**Curriculum**

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| **Program** |  **Biology** |
| **Degree awarded** | **Master of Natural Sciences in Biology,Master in Ecology** |
| **Faculty**  | Faculty of Exact and Natural Sciences |
| **Program coordinator/coordinators** | ***Cell Biology*****Natia Ghachava** - Doctor of Biology, Associate Professor***Human and Animal Physiology*****Reniko Sakandelidze** - Doctor of Biology, Professor**Ecology****Nana Kiladze** - Doctor of Biology, Associate Professor |
| **Length of the program (semester, ECTS)** | Length of the program-4 semestersLength of the program-120 ECTS |
| **Language of the Program**  | Georgian |
| **Program development and renewal date of issue** | **Accreditation Decision** **№66; 6.04.2012**Faculty Board protocol №8 ,24.05.2012Academic Board protocol №17 ,25.05.2012Faculty Board protocol №3,16.05.2014Faculty Board protocol №12,15.06.2016University Academic Board decision №2 (15/16)22.09.2016Faculty Board protocol №1,11.09.2017University Academic Board decision №1 (17/18)15.09.2017 |
| **Program prerequisites:** |
| Bachelor's degree in Natural Sciences (Biology, Ecology and related sciences) or equivalent qualified specialist. The person with Bachelor's Degree, who has opted for Biology and Ecology as an additional (Minor) specialty. The person who has passed the Unified Master's Examination and Admission Test in Biology. |
| **Aim of the Program**  |
| Prepare highly qualified specialists with deep and systematic knowledge of biological and ecological disciplines, with the ability of using knowledge in practice; To provide Graduates with fundamental knowledge in modern aspects of biology and ecology, to teach research methods in biology, as well as methods of preparation and visualization of scientific papers; To develop the following abilities while working on course and master’s thesis: use knowledge in practice, make conclusions and communication skills .The program is built on module system.The module "Human and Animal Physiology" aims to prepare a specialist who will have deep and systemic knowledge about normal physiological processes in the body. Master students will study the morpho-functional organization of the central nervous system, neurophysiology, vegetative functions, motivation and emotion, biosociology and membraneology, neurobiology, physiology of behavior. Experiments on experimental animals will be performed in the process of writing the master’s thesis and practical working hours during the teaching courses.Module "Cell Biology" aims to prepare a specialist / researcher morphologist who will have a deep and systematic knowledge in Cell Biology; To help Masters develop the usage of knowledge in practice and how to act in a new, unforeseen, multidisciplinary environment; Ability to search for new ways to solve problems, conduct research, conclusions, lead communication and learn independently. The student on master's degree course will study the biology of plant cell, culture of stem cell tissue, cell membranes, structural-functional organization of cells, structural organization of nucleus, cellular and genetic pathologies, cell physiology, cytogenetic and genetic engineering. The module "Ecology" aims to prepare a specialist who has deep and systematic knowledge in ecology; To help the master develop the following skills:working out original ideas, working in new unforeseen environments, using the knowledge in practice, solving complex problems, independently conducting learning, assessing his/hers and others attitudes towards values. The program aims to study forest ecology, human ecology, global ecology, ecological parasitology, ethology, international environmental organizations and conventions. |
| **Learning outcomes (the map of competences)** (The map of learning outcomes is given as an attached document ,see the Appendix 2) |
| **Knowledge and understanding:** | * Deep and systematic knowledge of modern biology and ecology
* Understanding and realizing important theories of biology and ecology.
* Knowledge of research planning and implementation methodology.
* Knowledge of modern methods of cytogenetic, morphological, physiological, statistical research.
* Deep and systematic knowledge of sectoral issues based on research in biology and ecology.
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| **Applying knowledge:** | * Use of biological and ecological disciplines in practice.
* Acting in a new, unforeseen and multidisciplinary environment.
* Finding new biological and ecological problems, identifying new original ways of solving.
* Conducting independent research by using the latest methods and approaches.
* Identification of biological and ecological processes (situations) and creation of a working model ,correctly assessing and solving the problem in a different situation.
* Conducting experiments independently on herbal and animal objects**.**
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| **Making judgement** | * Collection and explanation of biological and ecological information.
* Establishment of grounded conclusions based on critical analysis of the obtained information.
* Innovative synthesis of information based on the latest data.
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| **Communication skills:** | * Communication with academic and / or professional community.
* Selection of forms and approaches of communication to various auditors based on the specifics of the field.
* Use of modern information and communication technologies at professional level.
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| **Learning skills:** | * Study independently.
* Evaluation of learning process, understanding and planning the peculiarities.
* Finding and using scientific innovations in the field of biology and ecology.
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| **Values:** | * To evaluate own and others’ attitudes towards values.
* To contribute to the establishment of new values.
* General professional, scientific and laboratory safety.
* To understand environmental protection obligations.
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|  **Teaching methods** |
| There are different methods used in the teaching process within the program, as it is impossible to study any particular issue in biology with only one method. In many cases, these methods are combined in the teaching-learning process, thus they complement each other and move to each other.During studying various courses in the program the following teaching-learning methods are used:* ***Verbal or oral method* -** lecture, speech, conversation and more belong to this method . The teacher uses this method to deliver the material, while students listen, memorize and actively understand it
* ***Writing method*** means following types of activities: making copying and recordings, zummarizing the material, composing theses,doing paperwork or essays, etc.
* ***Laboratory method*** - implies conducting experiments
* ***Demonstrative method*** – this method means visual presentation of information. From the standpoint of reaching result, it is quite effective. In many cases, it is better to provide students with visual aids. The study material can be demonstrated by both the teacher and the student. This method helps us to make the perception of different stages of educational material more significant.
* ***Practical method*** - combines all forms that give the student practical skills, where the student based on the obtained knowledge independently performs various activities.For example: industrial practice.
* ***Group work*** - This method involves dividing students into groups and giving them the study material.The group members individually work on the issue and at the same time share it with other members of the group. With this method all students are involved in the learning process.
* ***Discussion/debates*** – is one of the widely spread methods of interactive studying. The process of discussion raises the quality of participation and activity of students. This process isn’t limited only to questions asked by professor. This method develops the ability of conformation ones’ own idea and discussion.
* ***Collaborative work*** – is a teaching strategy where every member of the group is obliged not only to study, but also to help the team-mate to study the subject better, thus the student acquires the ability to eliminate the problem.
* ***Method of explaining*** – is based on discussion around the given issue, while reporting the material, professor is giving a concrete example that is discussed in detail in the frame of given theme.
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|  **Structure of the Program** |
| **The program lasts for 2 years (four semesters).**The program covers 120 credits (ECTS \*) (60 credits in a year or 30 credits in a semester). Common compulsory courses are 35 credits. Optional compulsory courses - 50 credits. Coursework- 5 credits, master's thesis-30 credits.

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| --- | --- | --- | --- | --- |
| **Module/course** | **I sem** | **II sem** | **III sem** | **IV sem** |
| **Common Compulsory** | 30 | 5 | – | – |
| **Optional Compulsory** | – | 20 | 30 | – |
| **Coursework** | – | 5 | – | – |
| **Master’s thesis** | – | – | – | 30 |
| **Total** | **30** | **30** | **30** | **30** |

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|  **Assessment System** |
| The Master is able to obtain the credits only after achieving the teaching results planned according to the syllabus. It is not possible to evaluate the results of the studies achieved by the master, only on the basis of final exams.The assessment of the work of the graduate students should be done by certain measures:A) Interim assessment.B) Final exam assessment.Maximum assessment of the course is equal to 100 points. The final exam should not be evaluated more than 40 points.The master has the right to take the final exam, if his/her minimum competency in interim exam is no less than 18 points.Minimum margin of assessment received by the student on the final exam is no less than 20 points.Evaluation System includes: **A. Five Forms of Positive Assessment:**  (A) Excellent – 91-100 points  (B) very good – 81-90 points (C) good – 71-80 points (D) satisfactory – 61-70 points (E) sufficient – 51-60 points**B. Two Forms of Negative Assessment:** B.(FX) (Administrative Fail in Course for Grade/could not pass)– A student gets 41-50 points from maximum evaluation which means that s/he is required to work more for passing the exam, and that s/he is entitled to take a makeup exam only once through personal study;(F) (Academic Fail) – A student gets 0-40 points and less from maximum evaluation which means that the work done by him/her is not sufficient and s/he has to retake the course. The final assessments are made on the basis of summarizing the evaluation of intermediate and the final exam. According to educational component of educational program, in case of adoption of FX, a makeup exam will be appointed no less than 5 calendar days after the conclusion of the final exam results. The number of points received in the makeup final exam, is not added to the final assessment received by the student. According to the assessment 0-50 points received from the makeup final exam, in the final evaluation of the educational component, the student will be evaluated the F-0 score.Master's thesis /project should be assessed in the same or subsequent semester, where the student will complete the work. Master's thesis /project should be evaluated once (with final assessment). |
| **Employment opportunities** |
| Possible employment spheres : * Scientific research institutions with biological, ecological and medical profiles
* Various academic, state and agricultural institutions.
* Sanitary and biosafety services.
* Prophylactic, sanitary-ecological and disease control institutions.
* Pharmacological, pharmaceutical and agricultural profile companies
* Environmental, natural resources management and ecological supervision services.
* Private companies with non-governmental and environmental safe programs working on bio-diversity and conservation issues.
* Higher educational institutions.
* Generally, enterprises or institutions with deep and systemic knowledge of biology and ecology and conducting research independently by different methods and approaches are essential.
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| **Supportive resources** |
| Master's program "Biology" is provided with university and faculty academic and material-technical bases and resources. Professors of Biology Department of the Faculty of Exact and Natural Sciences of Akaki Tsereteli State University are involved in lecture courses.1. Sakandelidze Reniko- Professor
2. Julakidze Erekle-Associate Professor
3. Julakidze Nana-Associate Professor
4. Kuprashvili Khatuna- Associate Professor
5. Ghachava Natia- Associate Professor
6. Chikvinidze Ketevani- Associate Professor
7. Margvelashvili Nino- Associate Professor
8. Gabrichidze Maia- Associate Professor
9. Mangaladze Nino- Associate Professor
10. Kiladze Nana- Associate Professor
11. Gabunia Maia- Associate Professor
12. Zhorzholiani Tsira- Associate Professor
13. Mandaria Natalia- Associate Professor

The teaching process is supported by lecture rooms of the university, laboratories, library and reading halls. Foreign Language Learning Center, internet-enabled computer center equipped with a package of traditional programs, obtaining the necessary information and using e-library for the use of the student's registration and learning process management network. Support services of students’ activities. Lab cabinets of the Biology Department:1. Top Nervous Action Research Laboratory (1101)
2. Laboratory of Genetics (5102)
3. Herbarium (5110)
4. Laboratory of Microbiology - Virusology (5201)
5. Laboratory of Human and Animal Physiology (5301)
6. Laboratory of normal human anatomy (5302)
7. Laboratory of Cytology, Histology (5306)
8. Laboratory of herbal-biology (5307)
9. Cabinet of Geology and Ecology (5308)
10. Zoology Museum (5310)

Department of Biology is equipped with the following laboratory techniques:Thermostat, mixers, bathroom, distillate apparatus, autoclave, biochemical, microbiological vessels and apparatus, equipment for electrophoresis, PCR system, system for immunofermereal analysis,thin layer chromatography system,centrifuges, analytical and torsion scales, a binocular microscope, a binocular microscope with digital camera and student microscopes, a spectrophotometer with ultraviolet spectrum, a spectrophotometer, a rotating microtome, pH meter, a laminar box, a rotating lyophliser, automatic pipette set. 2 portable laboratories of environmental monitoring and analysis: 1) a fluorescent spectrophotometer for solid examination analysis and 2) multifunction system of atmospheric air control. |
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**Attached document 1**

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**Study Schedule of 2017-2019 Years**

**Program: Biology**

**Degree Awarded: Master of Natural Sciences in Biology, Master in Ecology**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| № | Course | Contact hours in week | Credits | The number of hours | Lecture/Practical/Laboratory/Group work | Semester | Preconditions |
| Total | Contact | Independent | I | II | III | IV |
| Class hours | Midterm, final exams |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1 | **Compulsory Modules of Specialty(70 ECTS)** |
| 1.1. | Field related foreign language 1 | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 | 5 |  |  |  |  |
| 1.2. | Field related foreign language 2 | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 |  | 5 |  |  |  |
| 1.3. | Modern aspects of Biology and Ecology | 6 | 10 | 250 | 90 | 3 | 157 | 3/3/0/0 | 10 |  |  |  |  |
| 1.4. | Research methods in Biology | 6 | 10 | 250 | 90 | 3 | 157 | 2/3/1/0 | 10 |  |  |  |  |
| 1.5. | Preparation and visualization of Scientific thesis | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 | 5 |  |  |  |  |
| 1.6. | Coursework |  | 5 | 125 | 30 |  | 95 |  |  | 5 |  |  |  |
| 1.7. | Master’s thesis |  | 30 | 750 | 50 |  | 700 |  |  |  |  | 30 |  |
|  | **Total:** | **21** | **70** | **1750** | **341** | **15** | **1394** | **21** | 30 | 10 |  | 30 |  |
|  | **Compulsory Optional Modules of Specialty (50 ECTS)** |
| 2 | **Module-Cell Biology** |
|  | **Compulsory Courses** |
| 2.1. | Biological Cell Biology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 2.2. | Phytohormons | 6 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 2.3. | Stem cells and tissue culture | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 |  | 5 |  |  |  |
| 2.4 | Cell membranes | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 2.5 | Structural-functional organization of cell compartments | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
| 2.6 | 3D structural organization of kernel | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
| 2.7 | Cellular and genetic pathologies | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
| 2.8 | Cell Physiology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
|  | **Optional Course** |
| 2.9 | Cytogenetics | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 |  |  | 5 |  |  |
| 2.10 | Genetic engineering | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
|  | **Total** | **30** | **50** | **1250** | **450** | **30** | **770** |  |  | 20 | 30 |  |  |
| 3 | **Module- Human and Animal Physiology** |
|  | **Compulsory Courses** |
| 3.1. | Morpho-functional organization of the central network system | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 3.2. | Neurophysiology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 3.3. | Vegetative functions | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 3.4. | Motivation and emotion | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  |  |
| 3.5. | Physiology of behavior | 6 | 10 | 250 | 90 | 6 | 157 | 4/2/0/0 |  |  | 10 |  |  |
| 3.6 | Neurobiology | 6 | 10 | 250 | 90 | 6 | 157 | 3/3/0/0 |  |  | 10 |  |  |
| **Optional Course** |
| 3.7. | Biosociology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
| 3.8 | Membranology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
|  | **Total:** | **30** | **50** | **1250** | **450** | **30** | **770** |  |  | 20 | 30 |  |  |
| 4 | **Module –Ecology** |
|  | **Compulsory Courses** |
| 4.1. | Forest Ecology | 6 | 10 | 250 | 90 | 3 | 157 | 4/2/0/0 |  | 10 |  |  |  |
| 4.2. | Ecological Parasitology | 6 | 10 | 250 | 90 | 3 | 157 | 4/2/0/0 |  | 10 |  |  |  |
| 4.3. | Ethology | 6 | 10 | 250 | 90 | 6 | 157 | 4/2/0/0 |  |  | 10 |  |  |
| 4.4. | Global Ecology | 6 | 10 | 250 | 90 | 6 | 157 | 4/2/0/0 |  |  | 10 |  |  |
| **Optional Courses** |
| 4.5. | International environmental organizations and conventions | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [4.1] |
| 4.6. | Human Ecology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
|  | **Total:** | **30** | **50** | **1250** | **450** | **30** | **770** |  |  | 20 | 30 |  |  |
|  | **Total:** |  | **120** |  |  |  |  |  | 30 | 30 | 30 | 30 |  |