**Curriculum**

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| **Program** | **Applied Biosciences(Biotechnology)** |
| **Degree awarded** |  **Master in Applied Biosciences (Biotechnology))** |
| **Faculty**  | Faculty of Exact and Natural Sciences |
| **Program coordinator/coordinators** | Program Supervisor-Doctor of Biology, Associate Professor **Nino Margvelashvili**Heads of Sub-Programs Healthcare Biotechnology -Doctor of Biology, Associate Professor **Ketevan Chikvinidze**Environmental Biotechnology -Doctor of Biology, Associate Professor **Tsira Zhorzholiani**Food Biotechnology -Doctor of Biology, Associate Professor **Nana Julakidze** |
| **Length of the program (semester, ECTS)** | Length of the program is 2 years (4 semesters)The program covers 120 (ECTS) ( 60 credits per year or 30 credits in one semester) |
| **Language of the Program**  | Georgian |
| **Program development and renewal date of issue** | The program was developed in 2010-2011Accreditation Decision №67; 6.04.2012Faculty 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:** |
| The applicant shall be admitted to the Master program on the basis of the results of the unified Master's Exam( in General Skills) if he/she overcomes the minimum competency level and will receive a Master's Exam Certificat. Also, those who wish to study this program have to pass an entry test in specialty. Students with the following eduction have the right to pursue studies :Biology, Ecology, Agricultural, Agricultural Sciences, Medicine, Biological Medicine, Food Technology, students with bachelors degrees in Environmental Technologies, or qualified specilists, also qualified specialists and students with bachelor’s degree with the following chosen minor programs:Biology, Ecology or Applied Biology/Biosciencese. |
|  **Aim of the Program**  |
| * To prepare highly qualified specialists in the field of Applied Biosciences covering three main directions: Health care, Environmental Protection and Food Safety Technologies.
* To provide the students on master's degree course with deep and systemic knowledge of Applied Biosciences in fundamental disciplines: Achievements of Biotechnology , Genomics, Microbial Technologies, achievements of Toxicology , the principles of Biosafety, legislative,ethical and commercial aspects of Biotechnology as well as special knowledge of Healthcare, Environment protection and Food Biotechnology.
* To develop practical skills of master students within the modern directions of Biotechnology and Applied Biosciences,which will help them to use their knowledge in practice; Act in a new, unforeseen and multidisciplinary environment;
* To develop the skills of planning and evaluating the priorities of the scientific researh in the future specialists; Encourage and advance the organizational work and creative approach to research.To facilitate close ties of Master students with an industry by introducing enterprise practices oriented on employment.
* To prepare highly qualified specialists who have a wide range of professional skills, including:Ability to make substantiated conclusions based on critical analysis of complex and incomplete information,in which the ethical and social responsibilities are defined; Innovative synthesis of information based on the latest data;Ability to communicate with academic,professional societies as well as non-specialists about its conclusions and arguments; Including the ability to use modern information and communication technologies in the foreign language, taking into account the peculiarities of the field.
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| **Learning outcomes (the map of competences)**The map of learning outcomes is given as an attached document ,see the Appendix 2) |
| **Knowledge and understanding:** | * Systemic knowledge of applied disciplines of Biosciences: planning and methodology of research; Intellectual property, legislative, ethical and commercial aspects of Biotechnology; Sectoral English;
* Deep and systemic knowledge of fundamental disciplines of Applied Biosciences: Genomics; Biotechnology achievements; Applied Toxicology; Microbial Technologies; Principles of Biosafety.
* Knowledge of specific issues of health care, environmental protection and nutrition Biotechnology.
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| **Applying knowledge:** | * Ability to use the knowledge and practice of applied and fundamental disciplines of Biosciences in practice.
* Identigying and solving the problems in a new, unexpected and multidisciplinary environment.
* Ability of independently performing the biological research by using the latest methods and approaches.
* Ability to conduct research or practical activities, according to pre-defined recommendations and instructions.
* Planning and implementation of the experimental part of the Master's thesis.
* Writing and desingning the Master's thesis by using a specific structure and dictionary.
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| **Making judgement:** | * Ability to collect and define Bioscientific and Biotechnological information (data).
* Ability to develop critical analysis and substantiated conclusions of data, including ethical and social responsibilities.
* Ability to generalize information and convey relevant conclusions based on the latest data in the field of Biotechnology.
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| **Communication skills:** | * To have scientific-communication skills of different formats. Ability to deliver

scientific information: make scientific reports, prepare presentations, present data.* Formulate and submit the conclusions and submissions to the audience. Ability to participate in the discussion.
* Ability to use modern information and communication technologies creatively in Applied Biology.
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| **Learning skills:** | * Ability of independently planning and implementing the learning of separate disciplines of natural disciplines and Applied Biosciences from different sources (academic-scientific literature, audio, video materials, internet resources, etc.).
* To determine the needs of further learning and ability to continue studying with high quality of independence.
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| **Values:** | * To evaluate one’s own and others’ attitudes towards values.
* To contribute to the establishment of new values.
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|  **Teaching methods** |
| Basic forms of applying knowledge for students are lectures, relevant practical and laboratory studies and seminars. Throughout the program, attention is paid to the development of cognitive skills, which will facilitate the teaching of such modules that involve practical exercises, group discussions and discussion of presentations.Intensive laboratory work implied in the majority of modules will facilitate to develop practical skills.In the last semester of the course, the master's work on scientific projects requires practical skills, as well as the ability to get to know the modern literature and the ability of interpreting the results through the analysis and the experiment.Learning skills will be strengthened during independent work, intermediate exams, discussing the results of colloquiums,when conducting individual consultations with the lecturer. During the whole program, the master is required to find and acquire additional material for the purpose of self-education. They should use both printed and internet-resources indicated by the lecturer.Presentations and laboratory reports will facilitate the mastering of presentation techniques and help to develop communication skills. |
| **Structure of the Program** |
| **The program lasts for 2 years (four semesters).****The program covers 120 credits (ECTS\*) ( 60 credits per year or 30 credits per semester). 60 credits are compulsory for all the subprograms (30 credits in I semester, 20 credits in II semester, 10 credits in III semester ); 30 credits are given to special modules ( Optional compulsory – 10 credits in II semester , Optional -20 credits in III semester); 30 credits are for the Master’s Thesis in IV semester.** **The program is divided into 3 subprograms: Food Biotechnology, Environmental Biotechnology and Health Biotechnology.****\*1 ECTS=25 Working hours**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Modules/Status** | **I/ECTS** | **II/ECTS** | **III/ECTS** | **IV/ECTS** |
| **Common Compulsory** | 30 | 20 | 10 | - |
| **Optional Compulsory** | - | 10 | 5 | - |
| **Optional** |  |  | 15 |  |
| **Master’s Thesis** | - | - | - | 30 |
| **ToTal** | **30** | **30** | **30** | **30** |

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| **Assessment System** |
| Knowledge and awareness are evaluated in written form (test, closed issues, problem solving, etc.) and in the form of Midterm papers (topics, laboratory work, presentations, report).Assessment of Cognitive skills will be conducted in different forms throughout the course (laboratory work, abstracts, final exam, preparation of Master's thesis); Strengthening practical skills will be evaluated in the form of laboratory reports.Communicative skills are evaluated within various modules (summaries, presentations, reprts, final exams) as well as submission of Master's thesis.**Assessment Criteria**100 points of the course evaluation will be distributed as follows:

|  |  |  |
| --- | --- | --- |
| **Midterm exam** | **Practical / laboratory Activity**  | **Final** |
| **30** | **30** | **40** |

The midterm examination covers 1-7 weeks of material and is held on the 8th week, the final exam is held on the 17th, 18th week and contains the covered entire material.Student's independent work and activity are evaluated at the end of the 16th week.Credits can be obtained only after the student achieves the learning results planned according to the syllabus It is unacceptable to assess the results of the student's achievement only once on the basis of the final exam. The assessment of the work of the student should be done by a certain ratio:A) Interim assessment;B) Assessment of the final exam.Maximum assessment of the course is equal to 100 points.The final exam should not be evaluated more than 40 points.The student has the right to take the final exam, if his/her minimum competency in interm exam is no less than 18 points.Minimum margin of assessment received by the student on the final exam is no less than 15 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.Concrete criteria of assessments are defined into the corresponding syllabus of an academic course.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** |
| Graduates of the Master’s Program have a wide range of employment opportunities: they may be employed in clinical-diagnostic and scientific-research institutes in respective profile labs; Diagnostic Centers of The Ministry of Interior and The Ministry of Justice; Expertise and standardization services; Product quality and sanitary safety management services; Pharmacological and pharmaceutical industry; Private companies of food industry and agriculture profiles; Food industry establishments; Laboratories; State authorities of food assessment and control;Normative documents processing departments. Ecology, nature protection and nature management organizations;Reserves, national parks, food markets, botanical gardens, biodiversity and conservation organizations,Private companies working on environmental issues, environmental, health care and sanitary security services. Biotechnological, food, pharmacological and pharmaceutical industries, biological profile industries and institutions, Ecological police, customs; In general, in such enterprises where complex knowledge of natural sciences techniques and approaches is necessary. |
| **Supportive resources** |
| Master's program “Applied Biosciences (Biotechnology) is provided with university and faculty academic and material-technical base and resources.Professors of Biology Department of Faculty of Exact and Natural Sciences of Akaki Tsereteli State University are involved in lecture courses. 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. Activity Support services. Private literature in the department.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 normal human anatomy (5302)
6. Laboratory of Cytology, Histology (5306)
7. Laboratory of herbal-biology (5307)
8. Cabinet of Geology and Ecology (5308)
9. 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, binocular microscope, binocular microscope with digital camera and student microscopes, spectrophotometer with ultraviolet spectrum, spectrophotometer, rotating microtome, pH meter, laminar box, rotating lyophliser, automatic pipette set. 2 portable laboratories of environmental monitoring and analysis: 1) fluorescent spectrophotometer for solid examination analysis and 2) multifunction system of atmospheric air control. |

**Attached document 1**

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**Study schedule of 2017-2019 years**

**Program: Applied Biosciences (Biotechnology)**

**Degree Awarded:**

**(Master in Applied Biosciences(Biotechnology))**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| № | Course | Contact hours in week | Cedits | The numbers of hours | Lecture/Practical/Laboratory/Team work | Semester | Preconditions |
| Total | Contact | Ind | 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 Program ( 60 ECTS)** |
| 1.1. | Field related foreign language | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 | 5 |  |  |  |  |
| 1.2. | Field related foreign language | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 |  | 5 |  |  | [1.1] |
| 1.3. | Research planning and methodology | 6 | 10 | 250 | 90 | 3 | 157 | 2/2/2/0 | 10 |  |  |  |  |
| 1.4. | Achievements of Applied Biosciences | 6 | 10 | 250 | 90 | 3 | 157 | 4/2/0/0 | 10 |  |  |  |  |
| 1.5. | Science Genome (Genomics) | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 | 5 |  |  |  |  |
| 1.6. | Microbial technologies | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 |  | 5 |  |  | [1.4] |
| 1.7. | Applied Toxicology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  | [1.3] |
| 1.8. | Protection of intellectual property legislative, commercial and ethical principles of Biotechnology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  | [1.5] |
| 1.9. | Biosafety principles | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [1.7] |
| 1.10. | Nutrition and public health care | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [2.1] |
|  | **Total** | **36** | **60** | **1500** | **486** | **30** | **984** |  | **30** | **20** | **10** |  |  |
| 2 | **Compulsory Optional Modules of Subprograms** |
|  | **Healthcare Biotechnology** |
| 2.1. | Basic aspects of Health Care Biotechnology | 6 | 10 | 250 | 90 | 3 | 157 | 2/2/2/0 |  | 10 |  |  | [1.4] |
| 2.2. | Practical training for students | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 |  |  | 5 |  |  |
|  | **Environmental Biotechnology** |
| 2.3. | Biotechnology in environmental protection and biodiversity conservation | 6 | 10 | 250 | 90 | 3 | 157 | 4/1/1/0 |  | 10 |  |  | [1.4] |
| 2.4. | Practical training for students | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 |  |  | 5 |  |  |
|  | **Food Biotechnology** |
| 2.5. | Basics of chemistry of food and its raw materials | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  | 5 |  |  | [1.3] |
| 2.6. | Food Microbiology | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 |  | 5 |  |  | [1.3] |
| 2.7. | Practical training for students | 3 | 5 | 125 | 45 | 3 | 77 | 0/3/0/0 |  |  | 5 |  |  |
|  | **Total** | **9** | **15** | **375** | **135** | **9** | **231** |  |  | **10** | **5** |  |  |
| 3 | **Optional Modules of Subprograms (15 ECTS)** |
|  | **Healthcare Biotechnology** |
| 3.1. | Clinical Diagnostic Methods I: (Clinical Biochemistry, Hematology and Transfusiology) | 6 | 10 | 250 | 90 | 3 | 157 | 4/2/0/0 |  |  | 10 |  | [2.1] |
| 3.2. | Clinical Diagnostic Methods II: (Cytogenetics, Cytotyagnostics and Histodiagnostics) | 6 | 10 | 250 | 90 | 3 | 157 | 2/2/2/0 |  |  | 10 |  | [2.1] |
| 3.3. | Principles of clinical Pharmacology | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 |  |  | 5 |  | [2.1] |
| 3.4. | Medicinal plants in human health | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
| 3.5.  | Environmental sanitary-hygienic condition | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
|  | **Environmental Biotechnology** |
| 3.6. | Environmental chemistry and methodology of ecological monitoring  | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [1.7] |
| 3.7. | Environmental legislation, strategy and politics | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [1.8] |
| 3.8. | Microorganisms and environment | 3 | 5 | 125 | 45 | 3 | 77 | 1/2/0/0 |  |  | 5 |  | [1.6] |
| 3.9. | Medicinal plants in human health | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
| 3.10. | Biotechnology of waste management | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [2.3] |
| 3.11. |  Sanitary-hygienic condition of the environment | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  |  |
|  | **Food Biotechnology** |
| 3.12. | Food processing and fermentation technology | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [2.5] |
| 3.13. | Food safety and quality | 3 | 5 | 125 | 45 | 3 | 77 | 2/0/1/0 |  |  | 5 |  | [1.7] |
| 3.14. | Food toxicology and allergy | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [1.7] |
| 3.15. | Genetically modified food and environmental safety | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [1.4] |
| 3.16. | Food and raw food material examination, standardization and certification | 3 | 5 | 125 | 45 | 3 | 77 | 2/1/0/0 |  |  | 5 |  | [2.5] |
|  | **Total:** | **9** | **15** | **375** | **135** | **9** | **231** |  |  |  | **15** |  |  |
| **4** | **Master’s Thesis** |
| 4.1. | Master’s thesis |  | 30 | 750 |  |  |  |  |  |  |  | 30 |  |
|  | **Total**  |  | 120 | 3000 |  |  |  |  | 120 |  |