plant metabolism of xenobiotics, similarities and differences.

Action of individual species, activities of the communities, interactions between consortia of microorganisms, microorganisms and plants in real contaminated environments.

Possibilities to improve degradation processes: construction of genetically modified organisms with enhanced degradative abilities (microbes and plants), enhance bioavailability of the xenobiotics and interactions of indigenous organisms.

## **Bioactive natural compounds**

Introduction, formulation of problems

Medicine plants, classification, growing and harvesting, drugs

Isolation of an active component, comparison with chemical synthesis

Alkaloids

Glycosides

Natural colouring agents

Plant antibiotics and cytostatics

Bitter principles, polyphenolic compounds

Gums, rosins, musilages and plant ooze

Vitamins, natural sweeteners

Terpenoids

Mushroom's active compounds

Animal drugs

Natural toxins

## **Molecular biology** (course requires basic orientation in microbiology, cell biology and biochemistry!)

Mechanisms of assembly of retroviral capsids

Intracellular targeting of retroviral proteins

Possible functions of phospholipases in plants

Horizontal transfer of DNA



Microscopic techniques as a tool for cytology  
Role of siRNA  
Gene therapy  
Biotic and abiotic stress in plants  
Cell cycle regulation  
Cell adhesion molecules  
Adhesion mediated signaling  
Signal transduction and cell regulation

**Genetic engineering** (course requires basic orientation in microbiology, cell biology and biochemistry!)

The approaches to bacterial expression and purification of recombinant proteins  
Systems for eukaryotic expression of heterologous proteins  
Design and expression of peptides for heavy metal binding  
The approaches to sequencing of microbial genomes  
Strategy of construction of transgenic plants  
Detection of genetic sequences  
Genetic markers and their use  
Genetic methods for specific detection of microorganisms  
Computer modeling of proteins

**Bioengineering**

Bioengineering problems in biotechnology, Bioprocess structure  
Kinetic of cell growth and product formation  
Metabolic quotients, differences in growth characteristics  
Bioprocess characteristics - stoichiometry, yields, productivity  
Design and operation of bioreactors  
Batch, fed-batch and semicontinuous cultures  
Continuous cultures - chemostat, turbidostat, systems with cell recycle  
One-stage and multi-stage culture systems, multistreams systems  
Instrumentation for monitoring and controlling bioreactors  
Macromixing, micromixing - models, hydrodynamic of batch and continuous reactors  
Solids, liquids and air handling, media sterilization  
Aeration and oxygen transfer in bioreactors  
Cell disruption - mechanical, chemical, biological methods  
Cell separation processes and equipment

## **STUDIJNÍ PROGRAM: Potravinářská a biochemická technologie**

Studijní obor: *Biochemie a biotechnologie*

### **Charakteristika oboru:**

Výchova odborníků pro všechna pracoviště (laboratorní i technologická), kde je možno uplatnit široké znalosti biochemie, mikrobiologie, buněčné biologie, bioinženýrství a dalších přírodovědných disciplin, včetně jejich aplikací v odvozených technologiích. Jedná se především o laboratorní zázemí výrobních podniků biotechnologického a potravinářského komplexu, o zdravotnické a farmaceutické instituce, o kontrolní či inspekční instituce, o sféru státní správy zajišťující kontrolu životního prostředí ale i o obchodní podniky zabývající se prodejem biochemikálií. Posлуhač se může orientovat na technologie jednak tradiční (pivovarství/sladařství, lihovarství, vinařství, droždářství, a další), jednak na technologie produkující biofarmaka, metabolity a produkty rostlinné i živočišné buňky i na technologie řešící problémy životního prostředí.

### **Profil absolventa:**

Výchova odborníků pro všechna pracoviště (zejména laboratorní), kde je možno uplatnit znalosti biochemie a příbuzných oborů. Jedná se především o laboratorní zázemí výrobních podniků biotechnologického a potravinářského komplexu, o zdravotnické a farmaceutické instituce, o kontrolní či inspekční instituce, o sféru státní správy zajišťující kontrolu životního prostředí ale i o obchodní podniky zabývající se prodejem biochemikálií. Současně připravuje odborníky pro pracoviště biotechnologických provozů a služeb, která vyžadují znalost mikrobiologie, buněčné biologie, biochemie, bioinženýrství a dalších přírodovědných disciplin, včetně jejich aplikací v odvozených technologiích. Posлуhač se může orientovat na technologie jednak tradiční (pivovarství/sladařství, lihovarství, vinařství, droždářství a další), jednak na technologie produkující biofarmaka, metabolity a produkty rostlinné i živočišné buňky i na technologie řešící problémy životního prostředí. Současně vychovává studenty pro navazující magisterské studium.

Studijní obor: *Chemie a analýza potravin*

### **Charakteristika oboru:**

Výchova odborníků schopných samostatně provádět průběžné kontrolní metody v závodních nebo podnikových laboratořích potravinářského průmyslu, výchova odborníků schopných samostatně obsluhovat moderní přístrojovou techniku a provádět běžné vyhodnocování získaných analytických dat v podnikových kontrolních či inspekčních institucích, spadajících do kompetence potravinářského průmyslu, zemědělství, zdravotnictví a obchodu.

### **Profil absolventa:**

Absolventi se uplatňují v závodních a podnikových laboratořích při běžných analýzách které jsou součástí kontroly a managementu jakosti potravinářských surovin a výrobků. Osvojí si praktickou obsluhu náročné laboratorní instrumentální techniky

a zpracování dat a budou schopni formulovat adekvátní závěry. Budou mít dále znalosti, které jim dovolí řídit technické zaměstnance laboratoří se středoškolským odborným vzděláním. Absolventi tohoto oboru se uplatí také při sledování a řízení hygienických podmínek a principů při výrobě v souladu se zásadami HACCP, mají předpoklady k aplikaci principů zdravé výživy při vývoji a marketingu potravinářských výrobků. Jsou seznámeni s legislativními aspekty výroby, distribuce a kontroly potravin. Jsou kvalifikováni k uplatňování výpočetní techniky v oblasti kontroly jakosti potravin a jsou využitelní ve všech laboratořích analyzující biologický materiál speciálně pak v laboratořích potravinářských, zemědělských, hygienicko-zdravotnických a obchodních. Současně vychovává studenty pro navazující magisterské studium.

## Studijní obor: *Technologie potravin*

### **Charakteristika oboru:**

Výchova odborníků schopných samostatně provádět průběžné kontrolní metody v závodních nebo podnikových laboratořích potravinářského průmyslu, výchova odborníků schopných samostatně obsluhovat moderní přístrojovou techniku a provádět běžné vyhodnocování získaných analytických dat v podnikových kontrolních či inspekčních institucích, spadajících do kompetence potravinářského průmyslu, zemědělství, zdravotnictví a obchodu.

### **Profil absolventa:**

Studijní obor potravinářská technologie potravin vychovává odborníky pro výrobní podniky potravinářského průmyslu, pro kontrolní či inspekční instituce, pro obchod nebo státní správu. Absolventi se uplatňují při přímém řízení technologických operací a procesů, při řešení koncepce dílčích technologických výrobních úseků ve velkých i středních podnicích s potravinářskou výrobou, dále při řízení inovace technologie. Mají předpoklady pro sledování a řízení hygienických podmínek a principů při výrobě a předpoklady k aplikaci principů zdravé výživy při vývoji nových nebo upravených výrobků. Jsou kvalifikováni k uplatňování výpočetní techniky ve výrobě a řízení, k používání moderních laboratorních i provozních metod a přístrojů a k interpretaci jejich výsledků. Při volbě příslušného technologického směru získávají základní znalosti pro podnikatelskou činnost a pro uplatnění v oblasti marketingu a managementu v potravinářské výrobě a obchodě. Současně vychovává studenty pro navazující magisterské studium.

## STUDY PROGRAMME: Food and Biochemical Technology

Field of study: ***Biochemistry and Biotechnology***

### Characteristics:

This field of study prepares experts for all careers (laboratory and technological) where they can apply their extensive knowledge of biochemistry, microbiology, cell biology, bioengineering and other disciplines of natural sciences, including their application in derived technologies. These concern in particular laboratories of manufacturing plants of the biotechnological and food complex, health and pharmaceutical organizations, control and inspection institutions, state administration sections providing for environmental control, and also trade companies dealing in biochemicals. Students may choose to focus on traditional technologies (brewing, malting, distilling and wine industries, yeast manufacture, etc.), the manufacture of biopharmaceuticals, metabolites and products of the plant and animal cells, or on technologies used in addressing environmental problems.

### Graduate profile:

Graduates may seek careers in biotechnological plants and services which require knowledge of microbiology, cell biology, biochemistry, bioengineering and other disciplines of natural sciences including their application in derived technologies. They may focus their attention on traditional technologies (brewing, malting, distilling and wine industries, yeast manufacture, etc.), technologies relating to the manufacture of biopharmaceuticals, metabolites and products of the plant and animal cells, or on technologies used in addressing environmental problems. Graduates from this field may also continue their studies in subsequent engineering (equal to MSc) programmes.

Field of study: ***Food Chemistry and Analysis***

### Characteristics:

This field of study prepares experts who are trained to apply independently continuous control methods in plant and company laboratories within the food industry, and to operate sophisticated apparatuses and conduct general evaluation of obtained analytical data in control or inspection institutions related to the food industry, agriculture, health care and trade.

### Graduate profile:

Graduates find jobs in plant and company laboratories where they conduct general analysis as part of quality control and management of food materials and products. They are able to operate complicated laboratory instruments, process data and formulate relevant conclusions. Their knowledge allows them to manage laboratory technicians with secondary vocational education. Graduates from this field may find jobs in the monitoring and control of hygienic conditions and principles in manufacture and their compliance with HACCP principles. They are also qualified to apply principles of healthy diet in food products development and marketing.

They are acquainted with the legislative aspects of food production, distribution and control. They are skilled in applying computer equipment in the area of food quality control, and they may find positions in all laboratories engaged in analyzing biological material, especially in laboratories related to the food industry, agriculture, hygiene and health, and trade. Graduates from this field may also continue their studies in subsequent engineering (equal to MSc) programmes.

Field of study: ***Food Technology***

Characteristics:

This field of study prepares experts trained to apply independently control methods in plant and company laboratories within the food industry, and to operate sophisticated apparatuses and conduct general evaluation of obtained analytical data in control or inspection institutions related to the food industry, agriculture, health care and trade.

Graduate profile:

The study field of Food Technology prepares experts for manufacturing plants of the food industry, control or inspection institutions, trade or state administration. Graduates find positions in the direct management of technological operations and processes, in designing the concept of partial technological production sections in large and medium-size plants of the food industry, and also in technology innovation management. They have good prerequisites for monitoring and controlling hygienic conditions and principles in production, and for applying the principles of healthy diet in the development of new or modified food products. They are qualified to apply computer equipment in manufacture and management, to use advanced laboratory and operational methods and apparatuses, and to interpret the obtained results. The obtained knowledge from the selected technological specialization allows them to pursue entrepreneurial activity and careers in marketing and management in the area of food processing and trade. Graduates from this field may also continue their studies in subsequent engineering (equal to MSc) programmes.

**Studijní plány bakalářského studijního  
programu**

***Food and Biochemical  
Technology***

**Bachelor studies at Faculty of the Food and Biochemical Technology**

**Study programme: Food and Biochemical Technology**

**Field of study: Biochemistry and Biotechnology**

**Study Year: 1**

**Winter Semester (1)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
General and Inorganic Chemistry I	3	2	0	C,Ex	8
Mathematics I	3	3	0	C,Ex	9
Biology I	3	0	0	Ex	4
Fundamentals of Toxicology and Ecology	2	0	0	Ex	3
Introduction to Food Legislation	2	0	0	G	3
Chemical Calculations	0	2	0	C	2
Introduction to Studies	1	0	0	C	1
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>30</b>

**Summer Semester (2)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Organic chemistry I	3	2	0	C,Ex	7
Physics I	3	2	0	C,Ex	7
Inorganic Chemistry: Laboratory I	0	0	4	G	3
Biology: Laboratory	0	0	2	G	1
Applications of Computer Science	0	3	0	G	3
Language I	0	2	0	C	0
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>21</b>

Semi-elective Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Mathematics II	3	3	0	C,Ex	8
Biology II	2	0	0	Ex	3
Production of Food Raw Materials	2	0	0	Ex	3
Sensory analysis	2	1	0	C,Ex	4
<b>Total:</b>					<b>18</b>

**Study Year: 2**

**Winter Semester (3)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Physical Chemistry I	3	2	0	C,Ex	7
Biochemistry I	3	0	0	Ex	5
Biochemistry: Seminar I	0	1	0	G	1
Bioinformatics	0	2	0	C	2
Applied Statistics	1	2	0	C,Ex	4
Organic Chemistry: Laboratory I	0	0	4	G	3
Physics: Laboratory	0	0	3	G	2
Language II	0	2	0	C,Ex	0
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>24</b>

Semi-elective Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Organic Chemistry II	2	1	0	C,Exk	4
Bioorganic Chemistry of Natural Compounds	2	1	0	C,Ex	4
Food Commodity Expertise	2	0	0	Ex	3
Enterprise Economics	2	1	0	C,Ex	4
<b>Totals:</b>					<b>15</b>

**Summer Semester (4)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Analytical Chemistry I	2	1	0	C,Ex	4
Physical Chemistry: Laboratory I	0	0	4	G	3
Analytical Chemistry: Laboratory I	0	0	6	G	4
Food Chemistry	2	1	0	C,Ex	4
Biochemistry: Seminar II	0	1	0	G	1
Biochemistry: Laboratory	0	0	6	G	4
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>20</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Physical Chemistry of Colloidal Systems	3	2	0	C,Ex	7
Biochemistry II	2	0	0	Ex	3
Introduction to Biotechnology	2	0	0	Ex	3
Food Technology and Biotechnology	3	0	0	Ex	5
<b>Totals:</b>					<b>18</b>



**Study Year: 3**

**Winter Semester (5)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Chemical Engineering I	2	3	0	C,Ex	6
Chemical Engineering: Project	0	1	0	G	1
Microbiology	3	0	0	Ex	5
Mikrobiology: Laboratory	0	0	5	G	3
Analysis of Food and Natural Products	2	1	0	C,Ex	4
Analysis of Food and Natural Products: Laboratory	0	0	5	G	3
Excursions	0	0	0	C	1
<b>Totals:</b>					<b>23</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Analytical Chemistry II	2	1	0	C,Ex	4
Molecular Genetics	3	0	0	Ex	4
Bioecology	2	1	0	C,Ex	4
Human Nutrition and Nutrition Policy	2	0	0	Ex	3
<b>Totals:</b>					<b>15</b>

**Summer Semester (6)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Bachelor Work	0	0	8	SGEx	10
Chemical Engineering: Laboratory	0	0	3	kz	2
Management of Enterprise Processes	2	1	0	z,Zk	4
<b>Totals:</b>					<b>16</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Bioanalytical Methods	2	0	0	Ex	3
Detection of Foodborne Pathogens	2	0	0	Ex	3
Traditional Biotechnology	2	1	0	C,Ex	4
Modern Biotechnology	2	1	0	C,Ex	4
Clinical Biochemistry	2	0	0	Ex	3
Food Engineering and Bioengineering	2	3	0	C,Ex	6
Food Technology and Biotechnology	3	0	0	Ex	5
Analytical Chemistry: Laboratory II	0	0	4	G	3
Isolation and Characterisation of Biomacromolecules	3	1	0	C,Ex	6
Cell Biology	2	0	0	Ex	3
Physiology of Industrial Microorganisms	2	0	0	Ex	3
<b>Totals:</b>					<b>15</b>

Field of study: **Food Chemistry and Analysis**

**Study Year: 1**

**Winter Semester (1)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
General and Inorganic Chemistry I	3	2	0	C,Ex	8
Mathematics I	3	3	0	C,Ex	9
Fundamentals of Toxicology and Ecology	2	0	0	Ex	3
Introduction to Food Legislation	2	0	0	G	3
Chemical Calculations	0	2	0	C	2
Biology I	3	0	0	Ex	4
Introduction to Studies	1	0	0	C	1
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>30</b>

**Summer Semester (2)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Organic chemistry I	3	2	0	C,Ex	7
Physics I	3	2	0	C,Ex	7
Inorganic Chemistry: Laboratory I	0	0	4	G	3
Biology: Laboratory	0	0	2	G	1
Applications of Computer Science	0	3	0	G	3
Language I	0	2	0	C	0
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>21</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Mathematics II	3	3	0	C,Ex	8
Biology II	2	0	0	Ex	3
Production of Food Raw Materials	2	0	0	Ex	3
Sensory analysis	2	1	0	C,Ex	4
<b>Totals:</b>					<b>18</b>

**Study Year: 2**

**Winter Semester (3)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Physical Chemistry I	3	2	0	C,Ex	7
Biochemistry I	3	0	0	Ex	5
Biochemistry: Seminar I	0	1	0	G	1
Bioinformatics	0	2	0	C	2
Applied Statistics	1	2	0	z,Zk	4
Organic Chemistry: Laboratory I	0	0	4	G	3
Physics: Laboratory	0	0	3	G	2
Language II	0	2	0	C,Ex	0
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>24</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Organic chemistry II	2	1	0	C,Ex	4
Bioorganic Chemistry of Natural Compounds	2	1	0	C,Ex	4
Food Commodity Expertise	2	0	0	Ex	3
Enterprise Economics	2	1	0	C,Ex	4
<b>Totals:</b>					<b>15</b>

**Summer Semester (4)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Analytical Chemistry I	2	1	0	C,Ex	4
Physical Chemistry: Laboratory I	0	0	4	G	3
Analytical Chemistry: Laboratory I	0	0	6	G	4
Food Chemistry	2	1	0	C,Ex	4
Biochemistry: Seminar II	0	1	0	G	1
Biochemistry: Laboratory	0	0	6	G	4
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>20</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Physical Chemistry of Colloidal Systems	3	2	0	C,Ex	7
Biochemistry II	2	0	0	Ex	3
Physical Properties of Food	2	1	0	C,Ex	4
Isolation and Identification of Natural Compounds	2	1	0	C,Ex	4
<b>Totals:</b>					<b>18</b>

**Study Year: 3**

**Winter Semester (5)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Chemical Engineering I	2	3	0	C, Ex	6
Chemical Engineering: Project	0	1	0	G	1
Microbiology	3	0	0	Ex	5
Microbiology: Laboratory	0	0	5	G	3
Analysis of Food and Natural Products	2	1	0	C, Ex	4
Analysis of Food and Natural Products: Laboratory	0	0	5	G	3
Excursions	0	0	0	C	1
<b>Totals:</b>					<b>23</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Analytical chemistry II	2	1	0	C, Ex	4
Human Nutrition and Nutrition Policy	2	0	0	Ex	3
Food Safety	2	1	0	C, Ex	4
Statistics Data Processing	1	2	0	G	3
<b>Totals:</b>					<b>14</b>

**Summer Semester (6)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Bachelor Work	0	0	8	SGEx	10
Chemical Engineering: Laboratory	0	0	3	G	2
Management of Enterprise Processes	2	1	0	C, Ex	4
<b>Totals:</b>					<b>40</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Food Analysis and Control	2	0	0	Ex	3
Bioanalytical Methods	2	0	0	Ex	3
Detection of Foodborne Pathogens	2	0	0	Ex	3
Food Analysis and Control: Laboratory	0	0	3	G	2
Foodborne Pathogens: Laboratory	0	0	3	G	2
Natural Compounds as Raw Materials	2	0	0	Ex	3
Food Technology and Biotechnology	3	0	0	Ex	5
Structural Analysis of Natural Compounds	2	0	0	Ex	3
Analytical Chemistry: Laboratory II	0	0	4	G	3
<b>Totals:</b>					<b>27</b>

Field of study: **Food Technology**

**Study Year: 1**

**Winter Semester (1)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
General and Inorganic Chemistry I	3	2	0	C, Ex	8
Mathematics I	3	3	0	C, Ex	9
Fundamentals of Toxicology and Ecology	2	0	0	Ex	3
Introduction to Food Legislation	2	0	0	G	3
Chemical Calculations	0	2	0	C	2
Biology I	3	0	0	Ex	4
Introduction to Studies	1	0	0	C	1
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>30</b>

**Summer Semester (2)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Organic chemistry I	3	2	0	C, Ex	7
Physics I	3	2	0	C, Ex	7
Inorganic Chemistry: Laboratory I	0	0	4	G	3
Biology: Laboratory	0	0	2	G	1
Applications of Computer Science	0	3	0	G	3
Language I	0	2	0	C	0
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>21</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Mathematics II	3	3	0	C, Ex	8
Biology II	2	0	0	Ex	3
Production of Food Raw Materials	2	0	0	Ex	3
Sensory analysis	2	1	0	C, Ex	4
<b>Totals:</b>					<b>18</b>

**Study Year: 2**

**Winter Semester (3)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Physical Chemistry I	3	2	0	C, Ex	7
Biochemistry I	3	0	0	Ex	5
Biochemistry: Seminar I	0	1	0	G	1
Bioinformatics	0	2	0	C	2
Applied Statistics	1	2	0	C, Ex	4
Organic Chemistry: Laboratory I	0	0	4	G	3
Physics: Laboratory	0	0	3	G	2
Language II	0	2	0	C, Ex	0
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>24</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Organic Chemistry II	2	1	0	C, Ex	4
Bioorganic Chemistry of Natural Compounds	2	1	0	C, Ex	4
Food Commodity Expertise	2	0	0	G	3
Enterprise Economics	2	1	0	C, Ex	4
<b>Totals:</b>					<b>15</b>

**Summer Semester (4)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Analytical Chemistry I	2	1	0	C, Ex	4
Physical Chemistry: Laboratory I	0	0	4	G	3
Analytical Chemistry: Laboratory I	0	0	6	G	4
Food Chemistry	2	1	0	C, Ex	4
Biochemistry: Seminar II	0	1	0	G	1
Biochemistry: Laboratory	0	0	6	G	4
Physical Education	0	2	0	C	0
<b>Totals:</b>					<b>20</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Physical Chemistry of Colloidal Systems	3	2	0	C, Ex	7
Physical Properties of Food	2	1	0	C, Ex	4
Food Technology and Biotechnology	3	0	0	G	5
<b>Totals:</b>					<b>16</b>

**Study Year: 3**

**Winter Semester (5)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Chemical Engineering I	2	3	0	C, Ex	6
Chemical Engineering: Project	0	1	0	G	1
Microbiology	3	0	0	Ex	5
Microbiology: Laboratory	0	0	5	G	3
Analysis of Food and Natural Products	2	1	0	C, Ex	4
Analysis of Food and Natural Products: Laboratory	0	0	5	G	3
Excursions	0	0	0	C	1
<b>Totals:</b>					<b>23</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Molecular Genetics	3	0	0	Ex	4
Principles of Food Preservation and Packaging	2	1	0	C, Ex	4
Human Nutrition and Nutrition Policy	2	0	0	Ex	3
<b>Totals:</b>					<b>11</b>

**Summer Semester (6)**

Required Courses	Weekly load			Assessment	Credits
	L	S	Lab		
Bachelor Work	0	0	8	SGEx	10
Chemical Engineering: Laboratory	0	0	3	G	2
Management of Enterprise Processes	2	1	0	C, Ex	4
<b>Totals:</b>					<b>30</b>

Semi-elective Subjects	Weekly load			Assessment	Credits
	L	S	Lab		
Food Technology I	3	1	0	C, Ex	6
Food Technology II	3	1	0	C, Ex	6
Food Engineering and Bioengineering	2	3	0	C, Ex	6
Production of Food Raw Materials	2	0	0	Ex	3
<b>Totals:</b>					<b>21</b>

# **Sylaby předmětů obsažených v bakalářském studijním programu**

## ***FOOD AND BIOCHEMICAL TECHNOLOGY***

**Subject Title: Biology I**

**Semester: 1**

**Weekly Load and Assessment: 3/0**

**Credit: 4**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

### **Annotation:**

1. Origin and evolution of life, live and lifeless systems, common features of plants and animals
2. Taxonomy, mutual relationships of organisms, chemical composition of living matter
3. Physical qualities of living matter, diffusion, osmosis, turgor, plasmolysis, pinocytosis
4. Noncellular forms: viruses, bacteriophages, L-forms of bacteria
5. Structure of cell
6. Reproduction and ontogenesis of cells
7. Reproduction and evolution of organisms
8. Heredity and variability
9. Gene interactions, mutations, genetics in plant and animal production
10. Anatomy of plants: dividing, covering, tissues
11. Anatomy of plants: leading and basic tissues
12. Histology of animals: epithelial, binding, supporting tissues
13. Histology of animals: muscular, nervous tissues
14. Basis of ecology and environmental science from biological point of view



**Subject Title: Biology II**

**Semester: 2**

**Weekly Load and Assessment: 2/0**

**Credit: 3**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Vegetative and generative organs of plants
2. Physiology of plants
3. Biology of cereals
4. Biology of root-crops
5. Biology of pulses
6. Biology of oil seeds
7. Biology of aromatic and other plants
8. Animal information and regulation systems: endocrine,
9. Animal information and regulation systems: nervous, immune
10. Metabolic and transport systems: digestive, respiratory, circulatory
11. Metabolic and transport systems: reproduction, excretion
12. Metabolic and transport systems: skeletal, muscular, dermal
13. Biological factors influencing the quality of raw materials
14. Biology of food animal raw materials: meat, milk, eggs

**Subject Title: Biochemistry I**

**Semester: 3**

**Weekly Load and Assessment: 3/0**

**Credit: 5**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Living systems, composition and organization
2. Biopolymers
3. Amino acids, peptides, proteins
4. Secondary, tertiary and quaternary structure of proteins. Protein classification.
5. Preparation and characterization of pure proteins
6. Mono-, oligo- and polysaccharides
7. Fatty acids, lipids and isoprenoids
8. Nucleotides, nucleic acids
9. Vitamins, antivitamins, coenzymes
10. Enzymes: common characteristic and classification, structure and form of occurrence, mechanism of action, effect of reaction conditions, regulation of activity, effect on reaction
11. Kinetics of enzyme reaction
12. Supramolecular structures / biomembranes
13. Applied enzymology
14. Biochemical literature, research, presentation

**Subject Title: Biochemistry II**

**Semester: 4**

**Weekly Load and Assessment: 2/0**

**Credit: 3**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Basic concept and design of metabolism and energy conversion
2. Oxidative phosphorylation. Photosynthesis.
3. Citric acid cycle. Glyoxalate cycle.
4. Metabolism of carbohydrates. Glycolysis and glycogenesis, gluconeogenesis, pentose phosphate pathway, etc.
5. Metabolism of lipids, including isoprenoides
6. Metabolism of nitrogen compounds I. Proteolytic enzymes and proteolysis, metabolism of amino acids
7. Metabolism of nitrogen compounds II. Decomposition of nucleotides and nucleic acids, metabolism of ammonia, biosynthesis of nitrogen compounds
8. Secondary metabolism in plants and microorganisms
9. Regulation of metabolic pathways
10. Classical and molecular genetics. Genetic code and its variability. DNA biosynthesis (Replication)
11. Transcription and translation of genetic information
12. Regulation of protein synthesis
13. Genomic technologies
14. Present stage and perspectives of modern biotechnology

**Subject Title: Bioanalytical Methods**

**Semester: 6**

**Weekly Load and Assessment: 2/0**

**Credit: 3**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Introduction: What are bioanalytical methods, their use in practice.
2. Methods with radionuclides.
3. Immunochemistry: Basis of immunochemical methods. Antigens and antibodies.
4. Immunoprecipitation methods and their use in practice.
5. Sensitive immunochemical techniques (ELISA, RIA).
6. Enzymes, enzyme classification, kinetics, specificity. Immobilized enzymes.
7. Enzyme methods and their significance.
8. Experimental techniques of enzyme methods.
9. Biosensors, enzyme electrodes.
10. Enzyme methods in clinical biochemistry and food analysis.
11. Affinity chromatography, HAPLC, biorecognition.
12. Electromigration methods; PAA, SDS, affinity electrophoresis, immunoelectrophoresis.
13. Capillary electrophoresis.
14. Biological and microbiological methods in analysis.

**Subject Title: Isolation and Characterisation of Biomacromolecules**

**Semester: 6**

**Weekly Load and Assessment: 3/1**

**Credit: 6**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Modern and classical separation techniques
2. Methods based on phase separation
3. Precipitation, two-phase systems
4. Membrane processes and methods based on differences in mobility, chromatography
5. Electromigration methods
6. HPLC, HPCE
7. Separation techniques as analytical and preparation tools
8. Interpretation of results from separation techniques
9. Basic steps in isolation of biologically active substances
10. Separation, homogenization, disintegration, extraction, purification
11. Specific features of isolation of proteins, enzymes and nucleic acids
12. Criteria of preparation purity
13. Characterization of enzyme preparations and determination of their purity
14. Technical enzymes, pure enzymes

**Subject Title: Microbiology**

**Semester: 5**

**Weekly Load and Assessment: 3/0**

**Credit: 5**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Microorganisms in nature and industry. Development of microbiology as a scientific discipline. Nomenclature and taxonomy of microorganisms.
2. Physiological characteristics of microorganisms. Organization and structure of microorganisms. Functions and cytology of basic microbial structures.
3. Reproduction of bacterial cells - binary fission. Bacterial spores, characteristics, biochemistry and regulation of sporulation. Chemical composition of cell mass.
4. Groups of bacteria important for food industry and biotechnology, their position in classification system of microorganisms.
5. Yeasts: morphology, cytology, vegetative reproduction, sexual reproduction. Chemical composition of yeast cell mass.
6. Classification of individual yeasts groups from the food industry and biotechnology point of view. Taxonomical position of these strains.
7. Filamentous fungi (molds) : morphology and cytology. Vegetative and sexual reproduction. Some representatives of filamentous fungi used in food industry and biotechnology. Taxonomy of these strains.
8. Viruses. Structure of viruses. Classification of viruses ( bacterial, plant, animal). Life cycle of bacteriophage and DNA animal viruses.
9. Metabolic strategies of microorganisms and their technological consequences. Chemoorganotrophic bacteria: their anabolic and katabolic processes.
10. Effects of outer factors (temperature, pH, water activity) on growth and reproduction of microorganisms. Nutrition: sources of individual nutrients, their transport into the microbial cell.
11. Bacterial growth. Kinetics of bacterial reproduction. Phases of microbial growth. Growth of bacterial cultures: batch cultures, continuous cultures, synchronous cultures
12. Microbial genetics: molecular basis of heritage. Transfer of genetic information. Mutations, recombination, extrachromosomal genetic structures ( plasmids and mitochondria).
13. Rules of Good Laboratory Practice (GLP), and Good Manufacture Practice (GMP) in food industry. Hygiene in food technologies. Rules of disinfection: effect of antimicrobial compounds.
14. Environment and microorganisms. Recent applications of microorganisms in protection of environment and in clean-up of polluted sites.

**Subject Title: Detection of Foodborn Pathogenes**

**Semester: 6**

**Weekly Load and Assessment: 2/0**

**Credit: 3**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Importance and classification of food poisoning microorganisms
2. Different types of contaminating bacteria and definition of indicator microorganisms
3. Examining methods of food poisoning microbes and of food spoilage organisms
4. Techniques of sampling and treatment of samples
5. Evaluation of standard procedures, and comparisons with ISO norms
6. Rapid methods of microbiological examination
7. Quality assurance and production control
8. Aspects of quality assurance
9. Definition achievement and cost of quality
10. Hazard analysis of food: critical control points and hazard categories of foods
11. Cleaning and disinfection: methods and practical application
12. Hygiene and training of personnel
13. Legislation: food legislation in the Czech Republic and within the European Union
14. Development of food legislation

**Subject Title: Molecular Genetics**

**Semester: 5**

**Weekly Load and Assessment: 3/0**

**Credit: 4**

**Language: czech, english**

**Course provider: Department of Biochemistry and Microbiology**

**Annotation:**

1. Historical review and basic genetic concepts
2. Structure and function of nucleic acids, modified bases
3. Organization of prokaryotic and eukaryotic genome, DNA binding proteins
4. Replication: initiation, replication fork, involved enzymes, cells differences
5. Recombination, segregation of genes during meiosis, mitotic recombination
6. Control of yeast pairing type, transposition
7. Mutations and repair mechanisms
8. RNA polymerases, structure, initiation, control, termination of transcription, attenuation
9. Modifications of RNA, splicing mechanisms
10. Plasmids and their construction
11. Prokaryotic translation, initiation, elongation and termination
12. Eukaryotic translation, stress proteins, synthesis of secretory and membrane proteins
13. Cancer, oncogenic factors, cellular signaling
14. Retroviral lifecycle, reverse transcription, HIV pathogenesis



**Subject Title: Food Technology and Biotechnology**  
**Semester: 4th**  
**Weekly Load and Assessment: 3/0 Exam**  
**Credit: 5**  
**Language: English**  
**Course provider: Department of Carbohydrate Chemistry**

**Annotation:**

1. Introduction to Food Technologies
2. Basic Processes in Food Technologies
3. Sugar Technology and Confectioneries
4. Starch and Modified Starches, Use of Carbohydrates for Food and Non-food production
5. Cereal Chemistry and Technology
6. Dairy Technology and Biotechnology
7. Technology of Edible Oils and Fats, Oleochemistry
8. Technology of Surfactants, Detergents and Cosmetics
9. Fundamentals of Food Preservation, Food Packaging
10. Technology of Fruit and Vegetable Processing, Soft Drinks
11. Meat and Eggs Technology, Environmental Aspects of Food Production
12. Malting and Brewing
13. Fermentation Chemistry and Technology (Spirits, Bakers Yeast)
14. Production of Wine and Organic Acids

**Subject Title: Food Technology I**

**Semester: 6th**

**Weekly Load and Assessment: 3/1 Z+ Exam**

**Credit: 6**

**Language: English**

**Course provider: Department of Carbohydrate Chemistry**

**Annotation:**

1. Raw materials of fermentation technology
2. Malting
3. Brewing
4. Production of Wine
5. Fermentation Chemistry and Technology, Production of Spirits
6. Production of Bakers Yeast and Organic Acids
7. Sugar Beet, Production of Beet Slices, Raw Juice Extraction
8. Juice Purification, Evaporation, Crystallization, Centrifugation of Sugar Crystals
9. Drying and Storage of Sugar, Waste Water Purification
10. Production of chocolate, Confectioneries
11. Starch and Modified Starches
12. Cereals, Milling, Quality of Flour
13. Cereal Chemistry, Rheology and Analytical Methods
14. Baking Technology, Quality of Products, Biscuits, Snack Products, Pasta

**Subject Title: Physical Properties of Food**

**Semester: 4**

**Weekly Load and Assessment: 2/1**

**Credit: 4**

**Language: Czech, English**

**Course provider: Department of Dairy and Fat Technology**

**Annotation:**

1. Density, porosity and bulk density of food.
2. Mechanical properties and rheological behaviour of food. Consistency and texture.
3. Viscosity, type of non-Newtonian fluids, consequences for food processing.
4. Methods of determination of food viscosity. Streamline flow and rotational rheometers.
5. Viscoelastic properties: permanent deformation, stress relaxation, manifestation during food processing.
6. Methods of evaluation of mechanical properties of solid and semi-solid foods.
7. Water activity in food, osmotic pressure, freezing point, sorption isotherm.
8. Heat properties: specific heat, latent heat and enthalpy.
9. Heat properties: thermal conductivity, thermal diffusivity, surface heat transfer coefficient.
10. Diffusion and mass transfer.
11. State transitions of foods: nucleation and crystallization, glass transition, gelatinization.
12. Electrical properties of food: resistance, specific conductance, dielectric properties.
13. Surface properties: emulsion, foams.
14. Optical properties of food and measurement of color.

**Subject Title: Food Technology II**

**Semester: 6**

**Weekly Load and Assessment: 3/1**

**Credit: 6**

**Language: Czech, English**

**Course provider: Department of Dairy and Fat Technology**

**Annotation:**

1. Composition and properties of milk. Primary production and quality evaluation. Heat treatment of milk and cream separation.
2. Technology of pasteurised milk products, long life milk, cream, butter and ice-cream.
3. Dairy starters. Technology of cultured milk products. Cheesemaking.
4. Processes of evaporation and drying of milk. Types of dried dairy products.
5. Lipids, fats and oils. Fatty acids and glycerol. Principal chemical reaction.
6. Sources of commercial oils and fats. Recovery of oils and fats from oilseeds. Refining processes.
7. Hydrogenation, transesterification and fractionation. Emulsifiers. Margarine and shortenings.
8. Survey and history of meat industry. Meat definition, composition, properties, sources, nutritional aspects.
9. Slaughtering, processing of slaughter by-products, meat cutting
10. Meat processing
11. Game processing; fish technology; egg processing.
12. Processing of fruit and vegetables - survey and history. Postharvest changes.
13. Heat processing; canned, dried, sugar-preserved, frozen fruit and vegetables
14. Jam and marmalade production, juices and concentrates, special technologies

**Subject Title: Principles of Food Preservation and Packaging**

**Semester: 5th**

**Weekly Load and Assessment: 2/1/0 c,Ex**

**Credit: 4**

**Language: English**

**Course provider: Department of Food Preservation and Meat Technology**

**Annotation:**

1. Principles of food preservation, elimination of microorganisms, sanitation, disinfection, etc., overview of the anabiotic methods
2. Thermosterilation, effect of heating on microorganisms, evaluation of heat inactivation treatment
3. Microwave heating, radiopreservation, chemosterilation, physical methods of inaction (ultrasound, high hydrostatic pressure and other)
4. Overview of anabiotic methods, osmoanabiosis,
5. Chilling (including MAF, CA, minimal treatment), freezing
6. Chemoanabiosis, cenoanabiosis, barrier theory
7. Food safety, GHP, GMP, hygienic requirements on food production
8. Principles of HACCP
9. Economy of food packaging, requirements on packaging.
10. Principal packaging materials, their properties and applications – wood, cloth
11. Package printing, protective role of packaging, principles of active packaging.
12. Moisture and redox changes protection of foodstuffs.
13. Packaging and temperature changes, packaging for microwave heating
14. Ecological aspects of packaging, ecobalances, migration of packaging components into foodstuffs

**Subject Title: Production of Food Raw Materials**

**Semester: 2th/ 6th (facultative)**

**Weekly Load and Assessment: 2/0/0 Ex**

**Credit: 3**

**Language: English**

**Course provider: Department of Food Preservation and Meat Technology**

**Annotation:**

1. Importance and position of agriculture and food industry
2. Crops consumption; Crop and food supplying; Regulations
3. Factors affecting crops production
4. Ecological aspects, sustainability
5. Cereals, pseudocereals, alternative crops
6. Legumes; Oilseeds; Potatoes; Sugar beet
7. Vine; Hops
8. Fruits and vegetables
9. Principles of plant products storing and transporting
10. Characteristics of farm livestock
11. Pork and beef production. Milk.
12. Eggs and poultry
13. Fish and aquatic animals
14. Hygienic aspects of animal products storing and transporting

The programme aims to equip students with knowledge in traditional food technologies, new emerging technologies and modern biotechnological techniques. Courses focus on several aspects of the production, composition, safety and quality of food products. Students accepted in the courses of Molecular biology and Genetic engineering must have a biological and biochemical background. Individual practical training could be integrated into the programme.