

II-Magistar biologije - biohemija i fiziologija

1. Obrazovni ciljevi

Magistar biologije - biohemija i fiziologija usavršava fundamentalna i praktična znanja iz različitih oblasti biohemije i fiziologije i drugih multidisciplinarnih oblasti koje integriraju u sebe biohemiju, biomedicinu i fiziologiju.

2. Ishodi učenja

Usvojena znanja mu omogućavaju razumijevanje mehanizama biohemijsko - fizioloških procesa i zakonitosti u živim sistemima, postavljanje i izvođenje eksperimenta u cilju dobijanja validnih rezultata istraživanja kao i interpretaciju istih ali i rukovanje i korištenje modernih analitičkih i instrumentalnih te mikroskopskih metoda.

3. Profesionalni status

Magistar biologije - biohemija i fiziologija svoja znanja prvenstveno može primjeniti u laboratorijama različitih profila i namjena koje se bave analizom humanih, animalnih i biljnih tkiva i tjelesnih tečnosti (medicinsko-biohemijske laboratorije, hematološke laboratorije, toksikološke laboratorije, laboratorije za humanu i animalnu reprodukciju, farmaceutskim laboratorijam, laboratorijama za molekularnu dijagnostiku i analizu humanih, animalnih i biljnih bioloških uzoraka, laboratorijama za kontrolu kvaliteta vode i hrane, u sudskoj medicini...), odnosno u naučnoistraživačkim institutima, i agencijama, te na visokoškolskim ustanovama. Može učestvovati u razvoju proizvoda i procesnom inženjerstvu, transferu procesa iz laboratorije u proizvodnju, upravljanju kvalitetom, u planiranju istraživanja i razvoju novih proizvoda, u otkrićima i razvoju patenata. Osposobljen je da učestvuje u istraživanjima, da izvodi standardne biohemijske laboratorijske procedure i da koristi laboratorijske instrumente, te svoje rezultate prezentira kroz naučne i stručne radove, u pisanoj i usmenoj formi.

II Master of Biology - Biochemistry and physiology

1. Educational goals

Master of Biology - Biochemistry and Physiology, advances fundamental and practical knowledge in various fields of biochemistry and physiology and other multidisciplinary areas that incorporate biochemistry, biomedicine and physiology.

2. Learning outcomes

The acquired knowledge enables students to understand the mechanisms of biochemical and physiological processes and processes in living systems, establishment and implementation of experiments in order to achieve valid research results and the interpretation thereof as well, and the use of the modern analytical, instrumental and microscopic methods.

3. Professional status

Master of Biology - Biochemistry and Physiology, may primarily apply his/her knowledge in laboratories of different profiles and purposes, including the analysis of human, animal and plant tissues and bodily fluids (medical and biochemical laboratories, laboratory of haematology, toxicology laboratories, laboratories for human and animal reproduction, pharmaceutical laboratories, laboratories for molecular diagnostics and analysis of human, animal and plant biological samples, food and water quality laboratories, in forensic medicine...) or in scientific and research institutes, agencies, and institutions of higher education. They can participate in product development and manufacturing engineering, transfer processes from laboratory to production, quality management, planning research and development of new products, the discovery and development of patents. They are qualified to participate in the research, to perform standard biochemical laboratory procedures and the use of laboratory instruments, and present their results through scientific and professional research, both in writing and orally.

Magistar biologije - ekologije

Master of Biology - Ecology

Obrazovni ciljevi

Cilj obrazovanja u oblasti ekologije na nivou magistra je proširivanje baze znanja za prepoznavanje i identifikaciju problema u životnoj sredini, otkrivanje njihovih uzroka, traženje optimalnih rješenja u održivom upravljanju prirodom, te razvoj sposobnosti za transfer istih znanja trećim licima.

Education objectives

The goal of education in the field of ecology at the level of a Master is expanding the base of knowledge for the recognition and identification of problems in the environment, discover their causes, finding optimal solutions in the sustainable management of nature and development capabilities for knowledge transfer them to third parties.

Ishodi učenja

Magistar biologije – ekologija, posjeduje nadograđena i usavršena znanja iz specijalizovanih ekoloških disciplina, te je osposobljen da samostalno izvodi istraživačke i aplikativne studije stanja biotičkih komponenti životne sredine. Takve studije uključuju sposobnost praćenja stanja životne zajednice ili pojedinih grupa organizama u ekosistemu, uz primjenu stečenih znanja o fizičko-hemijskim, geološkim, pedološkim, klimatskim, orografskim i drugim ekološkim uslovima vodenih i kopnenih staništa.

Learning outcomes

Master of Biology - Ecology possesses advanced and improved knowledge of specialized environmental disciplines, and is qualified to perform independent research and application studies of the state of biotic components of the environment. Such studies include the ability to monitor the state of the community or of individual groups of organisms in the ecosystem, applying the acquired knowledge of the physio-chemical, geological, soil, climatic, topographic and other environmental conditions of aquatic and terrestrial habitats.

Profesionalni status

Magistar biologije – ekologija, je sposoban i obučen da prepozna značaj postojećeg stanja lokalne životne sredine u odnosu na željeno optimalno stanje na lokalnom, regionalnom i globalnom nivou. Ima kompetencije da, na nivou stručnjaka, pruži stečena ekološka znanja u procesima zaštite prirode, održivog upravljanja prirodnim resursima, te u procesima smanjenja industrijskih, saobraćajnih, urbanih, poljoprivrednih, šumarsko-privrednih i drugih antropogenih efekata na okoliš. S obzirom na stepen usvojenih znanja, magistar biologije – ekologija, ima kompetencije da stečeno znanje prenosi i prezentira na različitim nivoima obrazovanja.

Professional status

Master of Biology - Ecology is capable and trained to recognize the importance of the existing state of the local environment in relation to the desired optimal state at local, regional and global levels. He/she possesses the competences to apply, at expert level, the ecological knowledge acquire to the processes of nature conservation, sustainable management of natural resources and the reduction of industrial processes, traffic, urban, agricultural, forestry and industrial and other anthropogenic effects on the environment. Given the level of knowledge acquired, a master of Biology - Ecology has the competences to transmit and presented such knowledge at different levels of education.

II - Magistar biologije - genetika **Master of Biology - Genetics**

1. **Obrazovni ciljevi**

Magistar biologije - genetika, stiče znanja i vještine koje mu omogućavaju razumijevanje molekularno-biohemijske dijagnostike, molekularno - biohemijskih tehnika, kliničke molekularne genetike, genetičkog testiranja i konsultacija, proteomike, farmakogenetike, genetike tumora, citogenetičke toksikologije, GMO kontrole, genetike selekcije i hibridizacije, genetike ponašanja, demografske genetike, konzervacijske genetike, molekularne antropologije i strukturne biologije.

Learning goals

A Master of biology - Genetics acquires the knowledge and skills that allow the student to understand molecular and biochemical diagnostics, molecular and biochemical techniques, clinical molecular genetics, genetic testing and consultation, proteomics, pharmacogenetics, genetics of cancer, cytogenetic toxicology, GMO control, genetics of selection and hybridization, behaviour genetics, demographic genetics, conservational genetics, molecular anthropology and structural biology.

2. **Ishodi učenja**

Magistar biologije – genetika osposobljen je da učestvuje u naučnoistraživačkom radu, da primjenjuje standardne laboratorijske procedure u genetičkim analizama svih vrsta bioloških uzoraka, da koristi laboratorijske instrumente, da dobijene rezultate intrerpretira i prezentira kroz naučne i stručne radove, u pisanoj i usmenoj formi.

Learning outcomes

A Master of biology - Genetics is qualified to participate in research, to apply the standard genetic laboratory procedures in genetic analyses of all types of biological samples, to use laboratory instruments, to interpret and present the results through original and scientific papers, in both written and oral form.

3. **Profesionalni status**

Magistar biologije - genetika, svoja znanja može primijeniti u različitim institucijama i laboratorijama različitih profila i namjena, a koje se bave genetskom analizom humanih i animalnih uzoraka. Njihova znanja i vještine se mogu primjenjivati u sljedećim laboratorijama: medicinsko - genetičkim, molekularno - dijagnostičkim, hematološkim, citogenetičkim, toksikološkim, u laboratorijama za humanu i animalnu reprodukciju, mikrobiološkim, farmaceutskim, forenzičkim, laboratorijama za kontrolu GMO hrane i sličnim, odnosno u naučno - istraživačkim institutima, agencijama, te na visokoškolskim ustanovama. Može učestvovati u planiranju istraživanja i razvoju novih istraživačkih procedura u različitim oblastima genetike kao u genetičkom inženjerstvu i biotehnologiji, funkcionalnoj genetici, proteomici, farmakogenetici, medicini, poljoprivredi, šumarstvu, prehrambenoj industriji itd.

Professional status

A Master of biology - Genetics can apply his/her knowledge in different institutions and laboratories with different profiles and purposes, which are dealing with the genetic analysis of human and animal samples. Their knowledge and skills can be applied in the following laboratories: medical genetics, molecular diagnostics, haematology, cytogenetics, toxicology, in laboratories for human and animal reproduction, microbiological, pharmaceutical, forensic, laboratories for control of GMO foods, and in scientific research institutes, agencies, and institutions for higher education. A Master of biology - Genetics may participate in the planning of research and development of new research procedures in various fields of genetics, as in genetic engineering and biotechnology, functional genetics, proteomics, pharmacogenetics, medicine, agriculture, forestry, food industry, etc.

Magistar biologije -mikrobiologija

Master of Biology -Microbiology

Obrazovni ciljevi

Magistar biologije -mikrobiologija usavršava fundamentalna i praktična znanja iz različitih oblasti mikrobiologije (sanitarna, industrijska, mikrobiologija okoliša, mikrobiologija namirnica, mikrobiologija voda, virologija, klinička mikrobiologija, imunologija, mikrobna genetika, genetičko inženjerstvo, biotehnologija i druge multidisciplinarne oblasti čiji je sastavni dio mikrobiologija) koja mu omogućavaju razumijevanje mehanizama mikrobioloških reakcija i procesa i osposobljavaju ga za vladanje savremenim tehnikama mikrobioloških analiza.

Study objectives

Master of Biology - Microbiology acquires the improved fundamental and practical knowledge in various fields of Microbiology (sanitary, industrial, environmental microbiology, food microbiology, water microbiology, immunology, medical microbiology, microbial genetics, genetic engineering, biotechnology and other multidisciplinary fields which is microbiology an integral part) that allows him or her to understand the mechanisms of microbial reactions and processes and enable him or her to conduct the latest techniques of microbiological analysis.

Ishodi učenja

Magistar biologije - mikrobiologija osposobljen je da učestvuje u naučnim istraživanjima, da samostalno organizuje, kontroliše i projektuje mikrobiološke procese, da izvodi standardne i savremene mikrobiološke laboratorijske metode, koristi laboratorijske instrumente te svoje rezultate prezentira kroz naučne i stručne radove, u pisanoj i usmenoj formi. Poznavanje biostatistike i bioinformatike omogućava mu da samostalno obrađuje vlastite eksperimentalne podatke i pretražuje baze podataka.

Learning outcomes

Master of Biology - Microbiology is qualified to participate in scientific research, to independently organize, control and project microbiological processes, to perform standard and modern microbiological laboratory methods, to utilize laboratory instruments. He or she also acquired relevant skills such as written and oral reporting of the work results and obtaining data through modern information sources.

Profesionalni status

Stečeno znanje magistru biologije – mikrobiologija obezbjeđuje stručnost, odnosno kompetencije za rad u laboratorijamarazličitih profila i namjena: razvojnim i primijenjenim laboratorijama, u naučnim i stručnim institutima i agencijama u poljoprivredi, veterinarstvu, šumarstvu, medicinskim ustanovama, službama za nadzor higijensko–sanitarne i zdravstvene ispravnosti prehrambenih i farmaceutskih proizvoda, vodovodu, ustanovama koje se bave praćenjem kvaliteta i zaštite životne sredine, u srednjim stručnim medicinskim školama i

drugim školama gdje se izučava mikrobiologija, u visokoškolskim institucijama i dr., kako u zemlji, tako i u inostranstvu.

Professional status

The acquired knowledge provides Master of biology - Microbiology the expertise or competence to work in development and applied laboratories in scientific institutes of agriculture, veterinary medicine, forestry, medical facilities, offices for monitoring hygiene and sanitation and health safety of food and pharmaceutical products, waterworks facilities dealing with ecology and environmental protection, in secondary vocational schools, higher education institutions, administration, governmental and non-governmental institutions, both home and abroad.

Magistar biologije – nastavnički smjer

Master of Education in Biology

Obrazovni ciljevi

Tokom jednogodišnjeg studija biologije na nastavničkom smjeru student proširuje i usavršava svoja biološka znanja, podjednako znanja iz pedagoško-psihološke i didaktičko-metodičke oblasti. Također, stiče znanja za izvođenje samostalnog istraživačkog rada vezanog za odgojno-obrazovne probleme nastave biologije koji imaju za cilj unapređenje nastave ovog predmeta sukladno suvremenim i budućim zahtjevima.

Education objectives

During the one-year study of biology, teaching branch, students expand and improves their knowledge in biology, both in pedagogy and teaching methodology. This includes the knowledge and skills to perform independent research related to educational problems of teaching biology aimed at improving the teaching of this subject in accordance with contemporary and future requirements.

Ishodi učenja

Student je proširio svoja biološka znanja kao i znanja i vještine izvođenja nastave biologije, a isto tako se osposobio da može samostalno obavljati istraživački rad u oblasti nastave biologije i te rezultate prezentirati u znanstvenim i stručnim radovima, usmeno i pismeno.

Learning outcomes

Students expanded their biological knowledge as well as knowledge and skills of teaching biology, thus being able to perform independent research in the field of teaching biology and present the results to scientific and professional papers, in both written and oral form.

Profesionalni status

Magistar biologije – nastavnički smjer je osposobljen za realiziranje nastave biologije u osnovnim, kao i u školama srednjeg obrazovanja općeg i stručnog profila, kao i za rad u nastavi na univerzitetskom nivou. Isto tako osposobljen je za rad na usavršavanju nastave biologije u svim njenim fazama, počevši od pripremne, do faze realizacije i evaluacije, što može biti od koristi u djelatnosti resornih ministarstava, pedagoških zavoda i instituta, izdavačkih kuća i sl.

Professional status

The Master of Education in Biology is qualified to teach biology in primary and secondary schools, both general and vocational, as well as at university level. He/she is also qualified to work on improving the teaching of biology in all its stages, starting from the preparatory phase to the implementation and evaluation, which can be of use in the work of relevant ministries, pedagogical institutes, publishing companies etc.

ODSJEK ZA BIOLOGIJU SMJER EKOLOGIJA

Magistar/Master biologije - Ekološki monitoring i biološka procjena kvaliteta voda Master of Biology – Ecological monitoring and biological assessment of water quality

Obrazovni ciljevi

Cilj obrazovanja iz oblasti ekologije na nivou Master je osposobljavanje studenata za samostalan rad u oblasti monitoringa okoliša i biološke procjene kvaliteta vode, upoznavanje studenata sa osnovnim pojmovima, principima i pojmovima iz oblasti biomonitoringa, kao i sa ekološkim principima u istraživanju odnosa između staništa i organizama. Specifični ciljevi su unapređenje kompetencija studenata u oblasti upravljanja vodnim resursima prema standardima Okvirne direktive o vodama, pružanje mogućnosti studentima da se upoznaju sa standardima u oblasti upravljanja vodnim resursima, pružanje mogućnosti studentima da razviju osnovne vještine važne za laboratorijski rad, kao i mogućnostima da razviju osnovne vještine razumijevanja potrebne za razumijevanje problema iz oblasti zaštite okoliša i primjene alata za analizu i evaluaciju stanja ekosistem

Education objectives

The goal of education in the field of ecology at the level of a Master is training students for independent work in the field of environmental monitoring and biological assessment of water quality, introducing students to basic terms, principles and concepts in the field of biomonitoring, as well as with the ecological principles in research of the relationship between habitats and organisms. Specific objectives are improvement of the competencies of students in the field of water resources management according to the standards of the Water Framework Directive, providing opportunities for students to get acquainted with standards in the field of water resources management, providing opportunities for students to develop basic skills important for laboratory work, and with the opportunity to develop basic skills necessary for understanding problems in the field of environmental protection and the application of tools for analysis and evaluation of the state of ecosystems.

Ishodi učenja

Magistar biologije - Monitoring okoliša i biološka procjena kvaliteta vode (EMAB) poseduje napredna i unapređena znanja iz specijalizovanih ekoloških disciplina, osposobljen je za obavljanje samostalnih istraživanja i primenjenih studija o stanju biotičkih komponenti okoliša. Po završetku studijskog programa studenti će moći:

- razumjeti i objasniti osnovne pojmove, principe i koncepte u oblasti biomonitoringa;
- razumjeti pravnu osnovu zakonodavstva Evropske Unije o vodama i kritički raspravljati o pitanjima politike zaštite okoliša;
- razumjeti glavne klase toksičnih supstanci, uključujući zagađivače u vodenim tijelima i glavne efekte toksičnih agenasa u vodenim organizmima;
- primjeniti naučne i stručne metode u istraživanju ekološkog statusa vodenih ekosistema;
- koristiti naučene principe za rješavanje stvarnih problema u očuvanju ili upravljanju močvarama i obalnim staništima;
- Sprovodeiti terenska istraživanja koristeći GIS i tehnologiju daljinskih istraživanja;
- koristiti modele prostornih baza podataka u prostornoj analizi i modeliranju procesa;

- primijeniti RHS (Istraživanje riječnih staništa) i SERCON (Sistem procjene očuvanja rijeka) metode za procjenu vrijednosti očuvanja rijeka.

Learning outcomes

Master of Biology - Environmental Monitoring and Biological Water Quality Assessment (EMAB) possesses advanced and improved knowledge of specialized environmental disciplines, and is qualified to perform independent research and application studies of the state of biotic components of the environment. Upon completion of the study program, students will be able to:

- understand and explain the basic terms, principles and concepts in the field of biomonitoring;
- understand the legal basis of European Union water legislation and critically discuss environmental policy issues;
- understand the main classes of toxic substances, including pollutants in aquatic bodies and the main effects of toxic agents in aquatic organisms;
- apply scientific and professional methods in research into the ecological status of aquatic ecosystems; • use learned principles to solve real problems in the conservation or management of wetlands and coastal habitats;
- carry out field research using GIS and remote sensing technology;
- use spatial database models in spatial analysis and process modeling;
- apply RHS (River Habitat Survey) and SERCON (River Conservation Assessment System) methods for assessing the value of river conservation.

Profesionalni status

Magistar biologije - Monitoring okoliša i biološka procena kvaliteta vode (EMAB) poseduje znanja i veštine vezane za ekološki inženjering i tehnologije zaštite voda. On/ona posjeduje kompetencije za obavljanje, na stručnom nivou, monitoringa vodenih makrofitna, monitoringa makrobeskičmenjaka, mikrobiološkog monitoringa vodenih ekosistema, monitoringa i procjene ribljih populacija, monitoringa obalnih staništa, te korištenje tehnika vezanih za GIS i daljinsku detekciju. Potom slijedi stručnost u oblasti administrativnih poslova vezanih za nacionalnu i zakonodavnu i politiku Evropske unije u oblasti kvaliteta voda i očuvanja slatkovodnih ekosistema kao i pisanje prijedloga projekata.

Professional status

Master of Biology - Environmental Monitoring and Biological Water Quality Assessment (EMAB) has knowledge and skills related to environmental engineering and water protection technologies. He/she possesses the competences to carry out, at expert level, monitoring of aquatic macrophytes, monitoring of macroinvertebrates, microbiological monitoring of aquatic ecosystems, monitoring and assessment of fish populations, monitoring of riparian habitats and use of techniques related to GIS and Remote sensing. This is followed by expertise in the field of administrative affairs related to national and legislative and European Union policy in the field of water quality and conservation of freshwater ecosystems and writing project proposals.