UNIVERSITY OF BIHAĆ
FACULTY OF BIOTECHNICAL SCIENCES

STUDY

Second Cycle Study Programme

SUSTAINABLE FOOD PRODUCTION SYSTEMS

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MSc in Sustainable Food Production Systems

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Authors:

STEPS team of the University of Bihać and **Second Cycle Study Programme** Committee **SUSTAINABLE FOOD PRODUCTION SYSTEMS**

University of Bihać
Faculty of Biotechnical Sciences

Asst Prof. Emir Mujić, PhD
Full Prof. Refik Šahinović, PhD
Assoc Prof. Suzana Jahić, PhD
Assoc Prof. Halid Makić, PhD
Assoc Prof. Jasmina Ibrahimpašić, PhD
Assoc Prof. Husein Vilić, PhD
Asst Prof. Vildana Jogić, PhD
Asst Prof. Aida Džaferović, PhD
Asst Prof. Melisa Oraščanin, PhD

Students of the Faculty of Biotechnical Sciences

Adnan Kovačević
Amina Selimanović

Ministry of Education, Science and Sport USK

Adnan Kreso

STUDY PROGRAMME
SUSTAINABLE FOOD PRODUCTION SYSTEMS
DEPARTMENT
SUSTAINABLE FOOD PRODUCTION SYSTEMS
PROGRAMME

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INTRODUCTION

The Faculty of Biotechnical Sciences at the University of Bihać prides itself on following cutting edge sciences in order to innovate and broaden its studies. Modern agriculture, production and food distribution trends are increasingly moving towards establishing the relationship and interaction with the natural, social and economic environment. With the aim to provide advanced education to prepare highly qualified experts capable of dealing with challenges, the Faculty of Biotechnical Sciences is utilizing new courses which break barriers of current understandings of agriculture and food technology. The department is developing a new study programme presented within this document with sustainable food production systems in the centre of the studies.

The second cycle degree programme "Sustainable Food Production Systems" deals with some of the most important challenges humanity faces today - the challenges and uncertainties of food production and food accessibility for the ever-growing population accompanied with scarce resources (due to climate changes, economic and political impact on unjust food distribution, food safety and health). This leads to the question whether and in which degree current food production systems can actually function in long-term.

Sustainable food production systems produce healthy nourishment created in humanely, ecologically, socially and economically fair manner. Such systems provide possibilities for economic gain, creating job opportunities and increasing safety of the food itself. According to the European Commission, there are numerous ideas of what "sustainable" food production systems present and what belongs to the sphere of "sustainability". Sustainability is mainly defined as the ability to use resources that do not surpass the Earth's capability to renew them. Sustainable food production systems can be comprehended as the ones that try to handle the challenges of food supply safety, health, accessibility, quality, strong food industry in terms of job opportunities and growth, and at the same time assure that such activities remain environmentally sustainable in terms of climate changes, biodiversity, water and land quality. The most frequent report of the Brundtland Commission states that "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

With the food production importance in mind (use of natural resources, global commerce, population growth), it is certain that current food production studies should deal with more thorough comprehension of sustainability concepts, and also grasp how to apply already confirmed sustainable approaches into complex and mutually connected agri-food systems. Initiative for the second cycle study programme "Sustainable Food Production Systems" implementation is mainly rooted in the Faculty's involvement with the **Erasmus+ project "MSc in Sustainable Food Production Systems / STEPS"**. By joining the realisation of the project, the University of Bihać and the Faculty of Biotechnical Sciences made a commitment to develop, adopt and implement the second cycle study programme in the field of sustainable food production systems.

1 BASIC INFORMATION ABOUT THE UNIVERSITY OF BIHAĆ AND THE FACULTY OF BIOTECHNICAL SCIENCES

1.1 Founder

Higher education in Bihać began in 1970, after an outpost the College of Engineering in Karlovac was founded. Five years later, the Department of Engineering at the College of Engineering was established, followed by 1979 founding of the Department of Textile Technology and the College of Economy. The Academy of Pedagogy was founded in 1993 followed by the Islamic Academy of Education in 1995.On June 30, 1997, a Contract between four Higher Education facilities was signed to form a University (No. 15/1.612-52/97); this Contract created basis for the establishment of the University of Bihać. On a meeting held on July 4, 1997, Government of the USK in Bihać accepted a Socio-economic Equality Study which justified the establishment of the University of Bihać (No. 03-017-279/97) and referred the Conclusion to the USK County Assembly. On July 28, 1997, the Assembly reached their Decision and accepted the Contract which allowed the establishment of the University of Bihać, with the USK County Assembly as the Founder of the University.

1.2 About the University

The University of Bihać is a public institution which organises and conducts academic studies, scientific and expert research, and nurtures scientific, technological and artistic creation. The Head Office of the University of Bihać is located in Papa Ivan Pavlo II 2/2. In 2006/2007, the University of Bihać implemented ECTS – the European Credit Transfer and Accumulation System as a tool for making studies more uniform and in accordance with the European Higher Education Area. Based on the Act on Amendments to the Act of the University of Bihać (Official Gazette of USK 8/06) and Study Rules for the First Cycle Studies (No.10-38-10599-2/06, September 28, 2006), University of Bihać implemented studies according to the principles of Bologna declaration. With the Registration Conclusion of Court Register of 2010, the University of Bihać became a Legal Entity, with unique ID and unique Federal Pension and Disability Insurance number.

Vision of the integrated Universities to reach the highest level of international excellence in terms of lectures, research, art and continuing education. Today, higher education of the University of Bihać is conducted at seven Faculties.

Mission of the University of Bihać is to spread, advance and promote knowledge, learning, skills, and artistic inclinations, nourishing diversity as the basis of richer and fuller life. Prerequisite to a successful realisation, the University cooperates with other similar institutions and subjects from immediate and broader area. The University of Bihać is actively involved in fostering traditional academic values and recognizing basic human rights and fundamental freedoms. The University is inclined toward the public and citizens; it respects humanistic and democratic values in accordance with the European system of values and higher education, which allows students to participate in decision making and management, and assures equal rights to education to all free from discrimination.

1.3 Academic Divisions at the University

Today, the University of Bihać is made of seven academic divisions or faculties:

- Faculty of Biotechnical Sciences
- Faculty of Economy
- Islamic Faculty of Pedagogy
- Faculty of Pedagogy
- Faculty of Law
- Faculty of Technical Sciences
- Faculty of Health Studies

1.4 About the Faculty of Biotechnical Sciences

The Faculty of Biotechnical Sciences was founded in 1998 as organisational unit of the University of Bihać running the process of higher education and scientific research. Studies and scientific research are conducted through the first and second cycle study programmes. Expected length of the first and second cycle study programmes is four years (eight semesters) and one year (two semesters) respectively. The Faculty of Biotechnical Sciences comprises of the following departments: Department of Food Technology (Food Technology Programme and Nutrition Programme), Department of Agriculture (General Programme, Farming and Horticulture Programme, Livestock Farming Programme, Organic Agriculture Programme, Fruit and Vineyard Programme, Agro-ecology Programme), Department of Forestry (Forestry Programme), and Department of Ecology (Ecology Engineering Programme). The Faculty is located on 3612 square meters with additional 3 ha of agricultural land being used for training courses. The Faculty offers up-to-date lab practices for certain courses and experimental research for final and master's dissertations. It is located in Luka Marjanović street in Bihać (postal code 77000, Bosnia and Herzegovina).

Mission of the Faculty of Biotechnical Sciences is to provide extensive range of courses, further develop scientific disciplines and apply obtained knowledge to economy and society. The Faculty of Biotechnical Sciences is consistently dedicated to achieving its mission and maintaining high-quality results in the area of scientific research and application. The Faculty follows current economic environmental and social needs, and constantly strives to develop new courses, improve work quality and manage human and material resources in order to achieve the highest academic standards. This way, the Faculty makes sure academic needs of the young generations are met, along with the needs of the expert scientific economy and materialistic needs of employees, and as a part of broader education and scientific system, it poses as advancing force of the societal development.

Vision of the Faculty of Biotechnical Sciences is to justify the role of equal partner in Europe's unique higher education and scientific research and achieve the highest levels of excellence. The Faculty is oriented towards modern study programmes and quality courses, creating conditions for faster growth and development with realistic comprehension of educational needs and characteristic environment.

In order to achieve its vision and create additional values and competences for the entities involved in the educational system, the Faculty conducts great number of scientific and expert projects and strives to transfer the results directly into economy.

1.5 Needs, Capacities and Strategic Objectives of the University

The Faculty of Biotechnical Sciences believes that global scientific progress should be followed by expanding and innovating its own studies. Modern agriculture, as well as production and distribution trends are moving towards the relationship and interaction with natural, social and economic environment. With these changes in mind, and with a mission to educate future experts, the Faculty of Biotechnical Sciences develops and implements study programmes which surpass narrow views of agriculture and food technology. Our second cycle study programme offers courses that deal with food analysis, and safety and control of food quality. Another reason and the foundation for administration of such studies is the fact that a number of our staff is involved in the realisation of the Erasmus+ project ("**MSc in Sustainable Food Production Systems / STEPS", 598963-EPP-1-2018-1-AL-EPPKA2- CBHE-JP**) which directly deals with further development of the curriculum and creating lab infrastructures ("Food Control Lab" and "ICT Centres for Food Production Management") to implement into the second cycle study programme of Sustainable Food Production Systems. As many other Erasmus+ projects, it is implemented through mutual effort of several Universities from the Western Balkan countries (Bosnia and Herzegovina, Albania and Kosovo) and the European Union partner universities (Greece, Czech Republic, Romania). The final goal of the project is development and functionality of the second cycle study programme which leads to a Master of Science in Sustainable Food Production Systems.

According to the STEPS project plans, the second cycle study programme will be carried out at Universities in Western Balkan countries. The core part of the curriculum (30 ECTS) will be realised at all associated Universities, while the rest of the programme will be realised by each University respectively, either by combining core and elective courses or only elective course (UNBI), or any other types of education (trainings, projects) in accordance with established or anticipated needs. Stakeholder analysis proved to be very effective in former projects carried out by the project consortium. The analysis conducted in Bosnia and Herzegovina by the Faculty of Biotechnical Sciences at the University of Bihać and the Faculty of Agriculture and Food Sciences at the University of Sarajevo consisted of online surveys, detailed interviews and round-tables. All parties involved - agriculture and food industry representatives, institutions that were directly or indirectly under agriculture supervision, food production and distribution, researchers and students, and other groups of interest, agreed that this kind of study would be of great value and would lead to transformation of agricultural sector and food production. Such studies would also be valuable to the University and staff/researchers, who would have to start implementing the best research and practical achievements acquired in the developed countries and societies that have already started to carry out courses that deal with the economic, social and ecological sustainability challenges. It is important to understand at this point that throughout the stakeholder analysis, many interest group representatives had no clear idea of the meaning of sustainability concept in general, thereby no idea of the meaning of sustainable food production systems.

With that in mind, staff of the Faculty of Biotechnical Sciences in Bihać and the Faculty of Agriculture and Food Sciences in Sarajevo elaborated and clarified sustainability concept during the stakeholder analysis. All parties subsequently agreed that there is a need for experts and holistic approach that deal with sustainability in agriculture and food industry, who will also plan and realise production and market verification along with the increased level of social and environmental responsibility. Reason for implementing this study programme is, therefore, the need for experts with master's degree who specialised in sustainability of complex food production systems, but also all the inputs already applied (stakeholder analysis, best practices analysis, similar study programmes analysis) or will be applied by the end of the project implementation (additional lab equipment, establishing modern LMS platform, preparing and promoting teaching materials).

Human resources and infrastructural capacities of the Faculty of Biotechnical Sciences at the University of Bihać play major role in organisation and implementation of the second cycle study programme "Sustainable Food Production Systems" leading to the Master's degree in the fields of Agri-food Technologies, Food Industry Management and Agriculture. These concepts of sustainable food production and consumption, along with the possible issues that may arise, generate new ideas that focus on the results and elements identified after the stakeholder analysis (efficient and rational use of resources in every phase – from primary agricultural production, processing, economy, marketing, distribution, consumption, land and water management, waste management, to policies and managements in agricultural and food sector).

1.5.1 Evaluation Study on the Relevance of the programme to the Public and Private Sectors

The Faculty of Biotechnical Sciences at the University of Bihać recognizes economic and social needs and uses these insights to develop or modernise its study programmes, work quality, human and material resources, all in order to achieve the highest standards of quality and keep up with the demands of potential employers. This relationship between the employers and the Faculty made Agronomic and Food and Technology studies evolve into "life sciences". Such studies move away from traditional narrow subjects towards multidisciplinary field concerned with the holistic engineering approach to create policies and strategies for development, quality control, issues of food and society, resource and environment protection. Furthermore, potential modern employers demand knowledge and skills, but also autonomous research abilities from graduates. Suggested study programme is created to respond to the current demands, but also any future challenges that may arise in the field of food production systems. Current economy and current employers' demands are the basis for analysis of the market and its need for educated experts. These include ongoing shifts in the economy and society which lead to the changing demand of job skills. Few years of studies can actually lead to graduates whose knowledge, skills and competencies do not meet the demands of the ever-changing market. Current agriculture and food laws, strategic division documents and requests on the Application of Bosnia and Herzegovina for Membership of the European Union insist on the reconstruction and modernisation of agriculture and food production. These demands cannot be met without graduates who possess new skills, competencies and knowledge. Bosnia and Herzegovina market analysis continuously reports noticeable number of unemployed agronomists and food technologists, more pronounced in some areas than others.

However, more detailed examination of history of education and universities that produce new employees in the field of agri-food sector (or similar jobs) show trust between employers and employees from public universities, especially those that follow research and education trends of developed countries. This will give Sustainable Food Production Systems graduates an advantage point with their Master's Degree awarded by the University with modern study programme which is greatly in accordance with structures and competencies of some of the top European Universities. Basic concept of the "Sustainable Food Production Systems" study programme is presented to number of responsible individuals from the production, research and control sectors, and administrative structures through STEPS stakeholder analysis, with almost 80 stakeholders in Bosnia and Herzegovina. All hold almost undivided opinion that university trained and competent expert in the field of sustainable food production systems will find employment in their business systems, especially in their planning and development teams.

Conducted analysis shows that leading Bosnian and Herzegovinian agri-food industries put sustainability in the centre of their business systems, and accordingly, expect growing demands for employees who understand the concept of sustainability in food chain and who are trained to apply them. Bigger business systems in Bosnian and Herzegovinian agri-food sector emphasise the need for highly educated individuals capable of supervising more than one narrow field of specialty. These industries demand individuals competent in the fields of research and development, production organisation, but also sales and distribution. Besides, agri-food sector companies demand experts that can integrate the principle of sustainability in all their affairs, especially those of international significance they move towards to, and also deal with the growing regulation demands in terms of food safety and quality and preservation and improvement of our environment that can enhance corporate and social responsibility. Suggested study programme is organised and connected to Food Engineering and Agro-Economic Control disciplines, and offers Master of Science graduate competent to meet the needs of employers, who is capable of connecting different company sections and coordinate complex business projects. After detailed examination of the study and stakeholders needs in Bosnia and Herzegovina, we came to a conclusion that new interdisciplinary and well organized postgraduate programme "Sustainable Food Production Systems" would be praised as a great opportunity to train future professionals in the area of agri-food sector which currently lacks knowledge, skills, and competences. Stakeholders also agreed that such programme should be organised to accept graduates of different previous study profiles. Among the most important subjects and modules that stakeholders believe belong in the study are food processing, along with "smart" and "eco-friendly" facilities for food processing and technologies, economic issues of financing, management, marketing, planning, analysis, project suggestions, agricultural land and water management, waste management, food packaging-plastics, CO2 emission, policies of agricultural and food sector, food laws and food regulations.

1.5.2 Study Programme and Current Strategic University Documents

Current Strategic Directions for the Development of the University of Bihać (2017-2022) predict transformation and modification of the study programmes from traditional concepts into modern and practical modules that put students and their qualifications into focus.

Such strategies keep the idea of organising knowledge society in mind and create postulates for lifelong learning with students, teachers and the entire community seen as participants in the learning process. This programme will be the much needed shift towards the new concepts predicted by the University's development strategies which are in line with the world that has already seen the necessity for multidisciplinary approach to food production systems, with strong emphasis on "sustainable". University of Bihać points out its vision: "As part of the European higher education and research environment, the University will conduct scientific, artistic and expert research, and use them to provide modern education which is recognized by the European standards in the areas of natural, technical, medical, biotechnical, social and humanistic sciences". Compatibility of the study with the Strategic Directions for the Development of the University is seen through quality policies of the University, which strive to "fortify its position in every aspect of the European higher education environment through quality work". Besides, based on its implementation process, its structure and goals, the study programme is completely in accordance with the strategic goals of the University of Bihać "Strategic Goals 3.1." "Education and Teaching Plans", and strategic tasks 1 and 2 (Revision of the Curriculum and Implementation of Study Programmes based on the Market Needs). Suggested study programme is a step forward towards holistic and multidisciplinary approach of sustainable food production systems examination. Its accordance with the University's strategic goal 3.2.1. "International Cooperation" from the Strategic Directions for the Development 2017-2022, is seen in the fact that this study programme is developed as part of the international Erasmus+ project "STEPS" which includes several universities from the EU countries, and several universities from the Western Balkan countries. Mentioned strategic goal states that "the most important aspect in the development of the University of Bihać is internationalisation which will lead to fulfilling its mission and vision". Internationalisation is acquired through creation of international plan and programme of its studies, international trainings for teaching staff which will be organised and realised by the Faculty and implementation of proven international practices into the study.

1.6 Legislation

Regulations of the University of Bihać were used to create this study programme proposal:

- University of Bihać Statute,
- Regulation on Procedures for Appointing, Adopting, Developing and Monitoring Implementation of Study Programmes at University of Bihać,
- Regulations on Student Examinations at Faculties and Colleges of Higher Education of the University of Bihać for Studies in Accordance with the Bologna Declaration
- Quality Assurance Regulations,
- I Cycle Study Rules,
- II Cycle Study Rules,
- Quality Policies,
- Mobility Rules,
- Strategic Directions for the Development of the University of Bihać 2017-2022,
- Internationalisation Strategies 2018-2023,
- Other specific decree

The following documents were also considered:

- Law on University of Bihać,
- Law on Higher Education of USK,
- Framework Law on Higher Education of USK,
- Rules Detailing the Content of the Official Documents Issued by Higher Education Institutions in USK,
- Standards and Norms for Conducting Higher Education Activities in USK,
- Rulebook on Use of the Academic Titles at Higher Education Institutions in the USK, Accreditation Criteria for Higher Education Institutions in BiH,
- Accreditation Criteria for the First and Second Cycle Study Programmes in BiH
- Recommendations on the Licencing Criteria of the Higher Education Institutions and Study Programmes in BiH
- Standards and Guidelines for the Quality assurance of Higher Education in BiH
- Framework Law on Higher Education Qualifications in BiH,
- Basic Qualification Framework Law in BiH, and
- Specific documents and recommendations of the authorities, agencies, and entities in BiH and abroad, relevant to the Higher Education and First and Second Cycle studies.

1.7 Reference Points

Current laws, rulebooks and regulations in the area of food production that have direct or indirect impact on the study programme are used as reference points:

1. Anderson, L. W., Krathwohl, D. R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths. J., and Wittrock, M.C. (Eds.). 2001. A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon. Boston, MA (Pearson Education Group),
2. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press. Oxford,
3. EASAC (European Academies Science Advisory Council), 2017, Opportunities and challenges for research on food and nutrition security and agriculture in Europe;
4. EC FOOD2030 (European Commission, Directorate-General for Research and Innovation), 2018, FOOD2030 - Recipe for change,
5. EEA (European Environment Agency), 2017, Food in a green light: A systems approach to sustainable food,
6. European Commission (2019). Towards a sustainable Europe by 2030. Reflection Paper. doi:10.2775/676251,
7. European Commission (2020). Towards a sustainable food system,
8. EQF – European Qualifications Framework,
9. FAO (Food and Agriculture Organization of the United Nations), 2018, The future of food and agriculture: Alternative pathways to 2050,
10. FAO (2014). Sustainable food value chain development – Guiding principles. Rome. E-ISBN: 978-92-5-108482-3,

11. Integrated Development Strategy of USK 2014-2020, Government USK, Development Agency USK, The Institute for Development and International Relations,
12. BiH Market Research to Determine how the Education System Compares to Market Needs in 2012, Sarajevo, Labour and Employment Agency of Bosnia and Herzegovina,
13. Ordinance on Hygiene, Quality Demands and Quality Control Methods in BiH,
14. Ordinance on Plants and Facilities for which Environmental Impact Assessment is Mandatory and Plants and Facilities that can be Created and Put into Operation Only if They Have an Environmental Permit [Official Gazette FBiH, 19/04],
15. Report of the World Commission on Environment and Development: Our Common Future
16. Medium-term Strategy for the Development of the Agricultural Sector in FBiH for the 2015-2019 Period,
17. Standards and Norms for Conducting Higher Education Activities in USK [Official Gazette of USK, XVI/12],
18. Strategic Development Documents of the Cities of Bihać and Cazin, and Municipalities of Bosanska Krupa, Bužim, Velika Kladuša, Ključ, Bosanski Petrovac and Sanski Most,
19. Study Programme "MSc Sustainable Food Systems" European Joint Degree Master (Ghent University, Aarhus University; ISARA-Lyon, Università Cattolica del Sacro Cuore, Fulda University of Applied Sciences, University of Kassel and USAMVCluj, Romania),
20. Study Programme "Sustainability in Agriculture, Food production and Food technology in the Danube Region", Joint Degree Master (University of Natural Resources and Life Sciences, Vienna (BOKU), Szent István University, Gödöllö, University of Zagreb; University of Novi Sad, Banat University of Agricultural Sciences and Veterinary Medicine of Timisoara (USAMVBT) Slovak Agricultural University Nitra),
21. Study Programme "Sustainable Food Systems", Multi-disciplinary Master's programme Swedish University of Agriculture,
22. First Cycle Study Programme "Agroecology and Rural Development" at the Faculty of Biotechnical Sciences at the University of Bihać,
23. First Cycle Study Programme "Food Technology" at the Faculty of Biotechnical Sciences at the University of Bihać,
24. Food Law [Official Gazette of BiH, 50/04],
25. Export and Import on Quality Control of Certain Products Act [Official Gazette of FBiH, 21/97],
26. The Agricultural Act [Official Gazette of FBiH, 88/07; 4/10; 7/13],
27. The Agricultural, Food and Rural Development of BiH Act [Official Gazette, 50/08],
28. The Agricultural Organic Foods Production Act [Official Gazette of FBiH, 72/16],
29. Small Economy Stimulation Act [Official Gazette of FBiH, 19/06],
30. Waste Management Act [Official Gazette of BiH, No. 33/03],
31. Zakon o zaštiti okoliša FBIH (Sl.novine FBIH br.33/03) (Eng. Environment Protection Act FbiH [Official Gazette of FBiH No. 33/03]);
32. Consumer Protection Act BiH [Official Gazette of BiH, 25/06],
33. Nature Protection Act [Official Gazette of FBiH, 66/13],
34. Plant Protection Act BiH [Official Gazette of BiH, 23/03].

1.8 Parties Involved in the Implementation of the Second Cycle Study Programme

Strategic Directions for the Development of the State of Bosnia and Herzegovina, Federation, USK, and cities and municipalities of USK, were used to create the curriculum for the second cycle study programme "Sustainable Food Production Systems". Almost 80 stakeholders were consulted and participated in online surveys, interviews and round-table discussions:

We consulted home and private sectors: Meggle, d.o.o. Bihać, Bihać Brewery d.d., Mavi d.o.o. Travnik, AC food d.o.o. Velika Kladuša, KolMix d.o.o. Velika Kladuša, Milk-San, d.o.o, Sanski Most, Meat Industry d.o.o. „MS Alem", d.o.o, Meat Industry "Karajić" Velika Kladuša, Specialised Beekeeping Company Apimed, Specialised Agricultural Cooperative AgroDar, d.o.o. EE-commerc Bihać, Cattle Farm „Perna-F", Institute „Razvojni centar za hranu Emona RCP" and Animal Feeds Company Jata Emona (Ljubljana, Slovenia), Nestlé Company, Klas d.d. Sarajevo, d.o.o. Akova Impex Sarajevo, d.o.o Sinalco BiH Sarajevo, d.o.o. Sava semberija Bijeljina, d.d. Vitaminka Banja Luka, d.d. Milkos (Sarajevo Dairy), Meat Industry d.o.o. Argeta Sarajevo, d.o.o. Ledo Čitluk, d.o.o. Lactalis BH Gradačac, Zenica Milk Industry d.d „ZIM", d.o.o. Poljorad Travnik, d.o.o. Mliječna industrija 99 Gradačac, d.d. Sarajevska pivovara, d.o.o. Bosnaplod Brčko, d.d. Vinarija čitluk Čitluk, d.o.o. Hercegovina produkt, Čitluk, d.o.o. Hepok Mostar, Coca-Cola HBC B-H Sarajevo.

We consulted the public directorate and decision-making bodies, services and local communities: Ministry of Foreign Trade and Economic Relations of BIH, Ministry of Agriculture, Water Management and Forestry of the Federation of Bosnia and Herzegovina, Ministry of Economy and Finance of Sarajevo (Expansion Bureau), Regional Development Agency-REDAH, Co-operative Alliance of the Federation of Bosnia and Herzegovina, Federal Institute of Agriculture Sarajevo, Federal Agro-Mediterranean Institute Mostar, Development Agency Žepče-RAŽ, Federal Institute of Agropedology Sarajevo, Ministry of Education, Science and Sport of USK, Development Agency of USK, Ministry of Health and Social Affairs USK, Ministry of Agriculture of USK (Food Business Operations Jurisdiction), Veterinary Service of USK, Agricultural Service of USK, Public Health Service of USK, Municipality of Bihać (Department for Local Economy Development and Project Management), Municipality of Cazin (Agricultural Counselling Service), The Chamber of Commerce and Industry of USK, Regional Commerce Development Agency Sarajevo-SERDA, International Fond for Agricultural Development-IFAD, Public Health Service of the Federation of Bosnia and Herzegovina, Organic Control "OK" Sarajevo.

We consulted Foreign Academic Community and Academic Community of Bosnia and Herzegovina: first cycle students at the Faculty of Biotechnical Sciences at the University of Bihać, Faculty of Agriculture and Food *S*ciences at the University of Sarajevo, Faculty of Technical Sciences at the University of Banja Luka, Faculty of Agriculture at the University of Banja Luka, Faculty of Technical Sciences at the University in Tuzla, University of León (Hygiene and Food Technology Institute, Spain), University of Klagenfurt (Department of Organisation, Human Resources and Service Management), Centro Tecnolóxico da Carne (Centre of Technology, Spain), Faculty of Agriculture at the University of Zagreb, Faculty of Agriculture at the University of Novi Sad, Josip Juraj Strossmayer University in Osijek,"Sanus Futurum" High-School in Sanski Most.

1.8.1 How this Study Programme Compares to Similar Accredited Study Programmes in Bosnia and Herzegovina and the World

The study programme was created as a joint effort of teachers at the Faculty of Biotechnical Sciences in Bihać and the Faculty of Agriculture and Food Sciences in Sarajevo. Through project activities of the Erasmus+ STEPS project, we reassessed practically every agriculture and food technology study programmes currently being taught at Universities in Bosnia and Herzegovina, region, and Universities around the world. The main goal of this assessment was to evaluate certain representation of the study programme courses that were directly or indirectly related to sustainability in the food production systems. There were only few elective courses in Bosnia and Herzegovina that dealt with the concept of sustainable food production systems (waste treatment from the food industry, green chemistry elements, biofuel production, organic agriculture production, sustainable land management and similar). None of the study programmes specialised in or systematically approached sustainable food production systems. This proved the suggested study programme to be unique in Bosnia and Herzegovina and region.

Sustainable food production systems are relatively new concepts even in the most advanced countries and their respective Universities. The first study programmes to include the sustainability concepts in agriculture and food production were established in 2000s in the United States of America. They appeared somewhat later in the European countries, at Universities that had prevailing agricultural and life science studies (Wageningen in Holland, Hohenheim in Germany, BOKU in Austria, Ghent in Belgium, etc.). European joint degree Master's programme **MSc Sustainable Food Systems** in Sustainable Food Production Systems is currently open in joint realisation of: Ghent University (Faculty of Bioscience Engineering), Belgium; Aarhus University (Faculty of Science and Technology, Department of Food Science), Denmark; ISARA-Lyon, France; Università Cattolica del Sacro Cuore, Italy; Fulda University of Applied Sciences (Department of Nutritional, Food and Consumer Sciences), Germany; University of Kassel (Faculty of Organic Agricultural Sciences), Germany, and USAMV Cluj (Faculty of Horticulture), Romania. This two-year study is divided into four semesters; the first semester consists of five or six core courses which deal with sustainability and the most important food production system concepts, policies and food legislations, food industry entrepreneurs, chain-supply elements, etc. The second semester consists of specialised studies of similar subjects (agroeconomics, food technology, nutritionism, sustainable chain supplies) which are organised throughout the Universities involved in the project. The third semester is carried out at the institute in France. Students are involved in practical work and projects with the industry in order to specialise in the fields of entrepreneurship and sustainable food production development, or innovative food technologies and management skills. The fourth semester is anticipated for research and finalisation of Master's thesis.

Considering the fact that more than one university is involved in the study programme "Sustainable Food Production Systems" presented within this document, it is possible to find many conceptual and content similarities with aforementioned European joint degree master study programmes of Sustainable Food Systems. One of them is joint degree master studies **Sustainability in agriculture, food production and food technology in the Danube region**.

It is being implemented by six Universities: University of Natural Resources and Life Sciences, (BOKU), Austria; Szent István University, Gödöllö, Hungary; University of Zagreb, Croatia; University of Novi Sad, Serbia, Banat University of Agricultural Sciences and Veterinary Medicine of Timisoara, Romania and Slovak Agricultural University Nitra, Slovakia. Main themes of this programme are sustainable development, safety of food, technology and quality of food, sustainable food production and biotechnology and renewable energy sources.

Another interesting master's degree programme, Food Systems, is being implemented by three Universities from Poland (University of Warsaw), Germany (University of Hohenheim) and Spain (Autonomous University of Madrid). This study programme deals with additional subjects important for understanding the concept of sustainability of food production systems (managing food production systems, functional foods and precision nutrition, etc.).

There is also a joint degree study programme in Food Technology which is being implemented by two Belgian Universities (Ghent and Leuven). This programme is characterised by classic food-technology studies of new disciplines (post-harvesting technologies and food preservation).

We also analysed the following study programmes being implemented at European and American Universities: **Sustainable Food Systems** (Swedish University of Agriculture, Uppsala; interesting combination of natural and social sciences that function as sustainable food production systems), **Food Science and Technology** (University of Copenhagen; the study deals with several important branches of food technologies and insists on sustainable food production and consumption, as well as production of healthy foods), **Sustainable and Resilient Food Systems** (University of Wisconsin; the basis of the study is sustainable food production and nutritionism), **Engineering in Food Science** (Latvia University of Life Sciences and Technologies, Jelgava; deals with regulations of biochemical processes, sensory analysis, functional foods, nutritionism, food packaging, food safety, entrepreneurship and marketing), **Food Science and Technology Engineering** (Szent Istvan University, Gödöllö; deals with planning of the processes used in food industry, economics of food production, new food products development), **Organic Agriculture - Sustainable Food Systems** (Wageningen University & Research; basis of the study are social elements of food production systems, globalisation, food production and consumption sustainability), **Sustainable Food Systems** (University of Leeds; deals with sustainable food production and consumption, sustainable food supply systems, food production in undeveloped countries), **Food Science and Safety** (Kaunas University of Technology; deals with managing food safety and quality, development of new food products, and food ingredients), **Agri-Food Chain** (INP ENSAT Toulouse: The Graduate School of Agriculture and Life Sciences of Toulouse; basis of the study is agriculture, agroeconomics, agriculture and ecology, plant and domestic animal genetics, nutritionism).

Our study programme is created with our capacities in mind, and we are willing to accept challenges in order to meet the needs of domestic food industry and other potential employers involved in food production and control. The Faculty did not copy any significant content from the above mentioned study programmes being implemented at European or American Universities. Our study programme has its own internal originality and logic, but it is also open to innovations even immediately after the initial evaluations.

2 DESCRIPTION AND EXPECTED LENGTH OF STUDY

Structure and content of the second cycle study programme “Sustainable Food Production Systems” at the Faculty of Biotechnical Sciences are based on contemporary scientific and expert knowledge in the area of primary agricultural production and food technology. While creating the study, we accepted the highest standards of modern higher education, based on the Bologna principles. Since the study deals with some of the most important challenges humanity faces today (questions of food, ever-growing population, scarce resources, climate changes, economic and political impact on food distribution, food safety, etc.), its main intention is to provide wide basic knowledge to future MSc on the most important general elements of food production systems, and especially those of domineering challenges such as systems’ sustainability, chain supplies, and supply values, food quality and safety, while providing specialisation in the fields of student’s personal interests.

The study programme also has a potential to help the market by increasing the number of highly competent experts in the areas of agriculture and food, capable of landing management and food engineering work positions in primary production and food industry and other similar areas that deal with sustainable food production. The study programme consists of carefully chosen courses in the areas of general knowledge, theory and methodology, science and applied science. All courses are defined in such manner to accentuate modern scientific and expert achievements in their respective areas, and are also acceptable and applicable to this level of higher education. “Sustainable Food Production Systems” study programme is created in accordance with the regulations and subordinate regulations of the higher education in Bosnia and Herzegovina and Una-Sana Canton (USK), as well as the Bologna Declaration. The European Credit Transfer and Accumulation System (ECTS) is also applied. Suggested second cycle study programme at the Faculty of Biotechnical Sciences at the University of Bihać equates to 60 ECTS credits. This is equivalent of two semesters of study. The final master’s thesis is written in the second semester. Courses are divided into cores and electives. The entire study is constructed as a modular system that combines two groups of courses in the area of sustainable food production systems. The first group consists of courses dealing with food engineering and quality and safety of food, while the second consists of courses dealing with food production systems management. The modular curriculum organisation of the interdisciplinary studies implies more teaching staff is involved in the courses, which will provide more efficient and stronger bond between the teaching materials in order to reach more defined second cycle study programme. Second cycle study programme suggestion is delivered by STEPS consortium of higher education institutions participating in the STEPS Project. Besides being implemented at two Universities in Bosnia and Herzegovina, study programme is also delivered under the same name and partly the same contents at two Universities in Albania, and two Universities in Kosovo. Project teams of all six partner institutions of the STEPS project (STEPS consortium) developed the second cycle study programme which consists of six core courses implemented in the first semester that will be the same at all Universities involved. Those are: Fundamentals of Sustainable Agri-Food Systems, Agriculture and Food Industry Waste Management, Advanced Food Science and Technology, Governance, Policy and Legislation in the Agri-Food Sector, Food Ethics, and Methodology Research and Tools.

Elective courses are created in a way they respect project guidelines and sustainability concepts for each University they are implemented at respectively. They are modelled according to the rules and capacities of the implementing Universities, stakeholder analysis results, and market rules of their respected countries. The Faculty of Biotechnical Sciences at the University of Bihać holds 10 elective courses in the second semester, each from two basic study programme groups (Food Engineering, Food Quality and Safety and Food Production Systems Management). Engineering and management courses from the two aforementioned groups are at the ratio 70 to 30 in favour of engineering courses. Students will choose at least two courses (10 ECTS) from the first group, and at least one from the second group (5 ECTS), corresponding to 15 ECTS credits for the second semester. This governs students towards both engineering and sustainable food production systems disciplines. Elective courses selection process will be conducted as an online survey which will be created by the University info service. Electives that receive the most votes will be implemented in the second semester. Elective courses have been approved by the EU Universities partners of STEPS projects (Engineering disciplines in Athens and Bucharest, and Management in Prague and Athens).

Second cycle study programme is considered completed after students finish and defend their Master's thesis at the end of the programme on the subject they have previously agreed upon with their supervisors in the desired field of research. This requirement is a final step after completing all the necessary courses in the first semester and elective courses in the second semester. Master's thesis presentation and completion will show student's ability to apply knowledge acquired through the programme by creating thematic research project, elaborating case study from industry and food markets, creating models, outlining strategic documents, etc. Students will have to show their ability to cooperate with different sections in different contexts, and on different subjects.

Lectures will be conducted in a fully equipped and spatially adequate classrooms, laboratories, with the support of competent services. Some courses will require practical work that will be conducted at the University's laboratories, representative lots and on polygon. Some practical work will be also realised through study visits to farms, food industries, institutions, etc. We need to point out that during the STEPS project realisation, the Faculty will also implement important additional laboratory and computer equipment which will provide better quality of the "Sustainable Food Production Systems" study programme, especially of those disciplines that deal with development of new products, safety and control of food quality and food production systems management.

2.1 Study Rank in the University's Structure

University of Bihać is a public institution that organises and performs university studies, scientific and expert work, technological and artistic creations. It is made of seven academic divisions or faculties, and the Faculty of Biotechnical Sciences being one of them. The first cycle studies at the Faculty of Biotechnical Sciences are organised at the Department of Agriculture - General Programme and Agroecology and Rural Development Programme, Department of Food - Food Technology Programme, Department of Forestry - Forestry Programme, and Department of Ecology - Ecology Engineering Programme.

The second cycle studies are organised at the Department of Forestry - Creating, Managing and Harvesting Forests Programme, and the Department of Sustainable Food Production Systems-the same title programme. In order to minimize further investments, most of the Sustainable Food Production Systems courses will be thought by the University of Bihać teaching staff.

2.2 Length of Study and Qualifications Awarded

The second cycle study programme duration is one year, divided into two semesters. The programme is awarded 60 ECTS credits. Academic year is divided into winter and summer semesters, and the course duration is 15 weeks. Course organisation and duration are defined by the Second Cycle Study Rules of the University of Bihać, and the Second Cycle Study Rules of the Faculty of Biotechnical Sciences. Teaching activities are organised in accordance with the Academic Calendar of the Senate of the University for each year subsequently, and teaching hours which are announced by Vice Dean for The Academic Affairs, and approved by the Academic Council of the Faculty. Programme is awarded academic degree Master of Science in Sustainable Food Production Systems.

3 STUDY PROGRAMME GOALS

The second cycle study programme Sustainable Food Production Systems goal is to upgrade and expand knowledge and skills acquired during the first cycle studies in the areas of agriculture and food. We aim to educate and train future Masters of Science in the areas of food technologies and food and agriculture management, and for the first time, put the focus on sustainability of food production systems. Besides, aim of such programme is to enable critical opinion, improve teamwork and individual skills, and develop affinity towards research which will provide higher level of expert and scientific knowledge in the field, and allow further development. This study programme offers insights into disciplines in the area of food and agricultural engineering, food safety and quality on one hand, and sustainable food production systems based on contemporary teaching methods and interactive involvement of students on the other. This should result in Masters of Science with significant transferable knowledge and skills, newly concluded specialised knowledge and high competence in planning, development, design, and management of complex, economically, socially and environmentally responsible food production systems

4 TEACHING METHODS

Teaching methods for the programme are presented for each course respectively in the syllabus part of the document. Teaching methods include lectures, laboratory, calculus and field practice, study visits and interactive lectures. Interactive methods being implemented are based on individual and teamwork methods of active learning. Special attention is given to discussions, simulation methods, research suggestions and projects. Individual work includes seminars and professional projects which will serve as a foundation to master’s thesis. There will be testing throughout the semester for each course, which will include written tests and/or preliminary exams, as well as final written or oral exam.

5 ECTS CREDITS

Implementation of the European Credit Transfer and Accumulation System (ECTS) is adopted by the University of Bihać Statute. European system of credit transfer is used, where 1 ECTS credit equals 25 study hours. The year is worth 60 ECTS, 30 ECTS per semester.

6 GRADING SYSTEM

Teaching organisation, examination and grading of students are set in the University of Bihać Statute and Second Cycle Study Rules. Overall work and knowledge are graded continuously throughout the semester and on final exam. On the very first lecture, teacher is obliged to inform students about the total ECTS credits and grading system for the course taken. ECTS credits are awarded for every individual activity and grade in accordance with the ECTS rules. Activities and testing throughout the semester must be awarded at least 50% of the total ECTS credit points. Test results and gained knowledge are documented into student's profiles (Student Information System) by course teacher.

Upon completion of the course and final exam, teacher calculates final grades for students and total ECTS achieved. Exam results and other workload throughout the semester is awarder with ECTS as follows:

a) 10 (A) – (outstanding performance with only minor errors), 95-100 points;
b) 9 (B) – (above the average standard but with some errors), 85-94 points;
c) 8 (C) – (average work with a number of notable errors), 75-84 points;
d) 7 (D) – (fair but with significant shortcomings), 65-74 points;
e) 6 (E) – (performance meets the minimum criteria), 60-64 points;
f) 5 (F, FX) – (considerable further work is required), bellow 60 points.

Final grade is based on the total amount of points for a course. A failing grade is given if a student does not achieve necessary number of points, and they do not get grade six (6), they do not receive course worth ECTS credits. If a student achieves grade six (6) or higher, they are given the number of course worth ECTS credits. Final grade is recorded in their academic record document (indeks).

7 STUDENT SUPPORT

Lecturers and staff are available to students during consulting hours and online communication info service of the Faculty of the Biotechnical Sciences. Students will receive a support from a supervisor when writing their Master's thesis, and gain access to laboratories, facilities and equipment necessary for conducting practical and theoretical parts of their thesis. They will also have an opportunity to do part of their research outside the Faculty, at the institutions we signed the Agreement with.

8 PATHS TO A DEGREE

Admissions are conducted in accordance with the provisions of the Framework Law on Higher Education in USK, University Legislation and the Faculty of Biotechnical Sciences Provisions. Second Cycle Study admissions are conducted through tendering process given by the Senate, and on proposition of the Academic Council of the Faculty. Aforementioned Law, Legislation, and Instruments provide transparent selection to the study programme. Tendering and admission procedures at the Faculty of Biotechnical Sciences are conducted by the Committee appointed by the Academic Council of the Faculty.

Right of admission to the Second Cycle Study programme, upon tender, have all individuals who have successfully completed a relevant First Cycle Study Programme, with verified 240 ECTS credits (four year study). Minimum average grade required is 8 (eight)/3.5 (three point five). Students with average ranging from 7 to 8 can be admitted with letters of recommendation from at least two university professors, one from the same specific field of study and other professor from any course completed during the First Cycle. Students qualified for admission are those who have completed their studies at the faculties of biotechnical and technical sciences, and relevant faculties in Bosnia and Herzegovina or abroad. Foreign citizens have a right of admission to the Second Cycle Study programme under the same conditions as citizens of Bosnia and Herzegovina, with previously validated degree and paid required admission fees. “Sustainable Food Production Systems” Second Cycle Study Programme at the Faculty of Biotechnical Sciences consists of 60 ECTS credits. It is carried out through two semesters. Courses anticipated in the curriculum are divided into cores and electives. There are 6 core courses in the first semester and 10 elective courses in the second semester. Electives are from two main programme groups - Food Engineering, Food Quality and Safety, and Food Production Systems Management. Student will choose and attend at least 2 courses from the first group (10 ECTS) and at least 1 course from the second group (5 ECTS), which corresponds to 15 ECTS for the second semester. For the admission to the second semester, students have to pass first semester exams and be awarded required ECTS credits.

Completed Master’s thesis is awarder 15 ECTS credits, and it is scheduled for the second semester. Student will choose a subject of their thesis with a supervisor teaching a second semester course, after completing the first semester, and before the second semester starts at the latest. With the approval of the supervisor, student will file a written application of the Master’s thesis to the Academic Council of the Faculty to be revised for schedule. Theme of the Master’s thesis must be clearly defined and represent the actual content of the work; this can be chosen form any field of study covered in the second cycle study programme. Student will be able to publically defend their thesis after completing and passing all the core and elective courses and meeting other responsibilities during the study, and after receiving a passing grade from the Committee in charge of grading and defending Master’s thesis. Final thesis must be submitted and defended within 3 years from the day it as approved. After successfully defending their thesis, student will be awarded the MSc in Sustainable Food Production Systems degree, which is in accordance with the Framework Law on Higher Education in USK (Official Gazette of USK No. 24) and the Rulebook on Use of the Academic Titles at Higher Education Institutions in the Una-Sana Canton.

After completing suggested study programme, ECTS are added to the previous study cycle, and total to at least 300 ECTS. According to the Basic Qualifications Framework in Bosnia and Herzegovina (Official Gazette of Bosnia and Herzegovina, 31/11), this will result in Masters of Science in Sustainable Food Production Systems which corresponds to the learning outcomes for EQF level *7.*

9 QUALITY ASSURANCE

University of Bihać has clearly defined and functional quality management system executed through following boards:

- Committee for Quality Assurance at the University of Bihać,
- Centre for Quality Assurance and Internal Evaluation at the University of Bihać,
- Teams for Quality Assurance of the Organisational Units at the University of Bihać

Quality Assurance bodies active at the University act together in order to maintain competencies of the University. Quality Assurance system at the University of Bihać follows the guidelines of the European Association for Quality Assurance in Higher Education (ENQA Standards and Guidelines). Basic guideline for quality assurance of the study programme is utilisation of internal system of Quality Assurance at the University of Bihać, and the Faculty of Biotechnical Sciences in particular. This internal assurance guarantees the following competencies: planning, documenting, amending and supplementing, as well as implementation and coherence between teaching goals, learning outcomes, and result evaluation, quality evaluation of the courses, quality evaluation of the study programme, quality evaluation of the academic staff, quality evaluation of available resources and student support system, analysis of students admitted to the academic year, ECTS credits analysis, evaluation of percentage of students passing and taking exams, grading system, teaching process evaluation, practical work analysis, anonymous student surveys, graduated students, external partners of the University, business representatives, coherence between new demands and new challenges and standards of vocations, application of new regulations, scientific advances coherence, regular advances through periodic system analysis, self-evaluation of the study programme, and preparations that meet criteria for accreditation of study programmes, monitoring of relevant Quality Assurance indicators of the Faculty and the study programme, fulfilling learning outcomes etc. Such system of Quality Assurance provides comprehensiveness, representativeness, periodicity, and required anonymity. Quality Assurance activities at the Faculty are carried out in accordance with the current University regulations, especially Ordinance on Quality Assurance and Quality Policy, while emphasising the respect for values defined by the Quality Policy.

10 CAREER POSSIBILITIES AND PERSPECTIVES

Upon successful completion of the study programme, MSc in “Sustainable Food Production Systems” will possess knowledge, skills and competencies, and will require minimum time of adjustment to answer demands for the following job positions:

- team leader for planning and sustainable development of agri-food production systems, and sustainable development jobs in general,
- agri-food technology engineer in complex sustainable production, processing and food distribution systems,
- new food products development engineer,
- quality manager at agri-food industry,
- clerical and consulting positions for government agencies that deal with sustainable development planning,
- project leader, researcher or consultant for research and development projects that deal with sustainability concepts and sustainable development,
- manager or consultant for non-governmental organisations specialized in the field of sustainable development,
- team leader for complex machinery tasks at agri-food industries,
- manager for businesses that deal with sales of raw materials and food equipment for food industries, and those that deal with production and marketing of food additives,
- leader or consultant for businesses that deal with education of consumers regarding food, and food promotion centres,
- at inspection services for food quality control,
- at distribution centres and stores that sell foods, at tourism and catering branches,
- at non-governmental organisations,
- at faculties, scientific institutes and schools as a teacher for expert subjects in agriculture, food technology and ecology.

When we consider local agri-food sector and its services, we have to accentuate regular recommendations they give to the Unemployment Agency in Bosnia and Herzegovina in terms of active measures taken in order to lower unemployment and promote self-employment and employment in the field of agriculture. It is commonly noticed that competitive and development oriented agri-food sector needs university educated experts, capable of responding to current and anticipated challenges. “Sustainable Food Production Systems” study programme for the first time in this area systematically combines research of sustainability concepts (as the most obvious demand for survival and further advancement of humanity), and modern engineering control technologies, methods and tools for organizing economically justifiable, and at the same time socially and ecologically responsible food production.

11 GENERAL AND SPECIFIC CONDITIONS FOR ORGANISATION OF HIGHER EDUCATION

Standards and norms to carry out higher education activities in the Una-Sana Canton aim to contribute to quality improvement of education and higher education results as a foundation for simpler and more successful degree which can be compared to the one acquired in Europe or other parts of the world. Standards define general, and norms specific conditions for conducting quality academic process, and artistic process respectively at higher education institutions.

Standards and norms to carry out higher education activities in the Una-Sana Canton determine minimum facility, personnel and other material and technical requirements for conducting teaching, scientific and research processes, and art processes. Academic process is organized in a way it allows for its unrestricted conduct and work with students in accordance with standards and norms, and at the same time implementing determined amount of activities through lectures, practical work, seminars, consulting, and examination during work hours determined by the curriculum, and teacher, assistant and other staff and adequate administrative and technical staff work hours respectively. Higher education institutions ensure European standards and guidelines which deal with internal quality assurance (ENQA Standards and Guidelines) are implemented and minimum requirements for certain higher education activities are based on them.

11.1 Pedagogical Standards and Norms

Standards and norms to carry out higher education activities in the Una-Sana Canton are oriented to contributing to quality improvement of education and higher education results as a foundation for simpler and more successful degree which can be compared to the one acquired in Europe or other parts of the world. For conducting higher education activities in the Una-Sana Canton (Official Gazette, No. 12/012) point 4.1. “Personnel Standards and Norms” of Pedagogical Standards and Norms are used.

11.2 Number of Students

Number of students admitted is regulated by the University of Bihać Statute and Second Cycle Study Rules. It is redefined every year based on the opinion of the Academic Council of the Faculty, proposed by the University Senate to the Ministry of Education, Science and Sports, and Government of USK respectively to adopt.

11.3 Facilities, Equipment, Furniture, Library and Other Standards

Standards and pedagogical norms also define:

- Optimal facilitation for students’ needs,
- Disability Access to Facilities,
- Teaching Aids,
- Sanitary Conditions,
- Libraries,
- Computers and Network.

12 SECOND CYCLE STUDY PROGRAMME

12.1 Educational Goals and the Second Cycle Study Programme Profile

Educational goals of the "Sustainable Food Production Systems" study programme are focused to provide students with improved general and specific knowledge, practical knowledge, abilities and skills to manage production, safety and quality of food in production processes of agri-food sector. We also aim to provide teachings and application of methods and techniques necessary for research, and encourage further research in order to solve problems in the area of the sustainable food production systems. The main goal of the study is to create conditions for the candidate to reach profound and specialised knowledge of scientific methods and research techniques in the area of their Master's thesis topic in order to creatively solve problems that may arise in the area of their research and improve further work. We aim to give our students basic knowledge of the most important general elements of food production systems and challenges they face, such as the problem of sustainability, supply chain and value chain, safety and quality of food, in combination with specialised knowledge in the specific areas. Degree awarded is Master of Science, and students will be able to autonomously work in the field of sustainable food production systems after finishing their studies. Knowledge and skills gained during the study will be used to solve problems in this area and contribute to its development.

12.2 Learning Outcomes of the Second Cycle Study Programme

By writing and presenting their final Master's thesis, student will apply acquired knowledge to create thematic research project, an elaboration of case study from the industry or food market, creation of models, strategic document blueprints, etc. By doing this, student will show their cooperation skills with different profiles and in different contexts, with different themes within a company.

"Sustainable Food Production Systems" Second Cycle Study Programme has clearly defined general outcomes for the second (II) cycle study, and upon successful completion of the programme, student will be able to:

- apply knowledge and understandings based on extended and deepen cognition gained during the first cycle study of university education which present basis for the original approach skills towards development or application of ideas in the context of research;
- use knowledge and understandings to solve problems in new, unknown and multidisciplinary surrounding associated to the field of study, and assess complex situations, including those with incomplete or limited information;
- argue and convey information, clearly and unambiguously make conclusions in specialised and layman surroundings (communication), and independently use developed skills and learning habits.

Beside general, "Sustainable Food Production Systems" study programme has clearly defined specific learning outcomes. Upon successful completion of the study programme, Masters of

Science will be able to:

- interpret, advocate and criticise concept of sustainable food production systems as a complex matrix of values that is directly connected to environment, economy and society;
- determine and functionally adjust all the segments of food production and distribution chains (farm to table), and identify and control factors that endanger sustainability of food production and distribution;
- analyse and critically compare alternative and conventional food production systems from environmental, economic and social sustainability aspects;
- analyse the way agri-food companies function and the role of different divisions (research and development, production, sales, marketing) in solving sustainable food production problems;
- plan and manage food production in agri-food systems, and handle management and quality assurance systems in companies that produce food or deal with foods.

After successfully completing the "Sustainable Food Production Systems" study programme, students will be able to independently propose, prepare and organize realisation of simple expert and research programmes in agri-food sector and agri-food industry management, and prepare reports and present the results of such programmes and projects. Student will prepare themselves for these general competencies throughout the study programme courses, especially during the writing of their Master's thesis.

This way, students will possess competencies to:

- use analytic and synthetic approach to create and use strategies to solve problems in different contexts;
- assess the demands of practice, apply gained knowledge and skills in practice, and deepen knowledge in sustainable food production systems;
- work in teams and independently to assess and apply basic information technologies in the field of study.

General and specific learning outcomes, skills and competencies set out above are in accordance with the fourth (analyse), fifth (assess) and in a part the sixth (create) levels of cognitive abilities based on Bloom's revised taxonomy of Cognitive Skills and Educational Objectives.

12.3 Curriculum

Figure 1 Structured Curriculum with Workload and ECTS per Semester

Code	Semester - Course	Type	ECTS	Hours/Semester			
				Le*	S*	La*	Total
	1st Semester						
OSPH 101	Fundamentals of Sustainable Agri-Food Systems	Core	5	45	15		60
OSPH 102	Agricultural and Food Industry Waste Management	Core	5	30	15	15	60
OSPH 103	Advanced Food Science and Technology	Core	5	30	15	15	60
OSPH 104	Governance, Policy and Legislation in the Agri-Food Sector	Core	5	15	15	-	30
OSPH 105	Food Ethics	Core	5	30	15	-	45
OSPH 106	Methodology Research and Tools	Core	5	30	15	-	45
	Total for the 1st semester		30				
	2nd Semester						
	LIST A (Food Engineering, Quality and Safety of Food) / min 10 ECTS						
OSPH I-201	Harvesting and Post-Harvesting Technologies	Elective	5	30	15	15	60
OSPH I-202	Animal Food Technology Science	Elective	5	30	15	15	60
OSPH I-203	Sustainable Animal Production	Elective	5	30	15	-	45
OSPH I-204	Sustainable Plant Production	Elective	5	30	15	-	45
OSPH I-205	Sustainable Technology of Meat Products	Elective	5	30	15	15	60
OSPH I-206	Sustainable Technology of Dairy Products	Elective	5	30	15	15	60
OSPH I-207	Low Input Agriculture	Elective	5	30	15	-	60
	LIST B (Food Production Systems Management) / min 5 ECTS						
OSPH I-208	Marketing of Sustainable Agri-Food Products	Elective	5	30	15	-	45
OSPH I-209	Sustainable Land Management	Elective	5	30	-	15	45
OSPH I-210	Total Quality Management in the Agri-Food Sector	Elective	5	30	15	-	45
OSPH-MT	**Master's Thesis**	Core	15				30
	Total for the 2nd Semester		*30*				
	Total		60				

*Le – Lectures; S – Seminars: La – Labs

12.4 Competency Matrix

Figure 2 “Sustainable Food Production Systems” Competencies Matrix

No.	COURSE	Apply knowledge and understandings based on extended and deepen cognition gained during the first cycle study of university education which present basis for the original approach skills towards development or application of ideas in the context of research.	Use knowledge and understandings to solve problems in new, unknown and multidisciplinary surrounding associated to the field of study, and assess complex situations, including those with incomplete or limited information.	Argue and convey information, clearly and unambiguously make conclusions in specialised and layman surroundings (communication), and independently use developed skills and learning habits.	Interpret, advocate and criticise concept of sustainable food production systems as a complex matrix of values that is directly connected to environment, economy and society.	Determine and functionally adjust all the segments of food production and distribution chains (farm to table), and identify and control factors that endanger sustainability of food production and distribution.	Analyse and critically compare alternative and conventional food production systems from environmental, economic and social sustainability aspects.	Analyse the way agri-food companies function and the role of different divisions (research and development, production, sales, marketing) in solving sustainable food production problems.	Plan and manage food production in agri-food systems, and handle management and quality assurance systems in companies that produce food or deal with foods.	Use analytic and synthetic approach to create and use strategies to solve problems in different contexts.	Assess the demands of practice, apply gained knowledge and skills in practice, and deepen knowledge in sustainable food production systems.	Work in teams and independently to assess and apply basic information technologies in the field of study.
1.	Fundamentals of Sustainable Agri-Food Systems	X	X		X		X		X		X	
2.	Agricultural and Food Industry Waste Management	X	X		X		X			X	X	
3.	Advanced Food Science and Technology	X	X				X	X			X	X
4.	Governance, Policy and Legislation in the Agri-Food Sector		X	X	X	X			X	X		X
5.	Food Ethics		X		X						X	X
6.	Methodology Research and Tools	X	X	X						X		X

7.	*Harvesting and Post-Harvesting Technologies*	X	X	X	X	X	X	X	X		X	
8.	*Animal Food Technology Science*	X	X		X	X	X	X	X		X	
9.	*Sustainable Animal Production*	X	X	X	X	X	X				X	
10.	*Sustainable Plant Production*	X	X	X	X	X	X				X	
11.	*Sustainable Technology of Meat Products*	X	X			X	X	X	X		X	
12.	*Sustainable Technology of Dairy Products*	X	X			X	X	X	X		X	X
13.	*Low Input Agriculture*	X	X			X	X			X	X	
14.	*Marketing of Sustainable Agri-Food Products*		X	X	X	X		X	X			X
15.	*Sustainable Land Management*	X	X	X	X					X	X	X
16.	*Total Quality Management in the Agri-Food Sector*		X	X		X		X	X	X	X	X
17.	Master's Thesis	X	X	X	X					X	X	X

12.5 Admission Requirements

Admissions to the study programme are conducted in accordance with the Provisions of the Framework Law on Higher Education in USK, University Legislation and the Faculty of Biotechnical Sciences Provisions. Second Cycle Study admissions are conducted through tendering process given by the Senate, and on proposition of the Academic Council of the Faculty. Aforementioned Law, Legislation, and Provisions provide transparent selection to the study programme. Tendering and admission procedures at the Faculty of Biotechnical Sciences are conducted by the Committee appointed by the Academic Council of the Faculty.

Right of admission to the Second Cycle Study programme, upon tender, have all individuals who have successfully completed a relevant First Cycle Study programme, with verified 240 ECTS credits (four year study). Applicants should have a BSc with 240 ECTS of 4 years with a minimum average of 8 (eight)/3.5 (three point five).

Students with average ranging from 7 to 8 can be admitted with letters of recommendation from at least two university professors, one from the same specific field of study and other professor from any course completed during the First Cycle. Students with average below 7 can be admitted with additional verification of the knowledge gained in the specific field of study. Students qualified for admission are those who completed their studies at the faculties of biotechnical sciences, agriculture, technical sciences, and relevant faculties in Bosnia and Herzegovina or abroad. A decision about meeting admission requirements will be made for all students enrolling for the Second Cycle Study Programme. Master's students from similar and related faculties that want to switch studies to the Faculty of Biotechnical Sciences at the University of Bihać will be able to transfer ECTS credits from the previous programme with the Decision of Exam Recognition and potential additional examination reached by the Academic Council of the Faculty based on the Report issued by a three-member Committee for Examination Recognition. The Committee is formed by the Dean of the Faculty of Biotechnical Sciences. Exams, ECTS credits and recommendation for admission to the semester are recognized based on transcripts submitted in a form of verified copy or original documentation. Documents needed are as follows: Certificate of passed examinations from the previous programme, validated curriculum from the University, and other papers classified as supporting documents that can be used to reach a decision to recognize previous exams.

International citizens are eligible for admission to the Second Cycle Study Programme under the same conditions as citizens of Bosnia and Herzegovina, after submitting verified diploma and paying study fees as proposed by the Decision about the Study Fees for the Second Cycle Study.

Final Master's thesis can be submitted only after passing all the exams and fulfilling all other requirements foreseen by the study programme. Candidates who fail to defend their Master's thesis in an anticipated deadline provided by the Second Cycle Study Rules, can file a request for extension to the Academic Council of the University.

13 REQUIREMENTS RELATED TO THE IMPLEMENTATION OF THE STUDY PROGRAMME

Number of candidates anticipated for admission to the Second Cycle Study programme is defined in the Decision made by the Academic Council of the Faculty, and cannot be less than 10.

13.1 Staff

University of Bihać and the Faculty of Biotechnical Sciences have a capacity for realisation of the curriculum according to the pedagogical standards and norms, which include teachers and associates managing the realisation of teaching process in the "Sustainable Food Production Systems" second cycle study, and according to the modular system with the involvement of number of teachers and associates in the implementation of the syllabus (Figure 3). Suggested study programme has a total of 24 teachers and 3 associates (senior teaching assistants) involved, all of them under permanent employment contract with the Faculty of Biotechnical Sciences or the University of Bihać, respectively (Figure 3).

At the same time, teachers presented in the Figure 3 are involved in teaching process at other study departments/programmes of the first and second cycle which are conducted at the University. Employees of the University of Bihać have a week norm of 6 teaching hours (+6 hours), 90/180 per semester, 180/360 per academic year, while the associates have a week norm of 10 hours, 150 per semester, or 300 hours per academic year. "Sustainable Food Production Systems" study programme consists of 300 contact hours during the first semester for core courses (180Le + 90S + 30La), and minimum of 135 contact hours (depending on the courses elected) during the second semester for elective courses, with different lecture distribution, seminars or exercises, all depending on courses elected.

Considering current teachers' and associates' workload at the University of Bihać, admission policies, planning and creating future workload for them, it is evident that teachers and associates involved in the "Sustainable Food Production Systems" study programme will be able to cover teaching obligations both at other study departments/programmes of the first and second cycle study as well as at the STEPS programme. This is proven by the fact that lectures are organized according to modular principles so teachers and associates are only doing a part of the total fund of hours anticipated for the syllabus, and other part is reserved for external associates. Besides lectures held by teachers and associates from the University of Bihać, students will have lectures during the first semester of every academic year held by external associates from the Faculty of Agriculture and Food Sciences at the University of Sarajevo. As part of the project STEPS, all consortium partners have accepted to incorporate elements of certain "Joint Degree" into their study programmes. This means that the Faculty of Biotechnical Sciences and the Faculty of Agriculture and Food Sciences in Sarajevo will offer a joint degree at the state level as part of the bilateral agreement. Joint degree elements will be realized through exchange of teaching staff and students during the first semester of the studies, joint mentorships, and committees for Master's thesis defence.

Figure 3 List of teaching staff

Course	Lecturer	Title/ Field	Teaching Associates	Title/ Field
Fundamentals of Sustainable Agri-food Systems	Sabahudin Bajramović, PhD	*Full Professor at the Faculty of Agriculture and Food Sciences at the University of Sarajevo in the field of Microeconomics of Agriculture and Food Industry*	Vildana Jogić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Physical Geography, Agroclimate Course and Farming and Horticulture*
	Mirsad Veladžić, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Farming and Horticulture*	Suzana Jahić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*
			Emir Mujić, PhD	*Assistant Professor are the Faculty of Biotechnical Sciences at the University of Bihać in the field of Livestock*

Course	Lecturer	Title/ Field	Teaching Associates	Title/ Field
Agricultural and Food Industry Waste Management	Jasmina Ibrahimpašić, PhD	*Associate Professor athe Faculty of Biotechnical Sciences at the University of Bihać in the field of Industrial and Environmental Biotechnologies*	Ifet Šišić, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Process Engineering*
			Fatima Muhamedagić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Interdisciplinary Ecology*
			Merima Toromanović, MSc	*Senior teaching Assistant at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Industrial and Environmental Biotechnology*
Advanced Food Science and Technology	Melisa Oraščanin, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drink*	Mejra Bektašević, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Biochemistry*
			Edina Šertović, PhD	*Senior Teaching Assistant at the Faculty of Biotechnical Sciences at the University of Bihać, Courses Functional Foods and Additives, and Food Toxicology*
Governance, Policy and Legislation in the Agri-Food Sector	Genc Trnavci, PhD	*Full Professor at the Faculty of Law at the University of Bihać in the field of Civil Law*	Albin Muslić, PhD	*Assistant Professor at the Faculty of Law at the University of Bihać in the field of Civil Law*
Food Ethics	Vildana Alibabić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food Quality Control and Food Science*	Suzana Jahić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*
			Mejra Bektašević, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Biochemistry*
			Edina Šertović, PhD	*Senior Teaching Assistant at the Faculty of Biotechnical Sciences at the University of Bihać, Courses Functional Foods and Food Toxicology*

Course	Lecturer	Title/ Field	Teaching Associates	Title/ Field
Research Methodologies and Tools	Refik Šahinović, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać, Courses Anatomy and Physiology of Animals, Livestock Farming and Domestic Animals Reproduction*	Suzana Jahić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać, Biometrics Course*
			Halid Makić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Biochemistry*
Harvesting and Post-Harvesting Technologies for Agricultural Products	Mirsad Veladžić, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the fields of Farming and Horticulture, and Food and drinks*	Zemira Delalić, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać, Courses General Farming, Fodder Plants and Plant Protection*
			Azra Skender, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Fruit-growing*
			Vildana Jogić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Farming and Horticulture*
Animal Food Technology Science	Melisa Oraščanin, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*	Suzana Jahić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*
			Mejra Bektašević, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Biochemistry*
			Aida Džaferović, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*
			Sebila Rekanović, MSc	*Senior Teaching Assistant at the Faculty of Biotechnical Sciences at the University of Bihać, Course Process Measurement and Management*

Course	Lecturer	Title/ Field	Teaching Associates	Title/ Field
Sustainable Animal Production	Husein Vilić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Livestock Farming*	Refik Šahinović, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać, Courses Anatomy and Physiology of Animals, and Livestock Farming*
			Nermin Pračić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the fields of Livestock Farming*
			Emir Mujić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Livestock Farming*
Sustainable Plant Production	Zemira Delalić, PhD	*Full Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Plant Protection*	Vildana Jogić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Farming and Horticulture*
	Azra Skender, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Fruit-growing*	Dinko Bećirspahić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Fruit-growing*
Sustainable Technology of Meat Products	Suzana Jahić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*	Elvisa Hodžić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Analytical Chemistry*
			Sebila Rekanović, MSc	*Senior Teaching Assistant at the Faculty of Biotechnical Sciences at the University of Bihać, Course Process Measurement and Management*
Sustainable Technology of Dairy Products	Suzana Jahić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Food and Drinks*	Nermin Pračić, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Livestock Farming*
			Edina Šertović, PhD	*Senior Teaching Assistant at the Faculty of Biotechnical Sciences at the University of Bihać, Courses Functional Foods and Additives*

Course	Lecturer	Title/ Field	Teaching Associates	Title/ Field
Low Input Agriculture	Vildana Jogić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Farming and Horticulture*	Emir Mujić, PhD	*Assistant Professor a t the Faculty of Biotechnical Sciences at the University of Bihać in the field of Livestock Farming*
			Dinko Bećirspahić, PhD	*Assistant Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Fruit-growing*
Marketing of Sustainable Agri-Food Products	Arnela Nanić, PhD	*Assistant Professor at the Faculty of Law at the University of Bihać in the field of Marketing*		
Total Quality Management in the Agri-Food Sector	Halid Makić, PhD	*Associate Professor at he Faculty of Biotechnical Sciences at the University of Bihać in the field of Biochemistry*	Esad Bajramović, PhD	*Associate Professor at the Faculty of Technical Sciences at the University of Bihać in the field of Quality Assurance*
Sustainable Land Management	Mirsad Ičanović, PhD	*Associate Professor at the Faculty of Biotechnical Sciences at the University of Bihać in the field of Soil Science*	Fatima Muhamedagić, PhD	*Associate Professor at he Faculty of Biotechnical Sciences at the University of Bihać in the field of Interdisciplinary Ecology*

13.2 Facilities

First and second cycle studies at the Faculty of Biotechnical Sciences at the University of Bihać are conducted at the Faculty's facilities at "Grmeč" campus. Lectures, auditory exercises and seminars are held in classrooms (P1, P2, P3, P4, P5 and Amphitheatre), while practical parts of the study are performed at chemical and biological laboratories for instrumental analysis. The Faculty stretches on 3612 square meters. Amphitheatre, classrooms and biological laboratories offer multimedia equipment (projector, screen, computers and laptops). Laboratories are fitted with modern instrumental equipment (Figure 4) which allows individual or small group practical exercises to be conducted. We offer bus or microbus for field exercises and study visits.

13.3 Equipment

The Faculty of Biotechnical Sciences at the University of Bihać has six classrooms with modern equipment and capacity for 20 to 60 students, depending on the classroom, with modern video projectors, computers and blackboards. Besides computer equipment available to teachers and administrative staff, the Faculty owns significant laboratory equipment.

Laboratories are located in a special facility at “Grmeč” campus, and stretch on around410sq. m. There are four bigger laboratories for experimental part of the studies, four smaller facilities with instrumental technology, two foreign service labs, and one laboratory for scientific and research work. There are also two administration and documentation offices, auxiliary facilities for preparation of lab equipment, chemical storage facility and sanitary facilities. We also have to point out that for the purpose of curriculum development and ensuring laboratory conditions through Erasmus+ project ‘MSc in Sustainable Food Production Systems/STEPS’, we will acquire laboratory equipment to organize ‘Food Quality Control Laboratories’, as well as computer equipment for ‘ICT Centres for Food Production Systems Management’. Lab equipment presented in Figure 4 contains significant devices and equipment, and does not contain auxiliary laboratory materials and expendables (chemicals and accessories).

Figure 4 Lab Equipment

No.	Equipment
1.	Amylograph – E, Brabender
2.	Analytical Scale– METTLER TOLEDO AB 204 – S
3.	Analytical Instrument – Automatic Titrator
4.	Moisture Analyzer
5.	EIA/ELISE type A_3 serial no. 1616 Instrument
6.	Deionized water machine 10L/H. Output water quality 0.2-0.4us/cm. Supply hose included (Termo Scientific)
7.	water distiller - MELAdest (MELAG)
8.	The Perten Falling Number System
9.	Steam Sterilizer - Autoklav, MELAtronic 17
10.	Steam distillation unit Kjeldahl «Pronitro I»
11.	Soxhlet extractor
12.	PerkinElmer A-Analyst 800 Atomic Absorption Spectrophotometer
13.	Autoclave Certoclav CV-EL 12 LGS
14.	Automatic viscometer – Thermo Scientific
15.	Binocular microscope – ZUZI
16.	Binocular microscope - PARALUX
17.	Block digest 6
18.	BPK 5 Block
19.	Centrifuge – BIOCEN
20.	Centrifuge –ALRESA mod.Digicen- E
21.	DNA Analyser – Agilent 2200 Tape Station System
22.	Extensograph – E, Brabender
23.	Farinograph – E , Brabender
24.	FT – IR Spectrometer, BRUKER, Tensor 27
25.	Multifunction Hygrometer - DELTA OHM HD 8901
26.	Incubator – SELECTA

27.	COD 20° C Thermostatic Incubator. Inner socket included. Stir volume of minimum 60L. (VELP Scientifica, WTW)
28.	Portable color measurement instrument to measure reflective colors and color differences in a wide range data processor (microcomputer and printer in one)
29.	Ion chromatograph – 790 IC Personal – Methrom
30.	Kjeldahl instruments for determination of proteins in food and animal foods – automatic distillation unit
31.	COD Determination Kit, which includes thermo reactor with 8 slots, heating temperature of 160°C, photometer for COD, and reaction cuvette kit to determine scopes of 0 – 150mg/L, 0 – 1500mg/L, 1 – 15000mg/L (CR 2200, WTW)
32.	Conductometer – Hanna
33.	Conductometer (OKTAON)
34.	Laboratory Blender - Kika labortehnik HS 501 digital
35.	Laboratory Scale – KERN pes (6 pieces)
36.	Laboratory Scale BL 3100-SARTORIJUS- AG Gottingen
37.	Laboratory Homogenizer Blender LB 20 E / model 38 BL 40
38.	Laboratory Mill – Instrument used for grinding or homogenizing food samples and animal foods
39.	Laboratory Spectrophotometer - ZUZI 4200/2000
40.	Lyophilizer – VaCo 2 Zirbus
41.	Magnetic Blender - AGITADOR MAGNETICO MS-8 BUNSEN
42.	Microtom Instrument DONGWON – Microscope
43.	Micropipette – Sartorius - 100 - 1000 µl (10 pieces),
44.	Micropipette – Sartorius - 100 - 5000 µl (1 piece),
45.	Micropipette – Sartorius - 2 - 20 µl (10 pieces),
46.	Micropipette – Sartorius - 30 - 300 µl (10 pieces),
47.	Microscope with Integrated Camera – Nikon (3 pieces)
48.	Microwave Reactin System, Anton Par
49.	Mini Spray Dryer B-290 – BÜCHI
50.	Noise Analyzer - Fonometer Type PCE 318
51.	Light intensity measurement unit Luksometar Type 1335
52.	Acidity Analyzer - pH meter for soil testing PH 220S
53.	Weather meter - Kestler AVM - 4000 Multifunctional Anemometer
54.	Ozone meter – Ozonometar 1000
55.	Gas meter TETRA for 4 gases CH4; H2S; CO and 02.
56.	Radiation detector - Radiometer Gamma-Scout
57.	Soil moisture meter - Hygrometer –TDR 100
58.	Soil conductivity meter
59.	Oximeter
60.	Muffle Furnace – SELECTA
61.	pH-meter 507 – Crison
62.	Portable Multi-parameter single-channel instrument with electrodes for the determination of pH, temperature, dissolved oxygen and conductivity. Field kit. (Lovi bond, Senso Direct 150)
63.	Portable field laboratory (OKTAON)

64.	Oil Press Machine – Ölpresse KK100 F / 140 F Universal-KERN&KRAFT,
65.	Rotary evaporator - Rotavapor R-210/215 BÜCHI
66.	Soxtectm 8000 (Soxlet Unit)
67.	Soyushka-2 Soybean Processing Multifunctional System
68.	Spectrophotometer, photoLab 6600 UV-VIS WTW)
69.	Mass Spectrometry System LC/MS/MS
70.	Drying and sterilizing unit SELECTA
71.	Telescopic rod adjustable to 4.5 meters, with bottle holder in PP for 750mL bottles and 750mL bottle for liquid sampling
72.	Trinocular microscope (BestScope)
73.	Turbidimeter – PCE – CM 41
74.	Ultra Centrifugal Mill Retsch ZM 200
75.	Food pH value meter - portable kit
76.	UV – VIS spectrophotometer
77.	VACIOTEM-T, Selecta Vacuum drying oven
78.	BUNSEN BA Water Bath
79.	Vortex blender

14 RELATED QUESTIONS

Five-year student numbers forecast

We accept 10 full-time students in the first admission term. The number of students is determined every year by the Ministry of Education, Science, Culture and Sports USK and USK Government based on the Faculty's and the University of Bihać Senate's proposition. Domestic agri-food sector and their services give regular recommendations to the Bureau of Unemployment of Bosnia and Herzegovina on specific actions in order to lower the unemployment numbers with emphasis on self-employment and employment in the agricultural sector. This highlights the need for competitive and developed agri-food sector academic experts, but with received education that can answer current and realistically anticipated challenges.

It is important to point out that during the implementation of the project "MSc in Sustainable Food Production Systems/STEPS" by the project consortium, an excellent stakeholder analysis was also conducted. Agriculture and food industry representatives in Bosnia and Herzegovina and institutions directly or indirectly connected to agriculture-production, processing and distribution of food, along with students as important interest group, all agreed that such study would be extremely important for agriculture and food production sectors and the inevitable transformation they are facing. Considering all the reasons for implementation of this study, e.g. the need for educated experts - Masters of Sciene" – specialized in the sustainability in complex food production systems, as well as the stakeholder analysis and good-practice analysis results, we aim to educate and qualify 50 experts in the next five years. These experts will be able to provide sustainable food production from farm to table, and improve export of the final products, which we believe justify five-year student number forecast plan as seen in Figure 5.

Figure 5 Student numbers forecast for the next five years

Year	Number of Students
2020/2021	10
2021/2022	10
2022/2023	10
2023/2024	10
2024/2025	10
Total	**50**

Involvement of students in research activities

Students will be involved in scientific research activities through seminars, projects, scientific conferences and final thesis.

Supervisor-student activities

Based on student's suggestion and supported by a potential supervisor, Master's thesis topic will be defined and analysed in order to confirm its validity. After the supervisor accepts student's proposal, it will be further methodologically profiled, defined, organized and all the required experimental research will be conducted in order to confirm or dismiss the hypothesis. Main and suggested bibliography and all the activities in the selection process and finding other appropriate sources for successful completion of the thesis will be decided. Student will be coordinated with members of committee involved in different stages of the thesis preparation, and this will result in final Master's thesis which will be defended by the student.

Motivating Students to be involved in Scientific Research Activities

Students will be motivated to participate in scientific research conferences and symposiums and present their own research results. Students will be urged to apply to calls for national and international development and research projects in the areas of primary agricultural production and food technology.

About Student Mobility (Planned and Anticipated)

Based on previously signed cooperation Agreements with other Universities, student mobility during the second cycle study is planned. In accordance with the bilateral Agreements with the Faculty of Agriculture and Food Science at the University of Sarajevo, student mobility is planned during the first semester of the studies. When it is not possible to conduct experimental part of the Master's thesis in a laboratory at the Faculty of Biotechnical Sciences, the same can be conducted in laboratories of the Universities we have signed the Agreement with.

Measures for Plagiarism Prevention

The following measures will be taken to prevent plagiarism:

1. Teachers and associates will train students on proper methodologies of academic writing, as well as plagiarism detection techniques. Proven plagiarism in someone's work is not a good example for students;
2. Authenticity investigation of scientific work of those recommended for academic career in higher education;
3. Necessity of international reviews of researchers' work during the academic ranking process. Work published in serious international publications usually undergoes strict controls and authenticity investigations, which minimises the possibility of plagiarism;
4. Master's thesis and other scientific work should be public and available as electronic copies;
5. Use of software for search of plagiarism in scientific work of teachers, associates and students. There are several software available that detect significant similarities with online texts and academic data bases. Systematic review and analysis of published scientific research precede plagiarism detection computer programmes in plagiarism detection.

Professional Practices

The Faculty has signed the Agreement with several companies which will allow students to participate in the realisation of their professional practice (Meat Industry d.o.o. „MS Alem", Specialized agricultural cooperative AgroDar, d.o.o. EE-commerc Bihać, Veterinary and Agricultural Service USK).

Guidelines for Master's Thesis

Procedures and methods for the preparation of the Master's thesis are defined in the University of Bihać Statute and Second Cycle Study Rules.

Career Counselling

The Faculty of Biotechnical Sciences will organize final year employment and career fair, where students, representatives of local companies and public sector will have an opportunity to understand the market needs of the primary agricultural production and food processing areas, and will consider possibilities for further improvement and development.

Cost Projection for the Second Cycle Study Programme

Total revenue of University fees for minimum planned number of students (10) will be 24000.00 BAM. Student tuition fees will be 1200.00 BAM for the academic year, which is 600.00 BAM per semester, and 1200.00 BAM for the Master's thesis defence, totalling to 2400.00 BAM per student (University of Bihać Board of Directors Decision no. 01-489/2016, 20 January 2016). Cost of six teachers (external associates) for the core courses in the first semester, who will lecture in the second semester are added to expenses. Teachers are doing modular 5-hour classes for each course (as defined and explained in STEPS project and they are mandatory for the Faculty of Biotechnical Sciences at the University of Bihać and the Faculty of Agriculture and Food Sciences at the University of Sarajevo as project partner).

Total revenue for implementation of modular classes (lectures, travel and accommodation) for all 6 external associates (all full professors, gross cost per class 53.15 BAM for 30 classes will be 3094.50 BAM, or 1594.50 BAM for classes and 300.00 BAM for accommodation, and 1200.00 BAM for Sarajevo-Bihać-Sarajevo travel expenses. Realisation of the rest of the classes of each module is reserved for associate teachers who hold permanent contracts with the Faculty of Biotechnical Sciences and other organisational units at the University of Bihać (Faculty of Technical Sciences, Faculty of Law and Faculty of Economy). Moreover, part of the cost being financed from total revenue of student fees go to the Master's thesis defence Committee. Committee fees are determined as gross cost as follows: 550.00 BAM for thesis Supervisor, 300.00 BAM for Committee member (there are usually two Committee members, so the cost is multiplied by 2, and add up to 600.00 BAM) and 50.00 BAM for Note taker, amounting to a total cost of 1200.00 BAM (University of Bihać Board of Directors Decision no. 01-489/2016, January 20, 2016). However, if the Supervisor and the Committee members are under a contract with the University, they do not claim the right to benefits (based on current Standards and Norms for Conducting Higher Education Activities in USK (Official Gazette of USK no. 12/12) which brings down the total cost. Considering the study income (fees) and expenditures (teachers and Committees) which will be financed from student fees, it is evident that the implementation of the "Sustainable Food Production Systems" study programme is economically justifiable.

Contracts with Other Institutions

Scientific, expert, business and technical cooperation contracts between the University of Bihać and other Universities, private and public institutions can be found at the Faculty of Biotechnical Sciences Archives:

- Faculty of Agriculture and Food Sciences at the University of Sarajevo,
- Specialised agricultural cooperative AgroDar,
- d.o.o. EE-commerc Bihać.

15 COURSE SYLLABUS

OSPH 101 - FUNDAMENTALS OF SUSTAINABLE AGRI-FOOD SYSTEMS

<table>
<tr><td>Full Course Title:</td><td>FUNDAMENTALS OF SUSTAINABLE AGRI-FOOD SYSTEMS</td></tr>
<tr><td>Course Code:</td><td>OSPH 101</td></tr>
<tr><td>Study Year:</td><td>1st</td></tr>
<tr><td>Semester:</td><td>1st</td></tr>
<tr><td>ECTS credit value:</td><td>5</td></tr>
<tr><td>Student work-load:</td><td>For the whole semester:
<table>
<tr><th>Lectures</th><th>Tutorial/ Practical training</th><th>Seminar</th><th>Project</th><th>Written assignment</th><th>Oral presentation</th><th>Study visit</th><th>Individual learning</th><th>Examination</th><th>TOTAL</th></tr>
<tr><td>45</td><td>-</td><td>15</td><td>15</td><td>-</td><td>-</td><td>-</td><td>48</td><td>2</td><td>125</td></tr>
</table></td></tr>
<tr><td>Course leader:</td><td>Teachers and associates involved with the course subject</td></tr>
<tr><td>Host Study Programme/ Department:</td><td>Sustainable Food Production Systems Department
Sustainable Food Production Systems Programme</td></tr>
<tr><td>Course status:</td><td>Core</td></tr>
<tr><td>Pre-requisites:</td><td>-</td></tr>
<tr><td>Course aims:</td><td>Main aim of the course is to:
- Acquire knowledge and skills in the field of sustainable food production systems with the focus on efficient and rational use of resources in every aspect of production – from primary agricultural production, processing, to distribution and consumption;
- Understand current food production systems and challenges they face (sustainable production and consumption);
- Make predictions in order to maximise sustainability;
- Understand new approaches in food production and be able to critically analyse them (retrieve, apprehend, apply).</td></tr>
<tr><td>Learning outcomes:</td><td>Upon successful completion of the course, the student will be able to:
- Identify and analyse factors that affect the production and consumption of food locally and globally, today and in the future;
- Know and classify the prerequisites for food production and supply chain, within primary production processing and distribution;
- Compare aspects of conventional and organic farming and know the value of agricultural products within them;
- Evaluate and solve problems in primary agriculture production and food industry related to sustainable food production and supply chain, and describe and evaluate the environmental, social and economic aspects of sustainable food production;
- Recognize current inefficiently used resources in food production, discover the potential of new ones;
- Analyse and assess agri-food systems from a consumer perspective;
- Explain the overall purpose and principles of life cycle assessment (LCA in the context of agri-food systems, describe the content and explain the purpose of the analytical steps of LCA, and understand the results of the LCA analysis.</td></tr>
<tr><td>Indicative syllabus content:</td><td>Topics: Introduction and main features of sustainable agri-food systems (opportunities and challenges for the future sustainable production and consumption of food); Analysis of agri-food systems based on environmental, economic and social sustainability at different scales (local, regional, national and global); Overview of the entire sustainable agri-food production systems including primary production, processing, supply chain, distribution, consumption and waste, and relationships between them; Structure and function of agri-food systems and their correlation with factors of agriculture production (crop and livestock based agriculture); Aspects of primary agricultural production (conventional and organic agriculture), value of crops and livestock products from conventional and organic production; Impact of agri-food systems on biodiversity, climate change and exploitation of resources; Impact of agri food systems on animal welfare and health; Basic knowledge of food manufacturing technologies; Agri-food systems and food quality and safety; Recognition of consumer’s needs and evaluation of consumer trends; Life-cycle assessment (software-based exercises and projects) - collect, analyse and monitor the sustainability efficiency data of company’s products and services; Life-cycle assessment (software-based exercises and projects) - decision-making, change products’ life cycles for the better, and improve the company's positive impact.</td></tr>
</table>

Learning delivery:

- *Theory lectures, presentations and interactive discussions;*
- *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;*
- *Discussions (preparing the discussion materials along with the recommended readings and internet sources).*
- *Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher.*

Assessment methods and schedule:

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*15*	*Throughout the semester*
Partial Exam	*25*	*Week 8*
Project	*10*	*Weeks 9 and 10*
Final Exam	*40*	*Examination period*

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS. Seminar can be given back to the student for further adjustments.*

c) *Partial exam will be taken in written form in Week 8 of the semester. It will consist of student's theoretical knowledge gained through completed lectures. A minimum of 50% is required for a pass. The exam is awarded 0-25 ECTS.*

d) *Students will autonomously do a project and work on an individual task and demonstrate their ability to apply theoretic knowledge. The project will be carried out in the second half of the semester as a preparation for the final exam, and will be awarded 0-10 ECTS.*

e) *Final exam will be taken orally as summative assessment. Students' assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Grujić, R., Jašić, M. (2018). Održive Tehnologije u prehrambenoj industriji. Univerzitet u Novom sadu,Tehnološki fakultet Novi Sad[Sustainable Food Industry Technologies, Faculty of Technology at the University of Novi Sad], available at: http://www.tf.uns.ac.rs/tempusIV/documents/files/Book2_Prehrambena_industrija_short.pdf*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt[unofficial teaching materials, ppt]*

Recommended Readings:

Textbooks:

- *Mason, J. (2003). Sustainable agriculture (Vol. 10). Landlinks Press.*

Academic papers:

- *Charis M. Galanakis (2018). Sustainable Food Systems from Agriculture to Industry - Improving Production and Processing, Elsevier Sciences.*
- *Röös, E., Patel, M., Spångberg, J., Carlsson, G., Rydhmer, L. (2016). Limiting livestock production to pasture and by-products in a search for sustainable diets. Food Policy, 58, 1-13.*
- *Struik, P. C., Kuyper, T. W. (2017). Sustainable intensification in agriculture: the richer shade of green. A review. Agronomy for Sustainable Development, 37(5), 39.*

Reports, official documents and legal texts:

- *FAO (2017). The Future of Food and Agriculture - Trends and Challenges, Rome.*
- *FAO (2018). Sustainable Food Systems - Concept and Framework.*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). Introduction to LCA with SimaPro. PRé, available at: https://support.simapro.com/articles/Manual/Introduction-to-LCA*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). SimaPro Tutorial PRé, available at: https://www.pre-sustainability.com/download/SimaPro8Tutorial.pdf*

Important Notes:

Some background in agriculture engineering, food sciences and food chemistry are recommended.

Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH 102 - AGRICULTURAL AND FOOD INDUSTRY WASTE MANAGEMENT

Full Course Title:	*AGRICULTURAL AND FOOD INDUSTRY WASTE MANAGEMENT*
Course Code:	*OSPH 102*
Study Year:	*1st*
Semester:	*1st*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:* *Lectures* | *Tutorial / Practical training* | *Seminar* | *Project* | *Written assignment* | *Oral presentation* | *Study visit* | *Individual learning* | *Examination* | ***TOTAL*** 30 | 15 | 15 | - | 8 | 5 | 6 | 44 | 2 | **125**
Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Core*
Pre-requisites:	-
Course aims:	*The aim of the course is to provide students with advanced knowledge in the field of agri-food waste management, particularly on waste treatment ways. The focal point of the course is based on the importance and role of waste management in the environment within the frame of the sustainable concept aspects, description and classification of by-products in agriculture and food industry sectors and possibilities of their reduction and eventually possible re-use. The focal point of the course is to provide a strong background in:* - *Origin and type of agricultural and food industry waste, waste identification, classification and composition.* - *Treatment and utilisation of agricultural and food industry waste. Impact of waste disposal on environment.* - *Food Industry waste water treatments.* - *Utilisation of waste in food industries based on the circular economy.* - *Recommendations of alternative solutions based on the concept of sustainability in the field of agricultural and food industry waste management;* - *Legal and statutory requirements (in EU and Bosnia and Herzegovina) for waste treatment.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Identify various waste from agricultural and food industries and evaluate its possible impact on the environment;* - *Recommend various methods of waste treatment and disposal;* - *Identify various by products from agricultural and food industry and ways to utilize them;* - *Suggest different waste treatment and disposal methods;* - *Design and develop a functional waste treatment plan to suit the requirements;* - *Analyse and apply legal aspects related to agricultural and food waste disposal.*
Indicative syllabus content:	*Agricultural and Food Industry waste; Waste treatment in agricultural and food industry: integral waste management based on 3R principle (reducing, reusing, recycling); Agricultural waste and by-products related to specific Processing: Fruit and vegetables, grains, livestock and poultry; Farm visits; Food Industry waste: dairy industry, oil and oil seeds industry, fruits and vegetables processing industry, milling industry, fermentation (wine and beer), fish and meat industry; Use of water in food industry; Wastewater treatment (physical, chemical and biological); Sludge processing (conditioning and digestion) with overview of wastewater and sludge treatment from meat and fish processing industries, fruits and vegetables processing industry and fermentation industry (wine, beer and distillates); Food packaging waste: Handling and treatment; Farm wastes; Agricultural waste treatment: anaerobic and aerobic digestion of organic wastes, activated sludge process, biomass generation, farm waste; Utilisation of biomass: for production of animal feed, compost and bio-gas; Incineration of solid agricultural waste and its disposal; Factory visits; Introduction to legal and statutory requirements for food waste handling, treatment and disposal: European and national legislation.*
Learning delivery:	- *Theory lectures, presentations and interactive discussions;* - *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* - *Autonomous study on course topics (preparing written materials based on the recommended readings and internet sources that will be used for oral discussion)* - *Discussions (preparing the discussion materials along with the recommended readings and internet sources).* - *Visits to farms, factories, and agricultural and food industry waste management companies.*

Assessment methods and schedule:

Assessment method	%	Scheduled
Overall presence and involvement	10	At all times
Written assignment	15	Throughout the semester
Partial exam	15	Week 8
Seminar	10	Throughout the semester
Labs	10	Week 15
Final exam	40	Examination period

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Written assignments. Students will prepare three written assignments in scope and characteristics of agricultural/food waste and waste processing technologies. Each assignment is awarded a maximum of 5 credits.*

c) *Partial exam will be taken in Week 8 of the semester, with minimum of 9 points (60%) out of 15 required for a pass.*

d) *Seminars and defence are mandatory for courses where defined by the syllabus. Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10% of points. Seminar can be given back to the student for further adjustments. Critical analysis of the seminar takes place after the presentation. Course teacher can ask questions within unlimited discussion time, but with suggested 30 minutes per student/seminar.*

e) *Preliminary exams (exercises) will be done in written form and it will consist of teaching materials (laboratory exercises) conducted during practical (lab) part of the course. It will be awarded with 6 to 10 ECTS.*

f) *Final exam will be taken orally as summative Assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Hušidić R. (2017). Upravljanje otpadnim vodama iz industrije sokova:Tehnologija sokova i nektara (uredile Akagić A., Spaho N.). Poljoprivredno-prehrambeni fakultet, Univerziteta u Sarajevu. Sarajevo, BiH ISBN 978-9958-597-62-6.COBISS.BH-ID 24162310. (str.365- 385)*
- *Šubarić, D. I sur. (2017), Neke mogućnosti iskorištenja nusproizvoda prehrambene industrije, Mononografija Sveučilišta u Osijeku, ISBN: 978-953-7005-51-1 (Odabrana poglavlja).*
- *Šubarić, D. I sur. (2019), Neke mogućnosti iskorištenja nusproizvoda prehrambene industrije Knjiga 2, Mononografija Sveučilišta u Osijeku, ISBN: 978-953-7005-65-8 (Odabrana poglavlja).*

Reports, official documents and legal texts:

- *Zakon o zaštiti okoliša FBiH (Sl.novine FBiH br.33/03), available at:http://extwprlegs1.fao.org/docs/pdf/bih130990.pdf*

Audiovisual resources:

- *Ibrahmpašić, J. Makić, H. Šišić.I. (2020): Nastavni materijal (ppt)*

Recommended Readings:

Textbooks:

- *Arvanitoyannis, I. S. (2010). Waste management for the food industries. Academic Press. Available at: https://books.google.com/*

Academic papers:

- *Jurgilevich, A., Birge, T., Kentala-Lehtonen, J., Korhonen-Kurki, K., Pietikäinen, J., Saikku, L., & Schösler, H. (2016). Transition towards circular economy in the food system. Sustainability, 8(1), 69.*
- *Liu, S. X., & Liu, S. X. (2007). Food and agricultural wastewater utilization and treatment (Vol. 705). Ames, IA: Blackwell.*
- *Wang, L. K., Lo, H. H., Hung, Y. T., & Yapijakis, C. (2005). Waste treatment in the food processing industry. CRC Press.*

Reports, official documents and legal texts:

- *Zakon o upravljanju otpadom ("Službene novine Federacije BiH", broj 33/03)*
- *EU Waste Legislation https://ec.europa.eu/environment/waste/legislation/index.ht*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH 103 - ADVANCED FOOD SCIENCE AND TECHNOLOGY

<table>
<tr><td>Full Course Title:</td><td>ADVANCED FOOD SCIENCE AND TECHNOLOGY</td></tr>
<tr><td>Course Code:</td><td>OSPH 103</td></tr>
<tr><td>Study Year:</td><td>1st</td></tr>
<tr><td>Semester:</td><td>1st</td></tr>
<tr><td>ECTS credit value:</td><td>5</td></tr>
<tr><td>Student work-load:</td><td>For the whole semester:
<table>
<tr><th>Lectures</th><th>Tutorial / Practical training</th><th>Seminar</th><th>Project</th><th>Written assignment</th><th>Oral presentation</th><th>Study visit</th><th>Individual learning</th><th>Examination</th><th>TOTAL</th></tr>
<tr><td>30</td><td>15</td><td>15</td><td>15</td><td>-</td><td>-</td><td>8</td><td>40</td><td>2</td><td>125</td></tr>
</table></td></tr>
<tr><td>Course leader:</td><td>Teachers and associates involved with the course subject</td></tr>
<tr><td>Host Study Programme/ Department:</td><td>Sustainable Food Production Systems Department
Sustainable Food Production Systems Programme</td></tr>
<tr><td>Course status:</td><td>Core</td></tr>
<tr><td>Pre-requisites:</td><td>-</td></tr>
<tr><td>Course aims:</td><td>Aim of the course is to familiarise students with advanced food science and technology with particular aspects of their contribution to sustainable food production development. It will cover the basic inter-relations of food sciences with food chemistry, microbiology and food processing. The course will look at various advanced food packaging, non-thermal process, nanotechnology, food encapsulation, novel and genetically modified food and their contribution to sustainable development.</td></tr>
<tr><td>Learning outcomes:</td><td>Upon successful completion of the course, the student will be able to:
- Know and describe the differences between advanced and conventional food technology;
- Identify the impacts of advanced food sciences and technology on sustainable development of food industry;
- Explain relation between health, nutrition and nutrients,
- Recognise and explain advanced approaches to food technology and food packaging,
- Apply lab methods for food quality and hygiene control;
- Apply advanced technology in food processing.</td></tr>
<tr><td>Indicative syllabus content:</td><td>Lectures: Introduction to Advanced Food Science and Technology, application in the agricultural and food sectors with the focus on sustainable development; Food sciences advancement and its inter-relationship with food chemistry, food microbiology and food processing; Chemistry of main food components; Reason for food analysis, food properties and analytical techniques; Additives and preservations in food industry; Nutrition, nutrients and functional food; Advances in food processing technology; Advances in food preservation; Advances in food packaging technology; Sensory attributes and the way they are perceived: aroma, colour, flavour, texture; the human senses; Circular economy in food production and processing.
Lab:
Lab1: Qualitative and quantitative physical analysis of food products.
Lab2: Qualitative and quantitative chemical analysis of food products.
Lab 3: Advanced technology of food processing: spray dray, lyophilisation.
Lab 4: Sensory evaluation of food products,
Study visits: Food Industry.</td></tr>
<tr><td>Learning delivery:</td><td>- Theory lectures and presentations;
- Practical labs;
- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;
- Discussions (preparing the discussion materials along with the recommended readings and internet sources);
- Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher;
- Study visits;
- Case study.</td></tr>
</table>

Assessment methods and schedule:

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*10*	*Throughout the semester*
Seminar presentation	*5*	*Throughout the semester*
Partial Exam	*15*	*Week 12*
Project	*10*	*Throughout the semester*
Preliminary exams (exercises)	*10*	*Examination period*
Final Exam	*40*	*Examination period*

Assessment Rationale:

a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.

b) Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS.

c) Seminar presentation and defence will be awarded with a maximum of 5 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members.

d) Partial exam will be taken in written form and consist of student's theoretical knowledge gained through completed lectures by Week 7, and it will be awarded with a maximum of 15 ECTS.

e) Project topics are assigned at the beginning of the semester, and will be handed in a form of research results of the given topic. Project is awarded with a maximum of 10 ECTS.

f) Preliminary exam (exercises) will be done in written form and it will consist of teaching materials (laboratory exercises) conducted during practical (lab) part of the course. It will be awarded with 0 to 10 ECTS.

g) Final exam will be taken orally as summative Assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.

Mandatory Readings:

Textbooks:

- *Mujić, I., Alibabić, V. (2005). Tehnološki procesi konzerviranja hrane. Univerzitetski udžbenik, Univerzitet u Bihaću, Biotehnički fakultet, Bihać. (Odabrana poglavlja).*
- *Omanović-Mikličanin, E., Badnjević, A. (2017). Uvod u nanotehnologiju. Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet. (Odabrana poglavlja).*
- *Tahmaz, J. (2019). Enkapsulacijske tehnike u prehrambenom inžinjerstvu. Dobra knjiga Sarajevo. (Odabrana poglavlja)*

Recommended Readings:

Textbooks:

- *Fellows, P. J. (2009). Food processing technology: principles and practice. Elsevier, available at:https://books.google.com/*
- *Hui, Y. H., Cross, N., Kristinsson, H. G., Lim, M. H., Nip, W. K., Siow, L. F., & Stanfield, P. S. (2006). Biochemistry of seafood processing. Food biochemistry and food processing, 1, 12-15.*
- *Jašić, M., Begić, L. (2008).Biohemija hrane I dio Uvod u biohemijske sastojke hrane. Grafički inženjering Tuzla.*

Academic papers:

- *Fito, P., LeMaguer, M., Betoret, N., & Fito, P. J. (2007). Advanced food process engineering to model real foods and processes: The "SAFES" methodology. Journal of Food Engineering, 83(2), 173-185.*
- *Maksimović, M., Omanović-Mikličanin, E., & Badnjević, A. (2019). Nanofood and Internet of Nano Things. Springer International Publishing.*
- *Mikkonen, K. S., Parikka, K., Ghafar, A., & Tenkanen, M. (2013). Prospects of polysaccharide aerogels as modern advanced food materials. Trends in food science & technology, 34(2), 124-136.*
- *Pathakoti, K., Manubolu, M., & Hwang, H. M. (2017). Nanostructures: Current uses and future applications in food science. journal of food and drug analysis, 25(2), 245-253.He, X., & Hwang, H. M. (2016). Nanotechnology in food science: Functionality, applicability, and safety Assessment. journal of food and drug analysis, 24(4), 671-681.*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH 104 - GOVERNANCE, POLICY AND LEGISLATION IN THE AGRI-FOOD SECTOR

Full Course Title:	*GOVERNANCE, POLICY AND LEGISLATION IN THE AGRI-FOOD SECTOR*
Course Code:	*OSPH 104*
Study Year:	*1st*
Semester:	*1st*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
15	-	15	15	15	5	-	58	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Core*
Pre-requisites:	*-*
Course aims:	*The aim of the course is to provide students with knowledge and skills in the field of food legislation in the World Trade Organization (WTO), the European Union (EU), and Bosnia and Herzegovina (BiH) at the deeper theoretical level, the level of its factual implementation through real life and case law, through analysis of these facts and findings. In addition to the goals and principles of modern food law, students, through independent work and analysis, under the supervision and in consultation with the teacher, will gain knowledge on the basics of international food regulation, history, development, institutional environment and functioning of food regulation in the WTO, the EU as well as the most important elements of legislation on food in BiH. The overall aim of the course is to train students to access relevant regulations and policy documents related to policy changes, while ensuring their understanding and critical analysis (decisions, sources of law, findings, understandings, and practical applications in real life).*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* *Describe, evaluate and be informatively critical of the goals, principles and key elements of modern food regulation, its institutional environment and case law;* - *Explicitly explain the roles and domains of work and the importance of leading international institutions with impact on food policy and regulation;* - *Elaborate and compare the goals, principles and structures of the key acts of the WTO, EU and Bosnia and Herzegovina food regulations.* - *Classify and analyse the situation-relevant food regulation acts, litigation and decision-making within the WTO, the European Union and Bosnia and Herzegovina.* - *Critically assess the food quality regulations and participate in the preparation of laws and regulations, and litigation in the field of food production and trade.*
Indicative syllabus content:	*Introduction - the course positioning; The history of food regulation; The goals, principles and elemental institutional environment of modern food regulation; International institutional environment of food regulation; The role of the WTO, EU and its Institutions; Legislative acts of the WTO and the European Union; Characteristics of the current EU food policy and regulation; The Agreement of Sanitary and Phytosanitary measures, non-tariff barriers to trade; Regulation (EC) 178/2002; The EU food hygiene legislation; EU food labelling and consumer information regulation; Official controls on import, export and inland transport of food; The EU sectorial and thematic food regulations; Food laws in Bosnia and Herzegovina; Food by-laws in Bosnia and Herzegovina; Institutional environment of food regulation in Bosnia and Herzegovina; Regulatory impacts on sustainability of food production systems.*
Learning delivery:	- *Theory lectures discussions and presentations;* - *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* - *Project – autonomous research and presentation of students' group assignments, with active participation of all students, and enhancements, suggestions and corrections from the teacher;* - *Discussion on the topic of choice: through discussion, students will be actively involved in understanding of certain problems that may arise during the course, such as world/national problems in the food legislation field;* - *Autonomous study on course topics (preparing written materials based on the recommended readings and internet sources that will be used for oral discussion)*

Assessment methods and schedule:

Assessment method	%	Scheduled
Overall presence and involvement	10	At all times
Seminar	15	Throughout the semester
Written assignment on the course topics	10	At all times
Partial exam	10	Week 8
Project	15	Weeks 9 and 10
Final exam	40	Examination period

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS. Seminar can be given back to the student for further adjustments.*

c) *Written assignments. Students will prepare 10 topics and deliver written discussions to the course teacher, a day before the date of the topic presentation at the latest. One credit is awarded to innovation and provocation of the discussion materials. It will be awarded with a maximum of 10 ECTS.*

d) *Partial exam will be taken in written form in the Week 8 of the semester and will consist of materials covered during lectures in the Weeks 2-8. The exam will cover questions on the theoretical knowledge. A minimum of 50% is required for a pass. The exam is awarded 0-10 ECTS.*

e) *Through an expert project, student will autonomously work on an individual task and demonstrate their ability to apply theoretic knowledge. The project will be carried out in the second half of the semester as a preparation for the final exam, and will be awarded 0-15 ECTS.*

f) *Final exam will be taken orally as summative Assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Blesić, M. (2009). Zakonodavstvo o hrani. Poljoprivredno-prehrambeni fakultet Univerziteta u Sarajevu i WUS Austria.*
- *Grujić, S., M. Blesić. (2007). Propisi o hrani. Tehnološki fakultet Univerziteta u Banjoj Luci – Konzorcijum TEMPUS UM_JEP 18084-2003 projekta, Banja Luka. (Odabrana poglavlja).*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt[unofficial teaching materials, ppt]*

Recommended Readings:

Reports, official documents and legal texts:

- *Codex Alimentarius Commission, available at: https:www.codexalimentarius.org;*
- *EU and EC Regulations: 178/2002; 852/2004; 853/2004; 854/2004; 2017/625; 1169/2011;*
- *Food legislation and by-laws in Bosnia and Herzegovina (web portal of the Food Safety Agency of Bosnia and Herzegovina, available at: http://www.fsa.gov.ba).*
- *List of Codex food standards, available at: https://www.fao.org/fao-who-codexalimentarius/standards/list-of-standards/en/;*
- *The EU legislative acts on food and agriculture, available at: (http://eur-lex.europa.eu);*
- *Trade and Food Standards, the FAO and the WTO, 2017; available at: http://www.fao.org/3/a-i7407e.pdf*
- *WTO, 2010. The WTO Agreement Series – Sanitary and Phytosanitary Measures, available at: https://www.wto.org/english/res_e/booksp_e/agrmntseries4_sps_e.pdf*
- *Zakon o hrani Bosne i Hercegovine [Food Law of Bosnia and Herzegovina] (Službeni glasnik BiH, 50/04).*

Academic papers:

- *Trnavci, G. (2004). The Virtues and Vices of the World Trade Organization and Proposals for Its Reform. Emory Int'l L. Rev., 18, 421.*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH 105 - FOOD ETHICS

Full Course Title:	*FOOD ETHICS*
Course Code:	*OSPH 105*
Study Year:	*1st*
Semester:	*1st*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	-	8	-	55	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Core*
Pre-requisites:	*-*
Course aims:	*The main aim of the course is to provide the insights into food ethics as a main principle of sustainable agriculture and food consumption. The course analyses the decisions individuals make about food they eat and moral, ethical, gender, religious, industrial, ecological impact on food choices and food values.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Project new public responsibilities in the domain of agriculture;* - *Define ethical principles in food production and food consumption,* - *Know and explain the connection between food ethics and the politics of nutrition;* - *Know moral, political, gender, religious issues and interpret arguments relevant to food choices and policies.*
Indicative syllabus content:	*Introduction: Food ethics in a globalized world; sustainable food systems; The ethical matrix as a tool in political interventions: the obesity crisis; Balance between food production, nutrition and health; Food safety: the ethical dimensions; Biotechnology, battery farming and animal dignity; Hunger, poverty, and climate change; Food versus fuel: governance potential for water resources; Ethics and genetically modified foods; Ethical analysis of food biotechnologies: an evaluative framework; Consumer sovereignty as ethical practice in food marketing; Consumer ethics - vegetarianism and veganism; Student seminars presentation and evaluation.*
Learning delivery:	- *Theory lectures through discussions and presentations;* - *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* - *Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher;* - *Discussion on the topic of choice: through discussion, students will be actively involved in understanding of certain problems that that may arise during the course, such as world/national problems in the food ethics field;* - *Case study.*
Assessment methods and schedule:	

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*10*	*Throughout the semester*
Seminar presentation	*5*	*Throughout the semester*
Partial Exam 1	*15*	*Week 8*
Project	*5*	*Weeks 9 and 10*
Partial exam 2	*15*	*Week 15*
Final exam	*40*	*Examination period*

Assessment Rationale:	*a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.* *b) Seminars and defence are mandatory for courses where defined by the syllabus. Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS. Seminar can be given back to the student for further adjustments.* *c) Seminar presentation and defence will be awarded with a maximum of 5 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate. Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.* *d) Through an expert project, student will autonomously work on an individual task and demonstrate their ability to apply theoretic knowledge. The project will be carried out in the second half of the semester as a preparation for the final exam, and will be awarded 0-5 ECTS.* *e) Partial exams 1 and 2 will be taken in written form and will consist of materials covered through lectures. Each exam is awarded 0-15 ECTS, depending on the knowledge and understanding of the theoretical and practical aspects of the course.* *f) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*
Mandatory Readings:	*Textbooks:* • *Goldacre, B. (2010). Loša znanost, Naklada Oceanmore, Zagreb, Hrvatska. (Odabrana poglavlja).* • *Kulier, I. (2013). Što i kako jedemo. Naklada Uliks. (Odabrana poglavlja).* • *Pollan, M. (2013). U obranu hrane, Manifest jelaca. Algoritam, Zagreb, Hrvatska. (Oabrana poglavlja).* *Audiovizualni resursi:* • *Neautorizovani nastavni materijal, ppt.[unofficial teaching materials, ppt]*
Recommended Readings:	*Textbooks:* • *Garton, L., & Harland, J. (2015). The plant-based plan: reference guide for plant-based nutrition. Lannoo Meulenhoff-Belgium.* • *Gottwald, F. T., Ingensiep, H. W., & Meinhardt, M. (Eds.). (2010). Food ethics. Springer Science & Business Media. Academic papers, available at: https://books.google.com/* • *Mepham, B. (2000). Food ethics. Taylor-Francis e-Library.* • *Mepham, T. B. (2005). Food ethics. Ethics, law and society, ed. VJ Gunning, and S. Holm, 141-152, available at: https://books.google.com/* • *Pollan, M. (2006). TheOmnivores' dilemma. ThePenguin Press, U.S.* *Academic papers:* • *Binkley, J. K., Eales, J., and Jekanowski, M. (2000). The relation between dietary change and rising US obesity. International journal of obesity, 24 (8), 1032-1039.* • *Carr, S. (2002). Ethical and value-based aspects of the European Commission's precautionary principle. Journal of Agricultural and Environmental Ethics, 15 (1), 31-38.* • *Early, R. (2002). Food ethics: a decision making tool for the food industry?. International journal of food science & technology, 37(4), 339-349.* • *Korthals, M. (2015). Ethics of food production and consumption. The Oxford Handbook of Food, Politics, and Society, 1-15.* • *Midgley, M. (2000). Biotechnology and monstrosity: why we should pay attention to the "yuk factor". Hastings Center Report, 30 (5), 7-15.* *Reports, official documents and legal texts:* • *Building trust and ethics in organic farming, available at: https://www.researchgate.net/publication/233425774_Improving_the_organic_certification_system_-Recommendations_from_the_CERTCOST_project*
Important Notes:	-
Quality Assurance:	*In accordance with the Second Cycle Study Rules of the University of Bihać.*

OSPH 106 - RESEARCH METHODOLOGIES AND TOOLS

Full Course Title:	*RESEARCH METHODOLOGIES AND TOOLS*
Course Code:	*OSPH 106*
Study Year:	*1st*
Semester:	*1st*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	10	-	-	53	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Core*
Pre-requisites:	*-*
Course aims:	*This course aims to guide Master's students towards achieving competence and proficiency in theoretical and practical research. This fundamental aim can be realised through helping these students to develop the subject of their research, encourage the formation of higher level of trained intellectual ability, critical analysis, rigour and independence of thought, foster individual judgement and skill in the application of research theory and methods, and develop skills required for writing research proposals, reports, and dissertation.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* *- Define research approaches;* *- Explain conditions necessary for quality scientific work;* *- Know and apply methods and tools in order to complete scientific work (pick subject, methods and techniques of data collection, collect and research literature, data analysis, write the scientific work);* *- Explain and apply parametric and nonparametric statistics;* *- Apply gained theoretical knowledge on how to write a scientific work to seminars (student project) and thesis , and prepare seminar and thesis;* *- Plan an experiment;* *- Statistically analyse data.*
Indicative syllabus content:	*Introduction: Research methodology - definitions and significance; Research strategies, research problem, literature review; Types of research: exploratory, conclusive modelling, algorithmic, causal, theoretical, empirical, cross-sectional and time series research; Research process: steps, research problems, objectives, characteristics, hypothesis and research in an evolutionary perspective; Research design and data collection: Research design, definitions, types, descriptive and experimental; Validity of findings, internal and external validity, variables of research, types of data: primary and secondary data; Methods of data collection for scientific and business research, experiments, construction and validation of the questionnaire; Measurement and scaling: Types of scale: Thurstone's case V scale model, Osgood's Semantic Differential scale, Likert scale, Q-sort scale; Sampling technique: Sampling methods, probability sampling methods, simple random sampling with replacement and without replacement, stratified sampling, cluster sampling, probability sampling method, convenience sampling, judgment sampling, two-sample tests; Mathematical tools for analysis/research measurement: Hypothesis testing -Testing of hypothesis concerning variance one tailed Chi-square test; Introduction to Discriminant, factor analysis, cluster analysis, multi-dimensional scaling, conjoint analysis, multiple regression and correlation, application of statistical software for data analysis; Ethic in research: Report writing- types of report, writing text, need of summary, importance of language in the preparation of research report, oral presentation; Recording the findings of research, publications, contents to meet the journal standard, impact factor citation and citation index; Policy and academic honesty and integrity, academic cheating and plagiarism; Opportunities to carry out research projects with funding/assistance from government agencies/international agencies; As part of their seminars, students will choose a subject with their teacher that deals with sustainable animal production and present it during the semester; Students will do a group project in order to master application writing techniques, budgeting, evaluation and report.*
Learning delivery:	*- Theory lectures through discussions and presentations;* *- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* *- Project – autonomous research and presentation of students' group assignments, with active participation of all students, and enhancements, suggestions and corrections from the teacher* *- Autonomous study on course topics (preparing written materials based on the recommendedreadings and internet sources that will be used for oral discussion)*

Assessment methods and schedule:

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*10*	*Throughout the semester*
Seminar presentation	*5*	*Throughout the semester*
Written assignment	*10*	*Throughout the semester*
Partial exam	*15*	*Week 8*
Project	*10*	*Weeks 9 and 10*
Final exam	*40*	*Examination period*

Assessment Rationale:

a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.

b) Seminar. Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS. Seminar can be given back to the student for further adjustments.

c) Seminar presentation and defence will be awarded 0-5 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate and grade them in accordance to article b). Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.

d) Students' written assignments. Students will hand in finished calculus work for one of the topics they agree with the course teacher seven days after the agreement. Student will autonomously work on an individual task and demonstrate their ability to apply theoretic knowledge. It will be carried out throughout the semester as a preparation for the final exam, and will be awarded with a maximum of 10 ECTS.

e) Partial exam is done in written form in the Week 8 of the semester. This way, a continuous students' focus on teaching materials is achieved, and irregular learning habit is avoided. It is awarded with a maximum of 15%.

f) Through an expert project, student will autonomously work on an individual task and demonstrate their ability to apply theoretic knowledge. The project will be carried out in the second half of the semester as a preparation for the final exam, and will be awarded 0-10 ECTS.

g) Final exam will be taken in a written form as summative assessment. Final exam will give us insight into students' theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject, and whether teaching objectives are met. Course teacher which will assess students based on their knowledge of the theoretical and practical aspects of the course, and it will be awarded 0-40 ECTS.

Mandatory Readings:

Textbooks:

- *Dizdar, S., Turčilo, L., Rašidović, B.E., Hajdarpašić, L. (2012): Informacijska pismenost – smjernice za razvoj inovativnih mrežnih modula. Štamparija Fojnica d.o.o. Fojnica. (Poglavlja 3, 4, 5, 7 i 8)*
- *Petz, B. (2002): Osnovne statističke metode za nematematičare. Naklada Slap, Zagreb. (Poglavlja 5, 7, 8, 9, 12, 14 i 20)*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt[unofficial teaching materials, ppt]*

Recommended Readings:

Textbooks:

- *Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.*
- *Dytham, C. (2003): Choosing and Using Statistics: A Biologist's guide. Blackwell Science, Blackwell Publishing, Oxford.Cohen, L., Manion, L., & Morrison, K. (2002). Research methods. 5 th Education.*
- *Kumar, R. (2019). Research methodology: A step-by-step guide for beginners. Sage Publications Limited, available at: https://books.google.com/*
- *Teetor, P. (2011): R Cookbook. O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.Denscombe, M. (2010). The good research guide: For small-scale social research projects (Open UP Study Skills). McGraw-Hill.*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH I-201 - HARVESTING AND POST-HARVESTING TECHNOLOGIES FOR AGRICULTURAL PRODUCTS

Full Course Title:	*HARVESTING AND POST-HARVESTING TECHNOLOGIES FOR AGRICULTURAL PRODUCTS*
Course Code:	*OSPH I-201*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:* *Lectures* 30 · *Tutorial / Practical training* 15 · *Seminar* 15 · *Project* - · *Written assignment* - · *Oral presentation* - · *Study visit* 5 · *Individual learning* 58 · *Examination* 2 · ***TOTAL*** **125**
Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	*-*
Course aims:	*The main aim of the course is to provide basic knowledge in physiological-biochemical processes, quality, and methods of maturity determination, harvesting, packing, storage and transportation of important fruits, vegetables and field crops.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Describe and explain basic harvesting and transportation techniques of fresh crops with an emphasis on maintaining product quality and safety;* - *Assess yield maturity stage and manage quality preservation techniques during harvest;* - *Manage the process of harvest, packaging, storage and transport of fruits, vegetables and other field crops;* - *Reduce risk and analyse post-harvest losses;* - *Define and explain the influence of growing factors on the quality of the fruit, vegetables and grains after harvest;* - *Know the process of storage of fruit, vegetable and field crops* - *Plan, choose and apply the best methods of harvest.*
Indicative syllabus content:	***Theory Lectures:*** *Introduction; Cultivation factors influencing quality of fruits and other products before and after harvesting; Types and causes of post-harvest losses - Prevention and control of post-harvest losses; Current Production, consumption and post-harvest loss situation factors in the world and our country; Harvesting that affects the quality and preservation of products; Harvesting and handling of fruits in the field: determining the optimal harvesting moment, ways of harvesting fruits, transportation, classification of fruits; Fruit storage: fruit maturity, ethylene, the most important physiological and biochemical processes in fruit during ripening and after harvest, factors affecting fruit storage length; Technology and equipment for fruit storage; Packaging and physiological and microbiological diseases occurring on stored fruits; Field crop products and types for storage; The principles of storing field crops; Organisation of work in storage, preparation of storage; Physical and physiological properties of seed; The role of moisture and temperature in the storage process and their effect on the quality of stored mass; Seed processing (cleaning, classification of seed, protection, packaging), drying and types of grain dryers, hygiene in warehouses, pests in warehouses, protection measures - regulations regarding allowed fumigation means for storage with grain products for human consumption; Importance of preserving and harvesting vegetables; Storage methods and conditions.* ***Practical – Laboratory and calculation exercises****: Practical exercises related to the harvesting and preservation of fruits: determining the optimum moment of ripeness of the fruits by purpose, classification of fruits for table consumption, the most significant diseases occurring in fruit warehouses; Cultivation before storage and changes that occur during the storage of vegetables; Factors that influence the quality and length of vegetable storage; Ecological factors (external) and biological (internal); Farm visits.*
Learning delivery:	- *Theory lectures through interactive presentations and discussions;;* - *Practical work through laboratory and calculation exercises;* - *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;*

	- *Discussion on the topic of choice: through discussion, students will be actively involved in understanding of certain problems that that may arise during the course, such as world/national problems in the field of study;* - *Study visits.*
Assessment methods and schedule:	<table><tr><td>*Assessment method*</td><td>*%*</td><td>*Scheduled*</td></tr><tr><td>*Overall presence and involvement*</td><td>*10*</td><td>*At all times*</td></tr><tr><td>*Seminar*</td><td>*10*</td><td>*Throughout the semester*</td></tr><tr><td>*Partial exam*</td><td>*20*</td><td>*Week 8*</td></tr><tr><td>*Preliminary exams (exercises)*</td><td>*15*</td><td>*Week 15*</td></tr><tr><td>*Final exam*</td><td>*40*</td><td>*Examination period*</td></tr></table>
Assessment Rationale:	*a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.* *b) Seminars and defence are mandatory for courses where defined by the syllabus. Course teacher will define topics of a seminar along with a student involved. It will be written in accordance with the methodology research and tools. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS credits. Seminar can be given back to the student for further adjustments. Critical analysis of the seminar takes place after the presentation. Length of discussion is unlimited, but with suggested 30 minutes per student/seminar.* *c) Partial exam will be taken in written form in Week 8 of the semester. It will consist of student's theoretical knowledge gained through completed lectures during Weeks 2-8. The exam is awarded 0-20 ECTS.* *d) Preliminary exams (exercises) will be done in written form and it will consist of teaching materials (laboratory and calculation exercises) conducted during practical (lab) part of the course. It will be awarded with 0 to 15 ECTS.* *e) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*
Mandatory Readings:	*Textbooks:* • *Jašić, M., Šubarić, D., Odobašić, A., Hadžimusić , V., Toroman, A., Alihodžić, D. (2010). Čuvanje voća i povrća u hladnjačama s kontroliranom atmosferom. PrintCom d.o.o., Grafički inžinjering, Tuzla.* • *Ritz, J. (1997). Uskladištavanje ratarskih proizvoda. PBI d.o.o., Zagreb. (Knjiga I – poglavlje II, Knjiga II – poglavlje I, II, III i V)* *Audiovisual resources:* • *Neautorizovani nastavni materijal, ppt /unofficial teaching materials/*
Recommended Readings:	*Textbooks:* • *Ilić, Z.,Elazar, F., Dardić, M. (2009). Berba, sortiranje, pakovanje i čuvanje povrća. Tampograf, Novi Sad.* • *P.H. Pandey (2015). Principles & Practices Of Post Harvest Technology. Kalyani Publishers / Lyall Bk Depot.* • *Ramaswamy, H. S. (2014). Post-harvest technologies of fruits & vegetables. DEStech Publications, Inc., available at: https://books.google.com/* • *Ritz, J. (1997). Uskladištavanje ratarskih proizvoda. PBI doo, Zagreb.* • *Thompson, A. K. (2008). Fruit and vegetables: harvesting, handling and storage. John Wiley & Sons, available at: https://books.google.com/* *Academic papers:* • *Pareek, S. (Ed.). (2004). Fresh-cut fruits and vegetables: technology, physiology, and safety. Science, 71, S615-S620.* • *Verma, M., Plaisier, C., van Wagenberg, C., & Achterbosch, T. (2019). A systems approach to food loss and solutions: understanding practices, causes, and indicators. Sustainability, 11(3), 579, available at: https://www.mdpi.com/2071-1050/11/3/579* *Reports, official documents and legal texts:* • *Empowering agriculture: Energy options for horticulture, USAID, US Agency for international development, available at: http://ucce.ucdavis.edu/files/datastore/234-1386.pdf* • *Food and Agriculture Organization of the United Nations. (2013). Food Wastage Footprint: Impacts on Natural Resources: Summary Report. FAO.* • *International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) and Food and Agriculture Organization of the United Nations. (2016). Zero Waste in the Mediterranean, Natural Resources, Food and Knowledge, Paris: Presses de Sciences Po, available at: http://www.fao.org/3/a-bq976e.pdf*
Important Notes:	-
Quality Assurance:	*In accordance with the Second Cycle Study Rules of the University of Bihać.*

OSPH I-202 - ANIMAL FOOD TECHNOLOGY SCIENCE

Full Course Title:	*ANIMAL FOOD TECHNOLOGY SCIENCE*
Course Code:	*OSPH I-202*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	15	15	15	-	-	8	40	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	
Course aims:	*Main aim of the course is to provide students with basic knowledge of animal food production systems, and industrial processes that turn raw milk, meat, fish and eggs into final products. Course content will deal with different production factors influencing processing and utilisation of nutritive (quality) raw animal source foods (milk, meat, eggs and fish). The course will also point out the importance of biochemical, microbiological, and hygienic factors influencing quality of milk, meat and fish, and explain the importance of keeping track of the quality of animal source foods and their final products. Students will know and understand importance of biochemical and bacterial changes that occur during handling, storage, and processing of animal source foods. Students will also get to know food legislation and regulations.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Recognize and understand the importance of livestock production (meat and milk) and the egg and fish production, and describe animal food production systems (meat, milk, egg, fish);* - *Understand and indicate the importance of use of animal source foods (meat, milk, egg, fish);* - *Analyse and explain the importance of biochemical, microbiological and hygienic factors for the utilisation and quality of food (milk, meat, fish and eggs) and describe how different production factors influence processing of milk, meat, eggs and fish;* - *Identify and describe physical and biochemical changes occurring during the process of handling, storage and processing, and describe and analyse methods and processes of storing and hygienic aspects of animal source foods;* - *Identify and analyse how different factors can affect the quality of meat, milk, fish and eggs, and describe interaction of such factors;* - *Manage the industrial processes of transformation of raw milk, meat, eggs and fish into ready-to-eat products;* - *Analyse and categorise legislation and regulations of animal source food.*
Indicative syllabus content:	***Lectures:*** *Introduction to Animal Food Technology Science; Current situation in livestock production (meat, milk, eggs and fish) and animal industry at the local, national and global level; Animal food production chains - milk, egg and cattle meat, poultry and fish; Chemical and structural composition of animal food raw materials (meat, milk, fish and egg) and their relationship with food quality; Influences of external factors in production and handling of the chemical composition and structure of animal food raw materials (milk, meat, fish and egg); Microbiological and biochemical changes in raw materials that occur during the process of handling, storage and processing; The most important food-processes for meat, milk, fish products and eggs. Relationships between the composition of the raw material and the eating quality of food; Main processes and storage methods as well as hygienic aspects of animal foods; Preservation of foods; Refrigeration and freezing, thermal processing, dehydration, irradiation, meat curing; Factors affecting meat, milk and egg quality (diet, genotype, gender, environmental factors), and the interactions between them; Quality parameters of food - meat processing and evaluation of quality; Quality parameters of food – Processing and evaluation of poultry quality; Quality parameters of food – Processing and evaluation of egg quality; Quality parameters of food – Processing and evaluation of milk quality; Animal by-products - importance, classification and uses; Legislation, foodstuff labelling, and regulations.* ***Lab Practice****: Physical and chemical methods of animal source foods quality analysis (meat, milk, fish and eggs); Evaluation of food freshness and hygiene of animal source foods (meat, milk, fish, eggs)****.***

Learning delivery:

- *Theory lectures through PowerPoint presentation andinteractive discussions;*
- *Practical work through laboratory exercises;*
- *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;*
- *Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher.*
- *Study visits to farms and factories.*

Assessment methods and schedule:

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*15*	*Throughout the semester*
Partial exam	*15*	*Week 8*
Project	*10*	*Weeks 9 and 10*
Preliminary exam (exercises)	*10*	*Week 15*
Final exam	*40*	*Examination period*

Assessment Rationale:

a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.

b) Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS credits. Seminar can be given back to the student for further adjustments.

c) Partial exam will be taken in written form in Week 8 of the semester. It will consist teaching materials presented during Weeks 1-8. The exam consists of questions that seeks theoretical answers, and it is awarded 0-15 ECTS.

d) Project. In the second half of the semester, students will receive precise instructions on how to write a project on certain topic. Continuous work throughout the semester is mandatory, sending course teacher draft versions of the work in certain timeframe, and responding to corrected versions. Team work is mandatory. It will be carried out in the second half of the semester as an introduction and preparation for the final exam, and will be awarded 0-10 ECTS

e) Preliminary exam (exercises) will be done in written form and it will consist of teaching materials (laboratory exercises) conducted during practical (lab) part of the course. It will be awarded with 0 to 10 ECTS.

f) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.

Mandatory Readings:

Textbooks:

- *Smajić, A. (2004). Prerada mesa. Sarajevo. Poljoprivredno-prehrambeni fakultet Univerziteta u Sarajevu. (Poglavlje 1, 2, 6, 10, 23, 25).*
- *Tratnik, Lj., Božanić, R. (2012). Mlijeko - tehnologija, biokemija i mikrobiologija. Hrvatska mljekarska udruga, Zagreb. (Poglavlje 1, 2, 3, 4 i 5)*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt /*

Recommended Readings:

Textbooks:

- *Nollet, L. M., and Toldrá, F. (2006). Advanced technologies for meat processing. CRC Press.*
- *Nollet, L. M., and Toldrá, F. (Eds.). (2016). Safety analysis of foods of animal origin. CRC Press.*
- *Toldrá, F. Mead, G. (Ed.). (2004). Poultry meat processing and quality. Elsevier. (Ed.). (2010). Handbook of meat processing. John Wiley & Sons.*
- *Warris, P. D. (2010). Meat science 2nd edition: An introductory text. Wallingford, UK: CABI Publishing.*

Academic papers:

- *Kandeepan, G., Mendiratta, S. K., Shukla, V., and Vishnuraj, M. R. (2013). Processing characteristics of buffalo meat-a review. Journal of Meat Science and Technology, 1(1), 01-11.*
- *Liu, Y. C., Chen, T. H., Wu, Y. C., Lee, Y. C., and Tan, F. J. (2016). Effects of egg washing and storage temperature on the quality of eggshell cuticle and eggs. Food chemistry, 211, 687-693.*
- *Wu, L., Pu, H., and Sun, D. W. (2019). Novel techniques for evaluating freshness quality attributes of fish: A review of recent developments. Trends in food science & technology, 83, 259-273.*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH I-203 - SUSTAINABLE ANIMAL PRODUCTION

Full Course Title:	*SUSTAINABLE ANIMAL PRODUCTION*
Course Code:	*OSPH I-203*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	-	-	8	55	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	*-*
Course aims:	*Basic aim of the course is to provide students with basic knowledge of the sustainable animal production, basic farming techniques and farm management in sustainable animal production. Besides basic aims and principles, we try to provide understanding of the current domestic animals production systems and challenges they face (sustainable production) and forecast possible improvements in order to make domestic animal farming and livestock farms more sustainable. The course aims for deeper understanding of main global questions of animal food production and main consumer tendency towards animal products, as well as economic, social and environmental impacts of sustainable animal production.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Know and describe the role of domestic animals and their importance to humans;* - *Use investigative processes to address sustainable animal production challenges;* - *Apply the principles and practices underpinning efficient and sustainable animal raising and production systems;* - *Explain the potential use of environmental indicators from a farm and life cycle perspective and understand the role of agriculture in shaping of the environment;* - *Describe the relationships between agriculture, society and the environment;* - *Critically assess achieved levels of sustainability of modern approaches in sustainable animal production;* - *Understand the requirements and apply principles of LCA;* - *Explain the overall purpose and principles of life cycle Assessment (LCA), describe the content and explain the purpose of the analytical steps of LCA.*
Indicative syllabus content:	*Definition of sustainability; Introduction to sustainable animal raising and production; Types and distribution of farm animals; Domestic animal structure and function; Roles of domestic animals and the importance of their correlation with humans; Types of livestock production systems. Extensive and intensive livestock raising systems. Environmental impact of intensive and extensive rangeland production systems; Animal products and by-products; Food, clothing, health, agro-tourism; Production of quality and safe animal products - contribute to poverty alleviation of smallholders; Sustainable development of food production; Knowledge of animal nutrition and physiology used in the context of a systems approach; Animal Health and Well-Being; Minimal environmental losses production, under optimal conditions for animal health and welfare; Environment protection and sustainable animal production; Minimal environmental losses production, under optimal conditions for animal health and welfare; Environment protection and sustainable animal production; Managing the economy for environmental sustainability; Economic and social impacts of sustainable animal production; Societal sustainability and economic animal production sustainability; Advancing sustainable animal production; Sustainability of innovations in agricultural systems; Storage and management of manure; Management of animal waste; LCA (Life Cycles Assessment) as a method of measuring the environmental impact of a sustainable animal production.*
Learning delivery:	*- Theory lectures through interactive presentations;* *- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* *- Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher;* *- Study visit.*

Assessment methods and schedule:

Assessment method	%	Scheduled
Overall presence and involvement	10	At all times
Seminar	15	Throughout the semester
Partial exam	20	Week 8
Project	15	Weeks 9 and 10
Final exam	40	Examination period

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Interactive involvement during lectures is awarded 0-10 ECTS. Groups of 3-5 students will be formed during the course by a course teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities.*

c) *Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS credits. Seminar can be given back to the student for further adjustments.*

d) *Partial exam will be taken in written form in Week 8 of the semester. It will consist teaching materials presented during Weeks 1-8. The exam consists of questions that seeks theoretical answers, and it is awarded 0-20 ECTS.*

e) *Project (in the second half of the semester, students will receive precise instructions on how to write a project on certain topic). Continuous work throughout the semester is mandatory, sending course teacher draft versions of the work in certain timeframe, and responding to corrected versions. Team work is mandatory. It will be carried out in the second half of the semester as an introduction and preparation for the final exam, and will be awarded 0-15 ECTS.*

f) *Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Senčić, Đ., & Antunović, Z. (2003). Ekološko stočarstvo. „Katava "doo, Osijek.*
- *Senčić, Đ., Antunović, Z., Mijić, P., Baban, M., Puškadija, Z. (2011): Ekološka zootehnika. Poljoprivredni fakultet u Osijeku, Sveučilište Josipa Jurja Strossmayera u Osijeku.*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt /*

Recommended Readings:

Textbooks:

- *Mason, J. Kebreab, E., Ominski, K., & Wittenberg, K. (2010). Sustainable Animal Production. Animal and Plant Productivity, 10, 24.*
- *Pretty, J. (2008). Sustainable agriculture and food. Volume I: History of agriculture and food. Earthscan.(2003). Sustainable agriculture. Landlinks Press.*

Academic papers:

- *Heitschmidt, R. Nardone, A., Ronchi, B., Lacetera, N., Ranieri, M. S., and Bernabucci, U. (2010). Effects of climate changes on animal production and sustainability of livestock systems. Livestock Science, 130(1-3), 57-69.K., Short, R. E., and Grings, E. E. (1996). Ecosystems, sustainability, and animal agriculture. Journal of Animal Science, 74(6), 1395-1405.*
- *Hellstrand, S. (2013). Animal production in a sustainable agriculture. Environment, development and sustainability, 15(4), 999-1036.*
- *McCormack, U. M., Curião, T., Buzoianu, S. G., Prieto, M. L., Ryan, T., Varley, P., and Paganoni, B. (2018). Environmental Sustainability - Environmental Impact Of Livestock II. Italian, 18, s1.*
- *Vavra, M. (1996). Sustainability of animal production systems: an ecological perspective. Journal of animal science, 74(6), 1418-1423.*

Reports, official documents and legal texts:

- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). Introduction to LCA with SimaPro. PRé, available at: https://support.simapro.com/articles/Manual/Introduction-to-LCA*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). SimaPro Tutorial PRé, available at: https://www.pre-sustainability.com/download/SimaPro8Tutorial.pdf*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH I-204 SUSTAINABLE PLANT PRODUCTION

Full Course Title:	*SUSTAINABLE PLANT PRODUCTION*
Course Code:	*OSPH I-204*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	-	-	8	55	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	*None*
Course aims:	*Main aim of the course is to provide knowledge and skills in the area of economic sustainability in the current evaluation conditions, while preserving resources and our environment. Course also aims to provide knowledge in the area of social sustainability which means acquiring high quality of life for farm employees and their respective communities, while implementing principles of sustainability through managing eco system, complex relationships between soil, water, plants, animals, climate and people. It is also important to integrate these factors into one productive system.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Recognize and use available resources in sustainable plant production;* - *Define sustainable systems characteristics and use them in current plant agricultural production systems;* - *Identify and apply crops which are suitable for sustainable plant production;* - *Plan and manage sustainable plant production from start-up to market;* - *Apply critical and creative thinking skills in farm management organisations;* - *Apply sustainable pesticide use skills* - *Explain general purpose and principles of Life Cycles Assessment (LCA) through influence of sustainable food production to the environment.*
Indicative syllabus content:	*Course content: Introduction; Sustainable agriculture and natural resources; Plant production systems; Biodiversity and living soil; Fertility of soil and fertilizers; Pest Management; A sustainable approach; Methods of sustainable agriculture; Eco agriculture and sustainability; Suitable crops for sustainable plant production; Protected agro area- Greenhouses; Benefits of sustainable crop production system - social and economic feasibility; Ecological viability and future prospects; LCA (Life Cycles Assessment) as a method of measuring the environmental impact of a Sustainable Animal Production; Sustainable use of pesticides; Farm and agricultural cooperatives visits.*
Learning delivery:	*- Theory lectures through interactive presentations;* *- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* *- Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher;* *- Autonomous study on course topics (preparing written materials based on the recommended readings and internet sources that will be used for oral discussion);* *- Study visit.*

Assessment methods and schedule:

Assessment method	%	Scheduled
Overall presence and involvement	10	At all times
Seminar	15	Throughout the semester
Partial exam	20	Week 8
Project	15	Weeks 9 and 10
Final exam	40	Examination period

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS credits. Seminar can be given back to the student for further adjustments.*

c) *Partial exam will be taken in written form in Week 8 of the semester. It will consist of teaching materials presented during Weeks 1-8. The exam consists of questions that seek theoretical answers, and it is awarded 0-20 ECTS.*

d) *Project (in the second half of the semester, students will receive precise instructions on how to write a project on certain topic). Continuous work throughout the semester is mandatory, sending course teacher draft versions of the work in certain timeframe, and responding to corrected versions. Team work is mandatory. It will be carried out in the second half of the semester as an introduction and preparation for the final exam, and will be awarded 0-15 ECTS.*

e) *Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Veladžić, M., Čaklovica, F., Fejzić, N. (2004). Organska proizvodnja hrane. IK "Ljiljan", Štamparija Bemust, Sarajevo.*

Reports, official documents and legal texts:

- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). Introduction to LCA with SimaPro. PRé, available at: https://support.simapro.com/articles/Manual/Introduction-to-LCA*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). SimaPro Tutorial PRé, available at: https://www.pre-sustainability.com/download/SimaPro8Tutorial.pdf*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt /unofficial teaching materials/*

Recommended Readings:

Textbooks:

- *Dixon, G. R., & Tilston, E. L. (Eds.). (2010). Soil microbiology and sustainable crop production. Springer Science & Business Media.*
- *Mason, J. (2003). Sustainable agriculture. Landlinks Press.*

Academic papers:

- *Behe, B. K., Campbell, B. L., Hall, C. R., Khachatryan, H., Dennis, J. H., & Yue, C. (2013). Consumer preferences for local and sustainable plant production characteristics. HortScience, 48(2), 200-208, available at: https://journals.ashs.org/hortsci/view/journals/hortsci/48/2/article-p200.xml*
- *Dantsis, T., Douma, C., Giourga, C., Loumou, A., & Polychronaki, E. A. (2010). A methodological approach to assess and compare the sustainability level of agricultural plant production systems. Ecological indicators, 10(2), 256-263.*
- *Sen, R. (2003). The root-microbe-soil interface: new tools for sustainable plant production. The New Phytologist, 157(3), 391-394, available at: https://www.actahort.org/books/1004/1004_2.htm*
- *Sugár, E., Fodor, N., Sándor, R., Bónis, P., Vida, G., & Árendás, T. (2019). Spelt Wheat: An Alternative for Sustainable Plant Production at Low N-Levels. Sustainability, 11(23), 6726, available at: https://www.mdpi.com/2071-1050/11/23/6726.*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH I-205 - SUSTAINABLE TECHNOLOGY OF MEAT PRODUCTS

Full Course Title:	*SUSTAINABLE TECHNOLOGY OF MEAT PRODUCTS*
Course Code:	*OSPH I-205*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	15	15	-	-	5	8	50	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	
Course aims:	*Main aim of the course is to introduce students to sustainability and best meat production practices, along with new technologies for sustainable meat processing which will provide high level of meat quality and safety. Special attention is given to possible solutions for improving meat industry productivity and environment protection. Students will solve problems of by-products of meat processing utilisation with the support of their teachers, and deal with possible plant based alternative protein solutions to meat. With knowledge and skills acquired, students will be able to participate, manage and control, but also independently create processes in the area of meat technology and meat products.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to identify the principles of sustainable meat production and processing, and analyse and independently choose potentially valuable by-products in order to rationalise and use raw material. Students will be able to independently, but as a part of team work, create and plan technological steps of production processes and develop new technologies and approaches which will contribute to general development of meat production and issues it faces.*
Indicative syllabus content:	***Theoretical lectures:*** *Introduction to basic concepts of sustainable agriculture and meat production and processing; Importance of meat production and processing: recent trends, future prospects; Techno-functional ingredients in meat products; Increasing societal prosperity through sustainable meat production and marketing; By-products of meat industry; Harnessing potentially valuable compounds from meat processing chains; Harnessing the potential of Blood based proteins; Meat substitute: plant based alternatives to meat products; Advances in meat processing and production technology; Advances in meat packaging and meat products; Recent trends in the use of natural antioxidants for meat processing.* ***Laboratory exercises****: testing physical properties of meat: colorimetric analysis of meat colour; Testing chemical properties of meat: determining water content in meat, its capacity to retain water, measuring meat pH; Microbiological meat analysis: determine total number of microorganisms, testing coliform bacteria and salmonella; Meat preservation: salting and drying, salting and cooking; Sensory testing: testing sensory characteristics of processed meat products.*
Learning delivery:	*- Theory lectures through PowerPoint presentation and interactive discussions;* *- Practical work through laboratory exercises;* *- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* *- Discussion on the topic of choice: through discussion, students will be actively involved in understanding of certain problems that that may arise during the course, such as world/national problems in the field of study;* *- Study visit.*
Assessment methods and schedule:	

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*10*	*Throughout the semester*
Seminar presentation	*5*	*Throughout the semester*
Partial exam	*15*	*Week 8*
Preliminary exam (exercise)	*15*	*Week 14*
Final exam	*40*	*Examination period*

Assessment Rationale:	*a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.* *b) Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS credits. Seminar can be given back to the student for further adjustments.* *c) Seminar presentation and defence will be awarded 0-5 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate and grade them in accordance to article b). Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.* *d) Partial exam will be taken in written form in Week 8 of the semester. It will consist of teaching materials presented during Weeks 2-8. The exam consists of questions that seek theoretical answers, and it is awarded 0-15 ECTS.* *e) Preliminary exam (exercises) will be done in written form and it will consist of teaching materials (laboratory exercises) conducted during practical (lab) part of the course. It will be awarded with 0 to 15 ECTS.* *f) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*
Mandatory Readings:	*Textbooks:* • *Teodorović, V., Dimitrijević, M., Karabasil, N., Vasilev, D. (2015). Higijena i tehnologija mesa. Univerzitet u Beogradu, Fakultet veterinarske medicine.* • *Vuković I. (2012). Osnove tehnologije mesa. Veterinarska komora Srbije. (Poglavlja 4, 16 i 17)* *Audiovisual resources:* • *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt/*
Recommended Readings:	*Academic papers:* • *Irshad, A., & Sharma, B. D. (2015). Abattoir by-product utilization for sustainable meat industry: a review. Journal of Animal Production Advances, 5(6), 681-696.* • *Kumar, Y., Yadav, D. N., Ahmad, T., & Narsaiah, K. (2015). Recent trends in the use of natural antioxidants for meat and meat products. Comprehensive Reviews in Food Science and Food Safety, 14(6), 796-812, available at: https://onlinelibrary.wiley.com/doi/pdf/10.1111/1541-4337.12156* • *Mullen, A. M., Álvarez, C., Zeugolis, D. I., Henchion, M., O'Neill, E., Drummond, L. (2017). Alternative uses for co-products: Harnessing the potential of valuable compounds from meat processing chains. Meat science, 132, 90-98.* • *Putnik, P., Lorenzo, J. M., Barba, F. J., Roohinejad, S., Režek Jambrak, A., Granato, D., Bursać Kovačević, D. (2018). Novel food processing and extraction technologies of high-added value compounds from plant materials. Foods, 7(7), 106.* • *Thornton, P. K. (2010). Livestock production: recent trends, future prospects. Philosophical Transactions of the Royal Society B: Biological Sciences, 365(1554), 2853-2867.* *Reports, official documents and legal texts:* • *Blood - based proteins, a market review. Prepared by Dianne Glennn and Corelli Consulting. Published by Meat & Livestock Australia, 2015.* • *Briggs E. (2015). Sustainable Consumption and production, A handbook for policymakers, UNEP.* • *HLPE. 2016. Sustainable agricultural development for food security and nutrition: what roles for livestock? A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.* • *Sustainable agriculture development for food security and nutrition: What roles for livestock. A report by the high level panel fof experts of food security and nutrition, 2015.*
Important Notes:	-
Quality Assurance:	*In accordance with the Second Cycle Study Rules of the University of Bihać.*

OSPH I-206 - *SUSTAINABLE TECHNOLOGY OF DAIRY PRODUCTS*

Full Course Title:	*SUSTAINABLE TECHNOLOGY OF DAIRY PRODUCTS*
Course Code:	*OSPH I-206*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	15	15	-	-	5	-	58	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	
Course aims:	*The aim of the course is to provide students with basic knowledge in the field of sustainable technology of dairy products. Introductory part of the module covers the concept of sustainability in milk production and processing, emphasising growing greenhouse gasses emission and all the necessary measures we need to take in order to decrease carbon dioxide footprint of milk and dairy products. Main part of the course deals with the ways of determining key problems, techniques, and methods in order to strengthen sustainable milk processing technologies, and also to highlight the importance and role of milk and dairy products in human nutrition within the sustainable concept. Students, with the help of their teachers, will be able to give solutions to improve productivity during the operations in dairy processing while following the environmental sustainability principles.*
Learning outcomes:	*Upon successful completion of the module, the student will be able to understand the principles of sustainability in dairy production and processing, also autonomously find solutions of further use of animal food waste and by-products of milk industry in order to lower the emission of negative environmental consequences, and increase economic benefits. Students will be able to plan and organise technological steps in creating production processes autonomously and in groups, and analyse them with the aim to improve dairy production. While respecting the sustainability principles, students will make functional milk products with benefits to human health.*
Indicative syllabus content:	***Theoretical Lectures:*** *Introduction to sustainable agriculture production, with the emphasis on production and processing of dairy products; Greenhouse gas emissions from milk and dairy production and mitigation measures for the carbon footprint; Sustainable production and marketing of dairy products to increase society prospects; New packaging trends in milk and dairy products; Key technological operations in dairy industry, and water and energy usage; Optimisation of production processes in dairy industry; Dairy production waste management; Innovative uses of dairy products in human nutrition; Advances in dairy production technology; The EU dairy production sector.* ***Laboratory Exercise****: Physical properties of milk and dairy: colourmetric determination of milk and dairy colour; Chemical properties of milk: using potentiometric titration method to determine milk acidity, analysing dry matter in milk and dairy products, proving natrium chloride in dairy. Microbiological analysis of milk: determining total number of microorganisms, total coliform bacteria testing, Salmonella testing. Functional dairy production: fermented dairy products, cheese. Sensory analysis: sensory properties of fermented dairy products and cheese.*
Learning delivery:	*- Theory lectures through PowerPoint presentations and interactive discussions;* *- Practical work through laboratory exercises;* *- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* *- Discussion on the topic of choice: through discussion, students will be actively involved in understanding of certain problems that that may arise during the course, such as world/national problems in the field of study;* *- Study visit.*

Assessment methods and schedule:

Assessment method	%	Scheduled
Overall presence and involvement	10	At all times
Seminar	10	Throughout the semester
Seminar presentation	5	Throughout the semester
Partial exam	15	Week 8
Preliminary exam (exercises)	15	Week 14
Final exam	40	Examination period

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS credits. Seminar can be given back to the student for further adjustments.*

c) *Seminar presentation and defence will be awarded 0-5 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate and grade them in accordance to article b). Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.*

d) *Partial exam will be taken in written form in Week 8 of the semester. It will consist of teaching materials presented during Weeks 1-8. The exam consists of questions that seek theoretical answers, and it is awarded 0-15 ECTS.*

e) *Preliminary exam (exercises) will be done in written form and it will consist of teaching materials (laboratory exercises) conducted during practical (lab) part of the course. It will be awarded with 0 to 15 ECTS.*

f) *Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Grujić R., Jašić M. (2013). Održive tehnologije u prehrambenoj industriji. Tehnološki Fakultet Novi Sad.*
- *Tratnik, Lj., Božanić, R. (2012). Mlijeko - tehnologija, biokemija i mikrobiologija. Hrvatska mljekarska udruga, Zagreb. (Poglavlje 1, 2, 3 i 9).*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt/*

Recommended Readings:

Textbooks:

- *Boza-Méndez, E., López-Calvo, R., & Cortés-Muñoz, M. (2012). Innovative dairy products development using probiotics: challenges and limitations. Probiotics, 213-226, available at: https://books.google.com/*
- *De Jong, P. (Ed.). (2013). Sustainable dairy production. John Wiley & Sons, available at: https://books.google.com/*

Academic papers:

- *Brush, A. (2012). Energy efficiency improvement and cost saving opportunities for the dairy processing industry, available at:https://escholarship.org/content/qt3pb7n796/qt3pb7n796.pdf*
- *dos Santos Neutzling, A., Dossa, L. H., & Schlecht, E. (2017). Production and milk marketing strategies of small-scale dairy farmers in the South of Rio Grande do Sul, Brazil. Journal of Agriculture and Rural Development in the Tropics and Subtropics (JARTS), 118(2), 283-295.*
- *Hamann, J. (2018). Sustainability Key Element for Future Dairying. J Dairy Res Tech, 1(001).*
- *Sedorovich, D. M., Rotz, C. A., & Richard, T. L. (2007). Greenhouse gas emissions from dairy farms. In 2007 ASAE Annual Meeting (p.1). American Society of Agricultural and Biological Engineers.*
- *Ščetar, M., Barukčić, I., Kurek, M., Jakopović, K. L., Božanić, R., & Galić, K. (2019). Packaging perspective of milk and dairy products. Mljekarstvo/Dairy, 69(1).*

Reports, official documents and legal texts:

- *F.A.O. Food and Agriculture Organization of the United Nations and Global Dairy Platform. (2019). Climate change and the global dairy cattle sector - the role of the dairy sector in a low-carbon future. Rome, available at: http://www.fao.org/3/CA2929EN/ca2929en.pdf.*
- *https://www.circle-economy.com/insights/the-circular-dairy-economy*
- *The EU dairy sector Main features, challenges and prospects. Author: Marie-Laure Augère-Granier, EPRS, European Parliamentary Research Service, 2018. http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/630345/EPRS_BRI(2018)630345_EN.pdf*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH I-207 - LOW INPUT AGRICULTURE

Full Course Title:	*LOW INPUT AGRICULTURE*
Course Code:	*OSPH I-207*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	-	-	8	55	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	*None*
Course aims:	*Main aim of the course is to provide students with knowledge and skills in the field of low input agriculture globally and in Bosnia and Herzegovina. Students will get to know organic, integral and other types of agricultural low input systems. Course will provide students with knowledge and competence to follow and incorporate basic principles of low input agriculture systems.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Understand and explain the principles, standards and innovations of low input agriculture;* - *Define the most important investments/expenses of agricultural manufacturers and apply methodologies to reduce major inputs and improve the profitability and environmental sustainability of agricultural operations;* - *Apply knowledge of soil and water pollution due to the use of synthetic fertilizers;* - *Compare different agri-food systems in relation to their viability for low input agriculture;* - *Apply methods to improve input efficiency of Low input Cropping Systems;* - *Describe integrated and organic fruit production systems, and know and practically use rustic varieties, multi-resistant to diseases or tolerant of water deficit;* - *Know animal production in low input systems (meat, milk, eggs), and apply methodologies to improve feeding strategies to maintain productivity and improve animal product quality;* - *Identify and apply integrated strategies to improve animal health, product quality and performance in low input animal production;* - *Explain and apply different tools to assess life cycle, and analyse and interpret the requirements of LCA studies.*
Indicative syllabus content:	*Introduction to low input agriculture; Development and innovation in low input agricultural production systems; Main inputs/costs of agricultural producers (N- and P-fertilizers, water, herbicides and fungicides, fuel, procurement and maintenance of machinery, seed material and labour); Reducing major inputs in agriculture for the purpose of improved profitability and environmental sustainability of agricultural operations; Low Input Agricultural systems - optimizing farm resources and minimizing the purchase of resources outside the farm; Environmental issues - soil and water pollution due to the use of synthetic fertilizers; Low input cropping systems/production - viewed in terms of input efficiency (treatment at the right time and at the optimum dose, possible use of precision agriculture tools); Integrated fruit trees production; Integrated soft fruit production; Organic fruit production; Low input Cropping Systems - viewed in terms of biological or physical pest control; Use of rustic varieties multi-resistant to diseases or tolerant to water deficit, biological or physical pest control; Low input Cropping Systems - viewed in terms of redesign of production systems (soil conservation agriculture, reduction of operational working time and redefinition of tolerance levels to damage; Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in low input animal production; Animal production/low input systems - milk production; Animal production/low input systems - meat production; Animal production/low input systems - egg production; Animal production/low input systems - feeding strategies to maintain productivity and improve product quality and animal health and welfare; Life-cycle Assessment (software-based exercises and projects); Introduction to LCA methods; Decision - making in agriculture food chain; Improve competitiveness and environmental performance; Analysing the environmental impacts and resources using LCA software.*

Learning delivery:

- Theory lectures through presentations and interactive discussions;
- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;
- Project – all students will conduct a research and present group assignments, with the enhancements, suggestions and corrections from the teacher;
- Study visit to farms.

Assessment methods and schedule:

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*15*	*Throughout the semester*
Partial exam	*20*	*Week 8*
Project	*15*	*Weeks 9 and 10*
Final exam	*40*	*Examination period*

Assessment Rationale:

a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.

b) Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS credits. Seminar can be given back to the student for further adjustments. The maximum length of seminar presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate. Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.

c) Partial exam will be taken in written form in Week 8 of the semester. It will consist of teaching materials presented during Weeks 2-8. The exam consists of questions that seek theoretical answers, and it is awarded 0-20 ECTS.

d) Project. In the second half of the semester, students will receive precise instructions on how to write a project on certain topic. Continuous work throughout the semester is mandatory, sending course teacher draft versions of the work in certain timeframe, and responding to corrected versions. Team work is mandatory. It will be carried out in the second half of the semester as an introduction and preparation for the final exam, and will be awarded 0-15 ECTS.

e) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher on several topics which will be based on course's mandatory readings.

Mandatory Readings:

Textbooks:

- *Kisić I. (2018): Gradska poljoprivreda. Sveučilište u Zagrebu.*
- *Kurtović M., Karić N. (2003). Načela integralne proizvodnje jabučastog voća. DEZA GTZ, Gradačac.*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt/unofficial teaching materials, ppt/*

Recommended Readings:

Textbooks:

- *Čengić-Džomba, S., P. Drkenda, M. Đikić, D. Gadžo, N. Latinović, N. Mirecki, S. Mirecki (2014). Organic agriculture. University of Monte Negro, Biotechnical faculty Podgorica, ISBN 978-9940-606-07-7.*

Reports, official documents and legal texts:

- *Baumann, H., and Tillman, A. M. (2004). The hitch hiker's guide to LCA. Articles / Viewpoints*
- *Bestman, M. (2014). Managing free range laying hens. Low Input Breeds Technical Note. Download at www.lowinputbreeds.org 1-7.*
- *Butler, G., & Stergiadis, S. Feeding for milk fat quality. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-4.*
- *Goedkoop, M., & Oele, M. (2001). Introduction into LCA methodology and practice with SimaPro 5. PRe Consultants, Amersfoort.*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). Introduction to LCA with SimaPro. PRé, available at: https://support.simapro.com/articles/Manual/Introduction-to-LCA*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). SimaPro Tutorial PRé, available at: https://www.pre-sustainability.com/download/SimaPro8Tutorial.pdf*
- *Hoste, H., Heckendorn, F., Werne, S., Sotiraki, S. (2014). Alternative control of gastro intestinal nematodes in low-input sheep and goat production Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-3.*
- *Hoste, H., Heckendorn, F., Werne, S., Sotiraki, S. (2014). Sainfoin, a Natural Anthelmintic for Small Ruminants. Low Input Breeds Technical Note. Download at www.lowinputbreeds.org 1-3.*

	• *Leenstra, F. (2013). Raising cockerels from free range egg production. Low Input Breeds Technical Note. Download at www.lowinputbreeds.org 1-3.* • *Leenstra, F., & Sambeek, F. (2014). Breeding of Laying Hens. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-3.* • *Luciano, G. (2014). Impact of grazing manage-ment on lamb meat quality. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-4.* • *Prache, S. (2014). Issues and challenges for lamb meat quality from organic and grassland based systems. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-4.* • *Simianer, H., & Bieber, A. (2014). Genomic breeding programmes-a large step forward for low-input dairy cattle breeding?. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-4.* • *Solagro, (2007). Low Input Farming Systems : An Umbrella Concept for Sustainable Agriculture in Europe. 4p.* • *Tzanidakis, N., Stefanakis, A., & Sotiraki, S. (2014). Dairy sheep breeding. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-4.* • *Vaarst, M., Zaralis, K., Padel, S. (2016). Low-input antibiotic strategies: improving animal health & welfare. Technical Note. Download at www.solidairy.eu* • *Van Krimpen M. (2014). Regional high protein feeds for poultry diets. Low Input Breeds Technical Note. Download at www.lowinputbreeds.org 1-4.* • *Van Niekerk, T. (2014). Egg quality. Low Input Breeds Technical Note. Download at www.lowinputbreeds.org 1-3.* • *Voutzourakis, N., Sotiraki, S., & Stefanakis, A. (2014). Impacts of the diet on sheep milk quality under Mediterranean conditions. Low Input Breeds Technical note. Download at www.lowinputbreeds.org 1-4.* *Academic papers:* • *Biala, K., Terres, J. M., Pointereau, P., & Paracchini, M. L. (2007). Low Input Farming Systems: an opportunity to develop sustainable agriculture. Proceedings of the JRC Summer University Ranco, 2-5.* • *Giuliano, S., Ryan, M. R., Véricel, G., Rametti, G., Perdrieux, F., Justes, E., & Alletto, L. (2016). Low-input cropping systems to reduce input dependency and environmental impacts in maize production: A multi-criteria Assessment. European Journal of Agronomy, 76, 160-175.* • *Kirchner, M. K., Ferris, C., Abecia, L., Yanez-Ruiz, D. R., Pop, S., Voicu, I., Winckler, C. (2014). Welfare state of dairy cows in three European low-input and organic systems. Organic agriculture, 4(4), 309-311.* • *Leach, K. (2012). Assessing the sustainability of EU organic and low input dairy farms. Organic Research Centre Bulletin, 111(Winter), 9-10.* • *Leifeld, J. (2013). Low-input farming: a way towards climate-friendly agriculture. Carbon Management, 4(1), 31-41.* • *Sroufe, R. (2013). Life cycle Assessment within MBA courses: a tool for integrating sustainability. Oper Manag Educ Rev, 7, 95-130.* • *Zollitsch, W., Ferris, C., Sairanen, A., Rinne, M., Steinwidder, A., Horn, M., Vestergaard, M. (2014). Adapted vs. conventional cattle genotypes: sustainability for organic and low input dairy production systems. Building Organic Bridges, 1, 25-28.*
Important Notes:	-
Quality Assurance:	*In accordance with the Second Cycle Study Rules of the University of Bihać.*

OSPH I-208 - MARKETING OF SUSTAINABLE AGRI-FOOD PRODUCTS

Full Course Title:	*MARKETING OF SUSTAINABLE AGRI-FOOD PRODUCTS*
Course Code:	*OSPH I-208*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	-	8	-	55	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	
Course aims:	*The course aims to provide students with specific management skills and develop special skills necessary to understand current market changes ignited by global problems, society changes (especially consumers' habits), and technical and technological changes. Development of IoT, environmental crisis, and competitive strength all demand a special approach based on modern business philosophy, with the focus on sustainability. Upon completion of the course, students will be able to identify connections between quality of life of urban and rural areas and current food supply and consumption (food networks), with special overview of social responsibility as an important element for the future growth and development. After fully understanding topics on elements of sustainability, students will be ready to use acquired knowledge in greening practices through marketing and business plan.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Apply the methodological tools for analysing the specificities of agriculture and agri-food sectors;* - *Describe the goals, principles and key elements of marketing of sustainable agri-food products;* - *Recognise and use marketing strategies for small and medium-sized companies in agri-food industry;* - *Describe the connection between global problems, alternative food networks, sustainable agri-food products (green design) and modern business philosophy (social responsibility and ethics) and new types of consumers (socially and environmentally conscious);* - *Describe and apply new services offered by sustainable and alternative agri-food networks* - *Recognise new consumer trends;* - *Identify challenges and barriers related to the marketing of sustainable agriculture and food products;*
Indicative syllabus content:	*Introduction to basic concepts of market, information asymmetry, marketing and marketing strategy in the era of IoT and global environmental crisis; Modern business policy, global problems and marketing concepts as a function of quality and sustainability (green and smart); Social responsibility of agro-business and marketing strategy/instruments; Connections between urban/rural quality of life and agriculture and food networks - Sustainable products – its added value, driving forces and new services (by-products) of the agri-food sector; Understanding socially responsible consumer demand and behaviour as driving forces behind alternative ways of food production; Eco-effective product design; Workshop: New type of consumers, the appearance of young and green consumers; Marketing of sustainable agri-food products and alternative food production systems – organic, urban agriculture, etc. (case study/project); Workshop: Driving forces and psychological changes of green consumers and their orientation; Marketing business plan presentation.*
Learning delivery:	– *Theory lectures through PowerPoint presentations and interactive discussions;* – *Different case studies lectures;* – *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;*

	– *Project – all students will conduct autonomous research and present group assignments, with the enhancements, suggestions and corrections from the teacher;* – *Discussion on the topic of choice: through discussion, students will be actively involved in understanding of certain problems that that may arise during the course, such as world/national problems in the field of study.*
Assessment methods and schedule:	

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*15*	*Throughout the semester*
Seminar presentation	*10*	*Throughout the semester*
Project	*25*	*Weeks 9 and 10*
Final exam	*40*	*Examination period*

Assessment Rationale:	*a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.* *b) Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS credits. Seminar can be given back to the student for further adjustments.* *c) Seminar presentation and defence will be awarded 0-10 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate and grade them in accordance to article b). Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.* *d) Project (in the second half of the semester, students will receive precise instructions on how to write a project on certain topic). Continuous work throughout the semester is mandatory, sending course teacher draft versions of the work in certain timeframe, and responding to corrected versions. Team work is mandatory. It will be carried out in the second half of the semester as an introduction and preparation for the final exam, and will be awarded 0-25 ECTS.* *e) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher on several topics which will be based on course's mandatory readings.*
Mandatory Readings:	*Textbooks:* • *Milićević, M., Zakić, Z., Rakita, B., Stanković, M. K., & Jokić, L. (2014). Marketing prehrambenih proizvoda.* *Audiovisual resources:* • *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt/*
Recommended Readings:	*Textbooks:* • *Armbruster, W. J., & Knutson, R. D. (Eds.). (2012). US programmes affecting food and agricultural marketing (Vol. 38). Springer Science & Business Media, available at: https://books.google.com/* • *Baker, M. J., & Baker, M. J. (Eds.). (2003). The marketing book (Vol. 195). Oxford: Butterworth-Heinemann.* • *Barkley, A. (2019). The Economics of Food and Agricultural Markets. New Prairie Press. available at: https://newprairiepress.org/ebooks/28/* • *Crawford, I. M. (1997). Agricultural and food marketing management. Rome: Food and Agriculture Organization of the United Nations.* • *Norton, G. W., Alwang, J., & Masters, W. A. (2014). Economics of agricultural development: world food systems and resource use. Routledge.* *Academic papers:* • *Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented innovation: A systematic review. International Journal of Management Reviews, 18(2), 180-205.* • *Cecchini, L., Torquati, B., & Chiorri, M. (2018). Sustainable agri-food products: A review of consumer preference studies through experimental economics. Agricultural Economics, 64(12), 554-565.* • *Ulvenblad, P. O., Ulvenblad, P., & Tell, J. (2019). An overview of sustainable business models for innovation in Swedish agri-food production. Journal of Integrative Environmental Sciences, 16(1), 1-22.*
Important Notes:	-
Quality Assurance:	*In accordance with the Second Cycle Study Rules of the University of Bihać.*

OSPH I-209 - SUSTAINABLE LAND MANAGEMENT

<table>
<tr><td>Full Course Title:</td><td>SUSTAINABLE LAND MANAGEMENT</td></tr>
<tr><td>Course Code:</td><td>OSPH I-209</td></tr>
<tr><td>Study Year:</td><td>1st</td></tr>
<tr><td>Semester:</td><td>2nd</td></tr>
<tr><td>ECTS credit value:</td><td>5</td></tr>
<tr><td>Student work-load:</td><td>For the whole semester:
<table>
<tr><th>Lectures</th><th>Tutorial / Practical training</th><th>Seminar</th><th>Project</th><th>Written assignment</th><th>Oral presentation</th><th>Study visit</th><th>Individual learning</th><th>Examination</th><th>TOTAL</th></tr>
<tr><td>30</td><td>15</td><td>15</td><td>-</td><td></td><td>8</td><td>-</td><td>55</td><td>2</td><td>125</td></tr>
</table></td></tr>
<tr><td>Course leader:</td><td>Teachers and associates involved with the course subject</td></tr>
<tr><td>Host Study Programme/ Department:</td><td>Sustainable Food Production Systems Department
Sustainable Food Production Systems Programme</td></tr>
<tr><td>Course status:</td><td>Elective</td></tr>
<tr><td>Pre-requisites:</td><td>None</td></tr>
<tr><td>Course aims:</td><td>Main aim of the course is to provide students with basic knowledge of soil functions in natural ecosystem, which is especially important for its sustainable management, food production and ecosystem protection. Upper layers of soil are responsible for vegetation growth, converting sunlight into biomass. This includes food for people and animals, while preserving energy in wood and coal and sustaining aerobic atmosphere. Organic matter that comes into contact with soil easily degrades, changes and establishes a connection with different soil components, humus and clay minerals in particular. This allows organic matter to circulate and act as a water filter and sustains ecosystem. There are more microorganisms in a handful of soil than people living on Earth. They are responsible for organic matter cycling. Number of plant and animal species living in soil sustain biological and genetic diversity in nature that surrounds us. This means knowing soil properties and processes is extremely important in order to address healthy and quality food production. Without healthy soils, there is no clean water, quality foods, or raw materials to be used in agriculture industries.</td></tr>
<tr><td>Learning outcomes:</td><td>Upon successful completion of the course, the student will be able to:
- Define principles of land management, recognise soil resources and explain challenges of sustainable land management;
- Know and describe components of soil and important land degradation processes (erosion, nutrient depletion);
- Identify problems in sustainable agriculture caused by the intensive agriculture production and use tools and methods to solve land degradation problems;
- Know and describe land values and how they change depending on different factors;
- Identify land cover changes in urban and rural areas in terms of land use planning;
- Explain the relationship between sustainable land management and water quality and analyse and explain forms of erosion, sedimentation processes and different types of erosion models;
- Apply chemical land analysis methods and interpret the results;
- Apply methods required for conducting and planning a GIS-based land use in a professional manner;
- Analyse and apply Land quality policies and regulations.</td></tr>
<tr><td>Indicative syllabus content:</td><td>Theoretical Lectures: Introduction to Sustainable Land Management; Basic definitions and principles of land management, degradation and restoration; Intensive farming systems and problems for agricultural sustainability; Land use, actual and future land challenges; The participatory Sustainable land management, land use planning approach; Definitions and concepts of land management, importance and functionality of land and property data; Land values and how they change depending on different land related factors; Land use and land use changes in urban and rural areas, general process of land use planning; Sustainable land management tools and methods to reduce land degradation and encourage sustainable land management; best land management practices - the effect of EU policies on agriculture and the environment; Proper nutrient management - total maximum daily loads and nutrients; Water for agriculture, questions and regulations on water quality, agricultural irrigation management, problems facing irrigated cropland, erosion processes and modelling.
Exercises: Soil Management - soil testing; Chemical properties of soil (humus found in soil, adsorption properties of soil); Chemistry of the liquid phase of soil, colloidal properties of soil, soil buffering capacity, pH reaction and its importance for plants; Soil as a factor of agro-ecological zoning - application of GIS in agro-ecological zoning; Application of GIS in: agricultural production planning, agrotechnical and agromeliorative measures application – deciding on crop based on soil characteristics, climate and economic market conditions; Soil quality and functions based on LCA method; Final thoughts on sustainable agriculture based on economic sustainability, environment quality and social safety; Land policy and its influence on the land situation.</td></tr>
</table>

Learning delivery:

- Theory lectures with interactive presentations and discussions;
- Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;
- Autonomous study on course topics (preparing written materials based on the recommended readings and internet sources that will be used for oral discussion)

Assessment methods and schedule:

Assessment method	*%*	*Scheduled*
Overall presence and involvement	*10*	*At all times*
Seminar	*10*	*Throughout the semester*
Partial test 1	*15*	*Week 8*
Preliminary exam	*10*	*Week 14*
Partial test 2	*15*	*Week 15*
Final exam	*40*	*Examination period*

Assessment Rationale:

a) Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.

b) Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 10 ECTS credits. Seminar can be given back to the student for further adjustments.

c) Partial exam 1. It will be taken in Week 8 of the semester. It will consist of teaching materials presented during Weeks 1-8. The exam consists of questions that seek theoretical answers, and it is awarded 0-15 ECTS.

d) Preliminary exam. It will be taken in Week 14 after finishing exercises. It will consist of questions that seek answers in a form of practical knowledge, and will be awarded 0-10 ECTS.

e) Partial exam 2. It will be taken in Week 15 of the semester after finishing lectures. It will consist of teaching materials presented during Weeks 9-14. The exam consists of questions that seek theoretical answers, and it is awarded 0-15 ECTS.

f) Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.

Mandatory Readings:

Textbooks:

- *Čustović, H., Ljuša, M., Schlingloff S. Održivo upravljanje zemljištem - pristupi i prakse u Bosni i Hercegovini.*
- *Resulović, H., Čustović, H. (2002) Pedologija, Univerzitet u Sarajevu. (Odabrana poglavlja).*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt/*

Recommended Readings:

Textbooks:

- *Kapur, S., Eswaran, H., & Blum, W. E. (Eds.). (2010). Sustainable land management: learning from the past for the future. Springer Science & Business Media.*
- *Liniger, H., Mekdaschi, R., Moll, P., & Zander, U. (2017). Making sense of research for sustainable land management. Centre for Development and Environment (CDE), University of Bern and Helmholtz-Centre for Environmental Research GmbH–UFZ.*

Academic papers:

- *Alemu, M. M. (2016). Sustainable land management. Journal of Environmental Protection, 7(04), 502.*
- *Pereira, P., Brevik, E. C., Muñoz-Rojas, M., Miller, B. A., Smetanova, A., Depellegrin, D., Cerdà, A. (2017). Soil Mapping and Processes Modeling for Sustainable Land Management. In Soil mapping and process modeling for sustainable land use management (pp. 29-60). Elsevier.*
- *Ulvenblad, P. O., Ulvenblad, P., & Tell, J. (2019). An overview of sustainable business models for innovation in Swedish agri-food production. Journal of Integrative Environmental Sciences, 16(1), 1-22.*

Reports, official documents and legal texts:

- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). Introduction to LCA with SimaPro. PRé, available at: https://support.simapro.com/articles/Manual/Introduction-to-LCA*
- *Goedkoop, M., Oele, M., Leijting, J., Ponsioen, T., & Meijer, E. (2016). SimaPro Tutorial PRé, available at: https://www.pre-sustainability.com/download/SimaPro8Tutorial.pdf*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.

OSPH I-210 - TOTAL QUALITY MANAGEMENT IN THE AGRI-FOOD SECTOR

Full Course Title:	*TOTAL QUALITY MANAGEMENT IN THE AGRI-FOOD SECTOR*
Course Code:	*OSPH I-210*
Study Year:	*1st*
Semester:	*2nd*
ECTS credit value:	*5*
Student work-load:	*For the whole semester:*

Lectures	*Tutorial / Practical training*	*Seminar*	*Project*	*Written assignment*	*Oral presentation*	*Study visit*	*Individual learning*	*Examination*	***TOTAL***
30	-	15	15	-	-	8	55	2	**125**

Course leader:	*Teachers and associates involved with the course subject*
Host Study Programme/ Department:	*Sustainable Food Production Systems Department* *Sustainable Food Production Systems Programme*
Course status:	*Elective*
Pre-requisites:	
Course aims:	*The main aim of the module is to provide a strong background in total quality management, economic and technological knowledge and how to apply them in the agri-food sector in order to solve problems of adjusting the quality of food to the consumer needs (legislator) and how to assure quality and consistency of products on the market. This module deals with quality as a foundation for achieving and sustaining competitive strength based on market differentiation and efficiency advancement of business in general. This will be achieved by improving levels of organisation, information flow and reduction of all kinds of waste (including waste of time). "Outer" quality characteristics (efficiency of production process, marketing and environmental impact) usually ignored in practices, will be covered by this course and applied for faster sector development.*
Learning outcomes:	*Upon successful completion of the course, the student will be able to:* - *Explain the role of total quality management in product quality, safety and environmental care;* - *Analyse various approaches to total quality management;* - *Select and apply tools for managing quality and statistical methods for quality control;* - *Examine and apply various total quality management systems and standards;* - *Define quality policy* - *Plans decision in the agri-food sector.*
Indicative syllabus content:	*Introduction to basic concepts - Quality, TQM; Quality theories (Deming, Juran, Crosby, Feigenbaum, Taguchi etc.); Cost of quality and quality awards; Quality control tools (histograms, Pareto chart, scatter diagram etc.) and methods (six sigma, house of quality etc.); Statistical methods for quality control; Product and plant manufacturing audits; Continuous improvement process; Standardisation, certification, accreditation; Quality management standards in the agri-food sector (ISO 22000, HACCP, etc.); Intercompany quality management (ingredient specifications and partners requirements); Financial recovery regulatory framework; Case studies; Study visits to companies.*
Learning delivery:	- *Theory lectures through PowerPoint presentations and interactive discussions;* - *Different study cases lectures;* - *Seminars – all students will present seminars and actively participate in the course, with the enhancements, suggestions and corrections from the teacher;* - *Project – all students will conduct autonomous research and present group assignments, with the enhancements, suggestions and corrections from the teacher;* - *Study visit.*

Assessment methods and schedule:

Assessment method	%	Scheduled
Overall presence and involvement	10	At all times
Seminar	15	Throughout the semester
Seminar presentation	10	Throughout the semester
Project	25	Weeks 9 and 10
Final exam	40	Examination period

Assessment Rationale:

a) *Student attendance and overall course involvement will be monitored by the teacher and it will amount to 10% of the student's grade. Number of classes the student attended out of the maximum number of classes held, will be multiplied by a maximum number of credits (10) to result in the final score required for the course. Interactive involvement: groups of 3-5 students will be formed during the course by a class teacher. They will deliver their seminars and interactively remark, make suggestions and defend fellows' papers during the presentation. Teacher will assess each student's question and answer and grade each of them according to their interactive activities and knowledge on the presented subjects.*

b) *Seminars will be written in accordance with the methodology research and tools. Course teacher will define topic of the seminar with the student. Course teacher will grade and assess overall quality and expertise of the seminar and award it with a maximum of 15 ECTS credits. Seminar can be given back to the student for further adjustments.*

c) *Seminar presentation and defence will be awarded 0-10 ECTS credits. The maximum length of the presentation is 10 minutes, due to seminars being given to the course teacher and other group members (3-5 students) prior to the presentation. Critical analysis of the seminar will be conducted after the presentation by group members. Course teacher can ask questions and is obliged to stimulate other students to interactively participate and grade them in accordance to article b). Length of defence and discussion is not limited, but 30 minutes per student/seminar is suggested.*

d) *Project. In the second half of the semester, students will receive precise instructions on how to write a project on certain topic. Continuous work throughout the semester is mandatory, sending course teacher draft versions of the work in certain timeframe, and responding to corrected versions. Team work is mandatory. It will be carried out in the second half of the semester as an introduction and preparation for the final exam, and will be awarded 0-25 ECTS.*

e) *Final exam will be taken orally as summative assessment. Students' Assessment will give us insight into their theoretical and practical knowledge and whether teaching goals are achieved. Students will be awarded 0 – 40 credits, depending on the theoretical and practical knowledge on the course subject. Exam will be organised through informal and expert dialogue with the course teacher which will be based on course's mandatory readings.*

Mandatory Readings:

Textbooks:

- *Sorak, M, Olga Belloso, Aleksandra Nikolić, Slavica Grujić (2003). Upravljanje sistemom kvaliteta korak naprijed za prehrambenu industriju", Tehnološki fakultet, Banja Luka.*

Audiovisual resources:

- *Neautorizovani nastavni materijal, ppt /unofficial teaching materials, ppt /*

Recommended Readings:

Textbooks:

- *Clute, M. (2008). Food industry quality control systems. CRC press.*
- *Dale, B. G., Bamford, D., & Van der Wiele, T. (Eds.). (2016). Managing quality: An essential guide and resource gateway. John Wiley & Sons.*
- *Kiran, D. R. (2016). Total quality management: Key concepts and case studies. Butterworth-Heinemann.*
- *Luning, P.A. and Marcelis, W.J. (2009). Food Quality Management, technological and managerial principles and practices. Wageningen: Wageningen Academic Publishers.*
- *Petersen, B., Nüssel, M. and Hamer, M. (eds.) (2014). Quality and risk management in agri-food chains. Wageningen: Wageningen Academic Publishers.*
- *Van Heerden, M. A., & Jooste, J. L. (2018). A guide for integrating total quality management and physical asset management in the food industry. South African Journal of Industrial Engineering, 29(4), 155-170.*

Academic papers:

- *Abdul Halim Lim, S. Antony, J. & Albliwi, S. (2014). Statistical Process Control (SPC) in the food industry – A systematic review and future research agenda. Trends in Food Science & Technology,37(2), 137-151.*
- *Dora, M., Kumar, M., Van Goubergen, D., Molnar, A., & Gellynck, X. (2013). Operational performance and critical success factors of lean manufacturing in European food processing SMEs. Trends in food science & technology, 31(2), 156-164.*
- *Dora, M., Kumar, M., Van Goubergen, D., Molnar, A., & Gellynck, X. (2013). Food quality management system: Reviewing Assessment strategies and a feasibility study for European food small and medium-sized enterprises. Food control, 31(2), 607-616.*
- *Kafetzopoulos, D., Gotzamani, K. & Psomas, E. (2013). Quality systems and competitive performance of food companies. Benchmarking: An International Journal, 20(4), 463-483.*
- *Maistry, K., Hurreeram, D. K., & Ramessur, V. (2017). Total quality management and innovation: Relationships and effects on performance of agricultural R&D organisations. International Journal of Quality & Reliability Management, 34(3), 418-437.*

Important Notes:

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Quality Assurance:

In accordance with the Second Cycle Study Rules of the University of Bihać.