IV. JAVAKHISHVILI TBILISI STATE UNIVERSITY
FACULTY OF EXACT AND NATURAL SCIENCES
DEPARTMENT OF BIOLOGY

# MASTER PROGRAM
# "APPLIED BIOSCIENCES"

Tbilisi

## I. MASTER PROGRAM TITLE

„Applied Biosciences“

## II. ACADEMIC DEGREE

MSc in Applied Biosciences and Biotechnology

## III. PROGRAM DIRECTOR (CV – see appendix I)

**Elena Cherkezia** - PhD, Academic Coordinator of TEMPUS project “MAPB” (#159340 Tempus-1-2009-1-ES-Tempus-JPCR - “MAPB”)

## IV. ANALOGICAL REPRESENTATIONS OF PROGRAM

MSc in Applied Biosciences:

University of East London
http://www.uel.ac.uk/hab/programmes/postgraduate/biosciencemsc.htm
University of Leeds - West Yorkshire
http://www.leeds.ac.uk/coursefinder/17203/MSc_Bioscience_(Biotechnology)
Cork Institute of Technology
http://www.cit.ie.course?id=604

## V. PROGRAM OUTLINE

A new Master’s degree program in Applied Biosciences has been designed at the Faculty of Exact and Natural Sciences, Tbilisi State University, within the framework of the TEMPUS Project ((#159340 Tempus-1-2009-1-ES-Tempus-JPCR - “MAPB”) in partnership with other local, regional and European Universities, such as Akaki Tsereteli State University, Georgian State Agrarian University, Yerevan State University, Armenian State Agrarian University, University of Alicante (Spain), University of West of England, Aristotle University of Thessaloniki, Consulting Company P&B (Portugal).

The program meets the TSU development and HEI reform strategy and priorities. The student-oriented program with a modular approach to teaching includes four strands in Healthcare, Food, Environment and Agricultural Biotechnology. It envisages the control of European standards for academic quality, program management and program accreditation. By intensive use of computer-based technologies the program will provide introduction of modern teaching methodologies (including online e-learning) and scientific investigations relevant to today’s standards.

The program offers specialization courses designed to prepare high-qualified professionals in applied biosciences and biotechnology as well as narrow-profile specialists in the spheres of their interest. A large number of subjects are newly designed, aimed to be economical and flexible. The curriculum covers different aspects of applied biosciences and biotechnology, such as key concepts and advances in applied biosciences; legislative, commercial and ethical principles, and biosecurity issues. After completion of the program, the graduates will gain in-depth theoretical and practical knowledge in the subjects taught, as well as general and specific skills, required for further successful scientific or other carreer. The program also offers students the course in Field Specific English that will help students to improve their knowledge with an emphasis to learning scientific terms and phrases, that is of extreme importance today, when English obviously dominates in modern scientific society.

*Healthcare Biotechnology*

Healthcare Biotechnology is one of the most rapidly developing interdisciplinary areas of Applied Biosciences. Recent advances in biology have generated new insights into the causes of disease and revealed the potential to improve health care by the development of new therapies, diagnostic tools, production of drugs and innovative medicines, etc. The Healthcare Biotechnology strand aims to give deep understanding of the biotechnological tools used in molecular biology with an emphasis on medical applications. It concentrates on biological processes and technologies, scientific and practical basis of biotechnology as applied in support of medicine, preparing the students for good job opportunities and making them attractive to potential employers.

Students of Healthcare Biotechnology strand will gain advanced knowledge of genome sciences; principles of clinical pharmacology; biodiversity and human health; methods used in clinical diagnostics, particularly in: clinical biochemistry, cytogenetics, cytodiagnostics, hystodiagnostics, hematology and transfusiology; skill sets used in the research, design and development of pharmaceutical products for medical industry. The students will also gain the regulatory and ethical framework with relationship to medical biotechnology.

Combination of the subjects taught in the Healthcare Biotechnology strand gives wide profile for a professional career in biotechnological industry, clinical/diagnostic centers, analytical services, pharmacological and pharmaceutical companies, scientific-research institutions or for further academic studies. All students with a Master in Applied Biosciences degree are admissible to a PhD program.

*Food Biotechnology*

The main goal of the Food Biotechnology strand is to give students systemic knowledge of the main principles and tendencies in the food biotechnology. The course will cover the topics in physical-chemical properties of food and food raw material; food compound determination and identification methods; principles of food processing; food microbiology; food toxicology and allergy; food expertise, standartization and certification issues, etc. The modules will serve to equip students with the in-depth knowledge of food safety and control; risk assessment and risk-management; the regulations and legislative base in EU and in Georgia. Students will learn a range of fundamental as well as modern express methods of food laboratory analysis. During laboratory work students will acquire practical methods, including taking food samples, preparations for food transportation and analysis; detection of physical, chemical and biological (microbial) contamination; quantitative and qualitative analysis of indicative microorganisms; evaluation of hazards, risk-assessment and risk-management.

After the successful completion of the course students will have the employment opportunities in food safety and expertise services; food producing and agricultural profile companies; food auditing and consulting companies; scientific-research institutes and laboratories. Alternatively graduates might apply for post-graduate doctoral programs locally or abroad.

*Environmental Biotechnology*

Environmental Biotechnology encompasses the biotechnological approaches applied to the management of environmental problems. Environmental Biotechnology strand is designed to train Master students for careers in new and growing areas of the life sciences emphasizing the use of biotechnology in agriculture, environmental clean-up and management. The strand offers brand new courses for the first time implemented in Master programs in biology. The course will cover the issues on biotechnology in environmental protection and biodiversity conservation; biotechnologies in

treatment of wastes; topics in environmental health; environmental legislation, strategies and policies. The employment opportunities for the graduates will include agencies of protected areas; inspection of environment protection; Forestry Agency; National Environment Agency; governmental and nongovernmental organizations of environment protection; universities and research institutes.

### *Agrobiotechnology*

The Agrobiotechnology is linked to a sector that is very important to the international economy. The program aims to impact understanding of the basic principles of agricultural sciences and molecular biology and of the integration of these disciplines to provide healthy crops and livestock in a safe environment for food and non-food applications. The goal of the program is to deliver the main achievements in Agrobiotechnology and information about biotechnologies in plant science, animal reproduction, and microbial biotechnology; the legal and ethical aspects of agricultural technologies clarifying how laws and public policy affect food production in developed and developing countries and the environment.

Graduates are university-trained professionals who are able to contribute to the sustainable development of plant and animal production at various integration levels, based on their knowledge of fundamental and applied sciences and their interdisciplinary approach. Graduates with a research focus are employed at universities, research institutes and biotech or agribusiness companies. Other job opportunities can be found in management, policy, consulting and communication in agrobusiness and governmental and non-governmental organizations.

## PROGRAMME GOALS AND OBJECTIVES:

The programme aims to:

- Provide courses of study which meet the standards of TSU Quality Assurance Office and the National Center for Educational Quality Enhancement;
- Produce qualified specialists in multidisciplinary field of applied biosciences. On the basis of four strands' modules (in Healthcare Biotechnology, Food Biotechnology, Agrobiotechnology and Environmental Biotechnology) the program aims to equip students with the fundamental knowledge in core disciplines of biosciences such as Genomics; Microbial Techniques; Applied Toxicology; Principles of Biosecurity; Legislative, Ethical and Commercial Principles of Biosciences, as well as in specialized areas of Healthcare Biotechnology, Food Biotechnology, Agrobiotechnology and Environmental Biotechnology;
- Produce qualified specialists with the ability to apply their knowledge and understanding in practice; to act adequately in new multidisciplinal environment; to handle complex problems by means of innovative original approaches; to conduct independent research by using modern approaches and techniques;
- Produce graduates who have a range of core skills including: the ability to formulate judgements with incomplete or limited information, reflecting on social and ethical responsibilities; the ability to extract, critically analyze, and innovatively synthesize information; the ability to communicate the data and conclusions to specialist and non-specialist audiences clearly and unambiguously; learning skills to continue to study in a manner that may be largely self-directed or autonomous; the ability to evaluate attitude towards values and participate in creation and implementation of new values;

- Contribute in the students' personal development ( communication, language knowledge, etc) and their involvement to the scientific-research, as well as social activities including participations at conferences, meetings, seminars, exhibitions, etc.
- Prepare qualified specialists with the knowledge and skills suitable for: subject-related career in research, teaching or management in educational and research institutions, industry or government agencies; general careers with the emphasis on non-subject-specific skills or to continue more advanced studies.

PROGRAMME OUTCOMES:

| LEARNING OUTCOMES |
|---|
| A. KNOWLEDGE AND UNDERSTANDING:<br><br>**A1** knowledge in research design and methodology; knowledge of statistical methods; systemic knowledge of legislative, commerial and ethical principles of biosciences.<br>**A2** in-depth and systemic knowledge of fundamental disciplines of Applied Biosciences (Genomics; Microbial Techniques; Applied Toxicology; Principles of Biosecurity, etc).<br>**A3*** fundamental knowledge of field-specific subjects in Healthcare Biotechnology, Food Biotechnology, Environmental Biotechnology and Agrobiotechnology. |
| B. APPLYING KNOWLEDGE IN PRACTICE<br><br>**B1** identification of complex problems and problem solving abilities in new or unfamiliar environments within multidisciplinary contexts related to the field of applied biosciences.<br>**B2*** independent research by using modern approaches and methodology. |
| C. MAKING JUDJEMENTS<br><br>**C1** the ability to formulate judgements on the basis of incomplete or limited information, including social and ethical responsibilities linked to the application of knowledge and judjements.<br>**C2** the ability of innovative synthesis of information. |
| D. COMMUNICATION<br><br>**D1** the ability to present the conclusions and the knowledge, and communicate with specialist and non-specialist audiences clearly and unambiguously. |
| E. LEARNING SKILLS<br><br>**E1** the ability to continue learning independently; understanding of learning process and strategy planning. |

F. **VALUES**

**F1** the ability to elaborate attitude towards values and participate in creation and implementation of new values.

**F2** the appreciation of principles and standards of bioethics

**F3** the appreciation of fairness in all kinds of professional activity ( negation of plagiarism, cheating, etc.)

***- see sub-programmes' subject-specific competencies in the table below***

| *Sub-programme* | *Subject specific competencies*<br>*Knowledge and understanding (A3); applying knowledge in practice (B2)* |
|---|---|
| Healthcare Biotechnology | (A3) *Knowledge and understanding*<br>*Upon the successful completion of the course students will:*<br>• Possess deep knowledge of the complex nature of genome, the molecular-genetic and cell processes occurring in living organisms at the different stages of ontogenesis.<br>• Express fundamental knowledge in applied toxicology; be able to evaluate the prospective risks of different types of intoxication; their damage effect to the organism; define biological parameters for making toxicological prognosis.<br>• Express in-depth knowledge of methods in clinical diagnostics, particularly in clinical biochemistry, clinical physiology, immunology, hematology and transfusiology, cytogenetics and cyto and histodiagnostics.<br>• Possess in-depth knowledge of structural-functional changes on cell and tissue level during the development of pathology.<br>(B2) *Applying knowledge in practice*<br>• Will express the practical knowledge of methods in clinical physiology; clinical immunology and microbiology; hematology and transfusiology; cytogenetics and cyto and histochemistry. |
| Food Biotechnology | (A3) *Knowledge and understanding*<br>*Upon the successful completion of the course students will:*<br>• Possess deep and systematic knowledge of the tendencies of modern food biotechnology, food and food raw products technologies, and the areas of their application;<br>• Express the knowledge of food and food raw products' chemistry, qualitative and quantitative parameters;<br>• Possess the understanding of the principles of food safety and quality;<br>• Express the in-depth knowledge of food technological schemes, the ways to reach economical efficiency and optimal organization of food production/distribution networks.<br>• Express the knowledge of the food impact on human health and the principles of healthy nutrition.<br>(B2) *Applying knowledge in practice*<br>• Be able to determine the chemical composition and qualitative and quantitative parameters of food and food raw materials;<br>• Demonstrate the practical knowledge of methods of laboratory analysis and the modern approaches in studying the food and food raw materials; |

| | |
|---|---|
| | • Demonstrate and implement the knowledge of the main principles of Good Manufacturing Practice (GMP) and Good Hygienic Practice (GHP) in food industry |
| **Agrobiotechnology** | **(A3)** ***Knowledge and understanding***<br>*Upon the successful completion of the course students will:*<br>• Demonstrate the in-depth knowledge of approaches in modern agrobiotechnology and their applications in plant science, animal reproduction and microbial biotechnology; define the approaches of biodiversity conservation and safety.<br>• Express systematic knowledge of agrobiodiversity, the types of agroecosystems and the ecological perspectives of agriculture;<br>• Gain knowledge in alternative agroecosystems, industry and perspectives;<br>• Demonstrate the in-depth knowledge of genetic engineering as the modern tool of biotechnology, it's potencies and applications.<br>**(B2)** ***Applying knowledge in practice***<br>• Use in practice the knowledge of the main methods and approaches in modern agrobiotechnology. |
| **Environmental Biotechnology** | **(A3)** ***Knowledge and understanding***<br>*Upon the successful completion of the course students will:*<br>• Obtain the in-depth and systematic knowledge of environmental pollutants and the ways to reduce the harmful effects of environmental pollution; develop key competencies in integrated management of natural resources as well as on the development, implementation and management of sustainable biotechnology.<br>• Demonstrate the fundamental knowledge of health impact of environmental factors; the main groups of diseases caused by environmental pollution and the ways of prevention;<br>• Express the understanding of main principles of environmental law, politics and strategies worldwide as well as on National level;<br>• Demonstrate the in-depth knowledge of environmental chemistry and environmental monitoring.<br>**(B2)** ***Applying knowledge in practice***<br>• Express the practical knowledge of the methods in environmental biotechnology; perform risk analysis. |

## EMPLOYMENT OPPORTUNITIES:

The graduates of the program have a wide range of employment opportunities. The potential employers of the MSc Applied Biosciences graduates include scientific research laboratories, clinical laboratories and diagnostic centres, pharmacological and pharmaceutical companies, analytical services, agroindustry, food processing, supply, safe and sale services, etc. Along with the subject-related career in research, teaching or management in industry or government agencies the graduates can follow general careers with the emphasis on non-subject-specific skills.

## LEARNING CONTINUATION PROSPECTS:

The graduates of the MSc Applied Biosciences program can continue more advanced studies and apply for post-graduate doctoral programs in Georgian as well as foreign higher educational institutions.

## VI. ENTRY REQUIREMENTS

Admission to the Master's programme "Applied Biosciences" meets the general TSU graduate admission requirements.

*Who can enroll on the MSc "Applied Biosciences" programme :*

1. Applicants should have a bachelor's degree diploma (or qualifications recognised as equivalent) in a relevant field: Biology, Applied Biology/Biosciences, Life Sciences, Natural Sciences, Biomedicine, Medicine, Healthcare, Pharmacology, Pharmacy, Psychology, Ecology, Environmental Sciences, Agrarian/Agricultural Sciences who had at least 15 ECTS credits in Biological disciplines.
2. Applicants with a bachelor's degree diploma (or qualifications recognised as equivalent) who have passed Minor Programs in Biology or Applied Biology/Biosciences.

- To be admitted to the Engish-language programme Georgian Citizens should pass the Unified Master's exam and the exam in General Biology.
- The enrollment of the foreign nationals and the people without citizenship is regulated by the legislation from the Georgian Ministry of Education and Science.

**Additional Admission Requirements for the Program:**

- For admission to the Program, the knowledge of English at B2 level is desirable. All applicants will be interviewed by the program director and program board members.

**Among competing applicants,** preference will be given to those who have participated in scientific conferences, trained at international schools or overseas universities, had professional experience in relevant or adjacent fields that meets the demands of the degree.

## VII. PROGRAM STRUCTURE

The program lasts **2 years (4 semesters).**

The program covers **120 ECTS*** (**60 ECTS per year, 30 ECTS per semester**)

The program includes four strands:

- Healthcare Biotechnology
- Food Biotechnology
- Environmental Biotechnology

- Agrobiotechnology

Semester I of the program includes common core modules.
Semester II and III include common core modules as well as optional modules of strands.
Semester IV is dedicated to the MSc research project.

* 1 ECTS = 25 working hours

Program structure

| Semester I | ECTS | Semester II | ECTS |
|---|---|---|---|
| Common Core Modules | 30 | Common Core Modules<br><br>Optional Modules | 20<br><br>10 |
| **Semester III** | **ECTS** | **Semester IV** | **ECTS** |
| Optional Modules | 30 | Research project | 30 |

Modular Distribution

| Semester I | |
|---|---|
| Common Core Modules<br>30 ECTS | 1. Research Design and Methodology - 10 ECTS<br>2. Advances in Applied Biosciences – 10 ECTS<br>3. Genome Science ( Genomics) – 5 ECTS<br>4. Field Specific English – 5 ECTS |
| **Semester II** | |
| Common Core Modules<br>20 ECTS | 1. Microbial Technology - 5 ECTS<br>2. Applications of Toxicology – 5 ECTS<br>3. IPR, Legislative, Commercial and Ethical Principles of Biosciences - 5 ECTS<br>4. Field Specific English – 5 ECTS |
| Optional Modules<br>10 ECTS | *Health Biotechnology:*<br>1. Key Concepts in Healthcare Biotechnology – 10 ECTS<br>*Agrobiotechnology:*<br>1. Agricultural Biotechnology - 5 ECTS<br>2. Agrobiodiversity, Biotechnology and Sustainablity – 5 ECTS<br>*Food Biotechnology:*<br>1. Fundamentals of Food Chemistry – 5 ECTS<br>2. Food Microbiology – 5 ECTS<br>*Environmental Biotechnology:*<br>1. Biotechnology in Environmental Protection and Biodiversity |

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|---|---|
| | Conservation –10 ECTS |
| Semester III | |
| Optional Modules 30 ECTS | 1. Principles of Biosecurity – 5 ECTS<br>2. Public Health Nutrition – 5 ECTS<br><br>*Health Biotechnology:*<br>1. Methods in Clinical Diagnostics: Clinical Biochemistry, Hematology and Transfusion Science – 10 ECTS<br>2. Methods in Clinical Diagnostics: Cytogenetics, Cytodiagnostics and Histodiagnostics – 10 ECTS<br>3. Principles of Clinical Pharmacology -5 ECTS<br>4. Biodiversity and Human Health – 5 ECTS<br>5. Topics in Environmental Health – 5 ECTS<br>6. Food Toxicology and Allergy – 5 ECTS<br><br>*Agrobiotechnology:*<br>1. Plant Tissue Culture and Micropropagation – 5 ECTS<br>2. GMOs/LMOs Food and Environmental Safety - 5ECTS<br>3. Alternative Agriculture – 5 ECTS<br>4. Biodiversity and Human Health – 5 ECTS<br>5. Food Expertise, Standardization and Certification -5 ECTS<br><br>*Food Biotechnology:*<br>1. Food Processing and Fermentation Technology – 5 ECTS<br>2. Food Safety and Quality – 5 ECTS<br>3. Food Toxicology and Allergy – 5 ECTS<br>4. Food Expertise, Standardization and Certification -5 ECTS<br>5. Methods of Food Analysis – 5 ECTS (TSU)<br>6. GMOs/LMOs Food and Environmental Safety - 5 ECTS<br>*Environmental Biotechnology:*<br>1. Environmental Chemistry and Methodologies in Environmental Monitoring – 5 ECTS<br>2. Environmental Legislation, Strategies and Policies – 5 ECTS<br>3. Biotechnologies for Treatment of Wastes – 5 ECTS<br>4. Biodiversity and Human Health – 5 ECTS<br>5. Topics in Environmental Health – 5 ECTS |
| Semester IV | |
| Research and Master Thesis 30 ECTS | |

| N | MODULE TITLE (CONTACT HRS/INDEPENDENT WORK HRS) | ECTS | SEMESTER | | | |
|---|---|---|---|---|---|---|
| | | | I | II | III | IV |
| | COMMON CORE MODULES | | | | | |
| 1 | Research Design and Methodology (90/160) | 10 | 10 | | | |
| 2 | Advances in Applied Biosciences (120/130) | 10 | 10 | | | |
| 3 | Genome Science (45/80) | 5 | 5 | | | |
| 4 | Field Specific English I (90/35) | 5 | 5 | | | |
| 5 | Field Specific English II (90/35) | 5 | | 5 | | |
| 6 | Microbial Technology (45/80) | 5 | | 5 | | |
| 7 | Applications of Toxicology (45/80) | 5 | | 5 | | |
| 8 | IPR, Legislative, Commercial and Ethical Principles of Biosciences (45/80) | 5 | | 5 | | |
| | OPTIONAL MODULES | | | | | |
| 1 | Principles of Biosecurity (45/80) | 5 | | | 5 | |
| 2 | Public Health Nutrition (45/80) | 5 | | | 5 | |
| | HEALTHCARE BIOTECHNOLOGY | | | | | |
| 1 | Key Concepts in Healthcare Biotechnology (90/160) | 10 | | 10 | | |
| 2 | Methods in Clinical Diagnostics: Clinical Biochemistry, Hematology and Transfusion Science (90/160) | 10 | | | 10 | |
| 3 | Methods in Clinical Diagnostics: Cytogenetics, Cytodiagnostics and Histodiagnostics (90/160) | 10 | | | 10 | |
| 4 | Principles of Clinical Pharmacology (45/80) | 5 | | | 5 | |
| 5 | Biodiversity and Human Health (45/80) | 5 | | | 5 | |
| 6 | Topics in Environmental Health (45/80) | 5 | | | 5 | |
| 7 | Food Toxicology and Allergy | 5 | | | 5 | |

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|---|---|---|---|---|---|---|
| | (45/80) | | | | | |
| | FOOD BIOTECHNOLOGY | | | | | |
| 1 | Fundamentals of Food Chemistry (45/80) | 5 | | 5 | | |
| 2 | Food Microbiology (45/80) | 5 | | 5 | | |
| 3 | Food Processing and Fermentation Technology (45/80) | 5 | | | 5 | |
| 4 | Food Safety and Quality (45/80) | 5 | | | 5 | |
| 5 | Food Toxicology and Allergy (45/80) | 5 | | | 5 | |
| 6 | Food Expertise, Standardization and Certification (45/80) | 5 | | | 5 | |
| 7 | Methods of Food Analysis (45/80) | 5 | | | 5 | |
| 8 | GMOs/LMOs Food and Environmental Safety (45/80) | 5 | | | 5 | |
| | AGROBIOTECHNOLOGY | | | | | |
| 1 | Agricultural Biotechnology (45/80) | 5 | | 5 | | |
| 2 | Agrobiodiversity, Biotechnology and Sustainablity (45/80) | 5 | | 5 | | |
| 3 | Plant Tissue Culture and Micropropagation (45/80) | 5 | | | 5 | |
| 4 | GMOs/LMOs Food and Environmental Safety (45/80) | 5 | | | 5 | |
| 5 | Alternative Agriculture (45/80) | 5 | | | 5 | |
| 6 | Biodiversity and Human Health (45/80) | 5 | | | 5 | |
| 7 | Food Expertise, Standardization and Certification (45/80) | 5 | | | 5 | |
| | ENVIRONMENTAL BIOTECHNOLOGY | | | | | |
| 1 | Biotechnology in Environmental Protection and Biodiversity Conservation (90/160) | 10 | | 10 | | |
| 2 | Environmental Chemistry and Methodologies in Environmental Monitoring | 5 | | | 5 | |

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|---|---|---|---|---|---|---|
| | (45/80) | | | | | |
| 3 | Environmental Legislation, Strategies and Policies (45/80) | 5 | | | 5 | |
| 4 | Biotechnologies for Treatment of Wastes (45/80) | 5 | | | 5 | |
| 5 | Biodiversity and Human Health (45/80) | 5 | | | 5 | |
| 6 | Topics in Environmental Health (45/80) | 5 | | | 5 | |
| | RESEARCH PROJECT | 30 | | | | 30 |

## Master's Programme "Applied Biosciences"

| Courses/Modules | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Code** | **Course/Module Title** | **ECTS** | **Contact/ Independent Work Hours** | | **Pre-Requisites** | **Semester ( fall/spring)** | **Lecturer/Lecturers** |
| **General Compulsory Courses/Modules ( 50 ECTS)** | | | | | | | |
| | Research Design and Methodology | 10 | 90/160 | 2/3/0/1 | None | I ( fall) | N.Archvadze<br>E.Cherkezia |
| | Advances in Applied Biosciences | 10 | 120/130 | 4/2/0/2 | None | I ( fall) | D.Dzidziguri<br>E.Cherkezia<br>D.Dzneladze |
| | Genome Science ( Genomics) | 5 | 45/80 | 1/0/1/1 | None | I ( fall) | N.Dvalishvili |
| | Field Specific English I | 5 | 90/35 | 2/0/0/4 | Elementary Level of English Language (A1) | I ( fall) | E.Cherkezia<br>N. Inasaridze |
| | Field Specific English II | 5 | 90/35 | 2/0/0/4 | Field Specific English I | II (spring) | E.Cherkezia<br>N. Inasaridze |
| | Microbial Technology | 5 | 45/80 | 1/0/2/0 | None | II (spring) | N.Chanishvili |
| | Applications of Toxicology | 5 | 45/80 | 1/0/1/1 | None | II (spring) | M.Gedevanishvili<br>N.Kotrikadze |
| | IPR, Legislative, Commercial and Ethical Principles of Biosciences | 5 | 45/80 | 1/0/0/2 | None | II (spring) | A.Didebulidze<br>N.Chikhladze |
| **Specialization Core Optional Courses/Modules ( Sub-Programme "Healthcare Biotechnology") (10 ECTS)** | | | | | | | |
| | Key Concepts in Healthcare Biotechnology | 10 | 90/160 | 2/0/2/2 | None | II (spring) | N.Gachechiladze<br>N.Mitskevich<br>N.Doreulee<br>D.Gamrekeli |
| **Specialization Core Optional Courses/Modules ( Sub-Programme "Agrobiotechnology") (10 ECTS)** | | | | | | | |
| | Agricultural Biotechnology | 5 | 45/80 | 1/0/0/2 | Genome Science | II (spring) | M.Gaidamashvili |
| | Agrobiodiversity, Biotechnology and Sustainablity | 5 | 45/80 | 1/0/0/2 | Advances in Applied Biosciences | II (spring) | M.Murvanidze<br>A.Gegechkori |
| **Specialization Core Optional Courses/Modules ( Sub-Programme "Food Biotechnology") (10 ECTS)** | | | | | | | |
| | Fundamentals of Food Chemistry | 5 | 45/80 | 1/0/2/0 | None | II (spring) | Z.Kuchukashvili |
| | Food Microbiology | 5 | 45/80 | 1/0/2/0 | None | II (spring) | I.Gorozia |
| **Specialization Core Optional Courses/Modules ( Sub-Programme "Environmental Biotechnology") (10 ECTS)** | | | | | | | |
| | Biotechnology in Environmental Protection and Biodiversity Conservation | 10 | 90/160 | 2/0/0/4 | Advances in Applied Biosciences | II (spring) | N. Inasaridze<br>A. Chogoshvili<br>M.Murvanidze |

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|---|---|---|---|---|---|---|---|
| | **Optional Courses/Modules – 30 ECTS** | | | | | | |
| | **Core Optional Courses/Modules** | | | | | | |
| | Principles of Biosecurity | 5 | 45/80 | 1/0/0/2 | Advances in Applied Biosciences | III ( fall) | M.Murvanidze |
| | Public Health Nutrition | 5 | 45/80 | 1/1/0/1 | Basics of Microbiology, Biochemistry and Physiology | III ( fall) | K.Dadiani<br>I. Beraia |
| | **Specialization Optional Courses/Modules ( Sub-Programme "Health Biotechnology") (minimum 20 ECTS)** | | | | | | |
| | Methods in Clinical Diagnostics: Clinical Biochemistry, Hematology and Transfusion Science | 10 | 90/160 | 2/0/4/0 | None | III ( fall) | N.Koshoridze<br>N.Gachechiladze<br>N.Kulikova<br>M.Abashidze |
| | Methods in Clinical Diagnostics: Cytogenetics, Cytodiagnostics and Histodiagnostics | 10 | 90/160 | 2/2/2/0 | Genome Science | III ( fall) | N.Dvalishvili<br>P.Tchelidze |
| | Principles of Clinical Pharmacology | 5 | 45/80 | 1/0/1/1 | None | III ( fall) | M.Gedevanishvili<br>N.Doreulee |
| | Biodiversity and Human Health ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | A.Gegechkori<br>Sh.Shetekauri<br>M.Gedevanishvili |
| | Topics in Environmental Health ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | A.Chogoshvili<br>M.Murvanidze<br>E.Cherkezia |
| | Food Toxicology and Allergy ***** | 5 | 45/80 | 1/2/0/0 | None | III ( fall) | N.Mitskevich<br>K.Laperashvili |
| | **Specialization Optional Courses/Modules ( Sub-Programme "Agrobiotechnology") (minimum 20 ECTS)** | | | | | | |
| | Plant Tissue Culture and Micropropagation | 5 | 45/80 | 1/0/1/1 | Agricultural Biotechnology | III ( fall) | M.Gaidamashvili |
| | Alternative Agriculture | 5 | 45/80 | 1/0/1/1 | None | III ( fall) | T.Urushadze |
| | GMOs/LMOs Food and Environmental Safety ***** | 5 | 45/80 | 1/0/0/2 | Genome Science; Microbial Technology | III ( fall) | M.Gaidamashvili |
| | Food Expertise, Standardization and Certification ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | K.Laperashvili |
| | Biodiversity and Human Health ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | A.Gegechkori<br>Sh.Shetekauri<br>M.Gedevanishvili |
| | **Specialization Optional Courses/Modules ( Sub-Programme "Food Biotechnology") (minimum 20 ECTS)** | | | | | | |
| | Food Processing and Fermentation Technology | 5 | 45/80 | 1/0/2/0 | Microbial Technology | III ( fall) | I.Gorozia |
| | Food Safety and Quality | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | Z.Kuchukashvili |
| | Methods of Food Analysis | 5 | 45/80 | 1/0/2/0 | None | III ( fall) | Z.Kuchukashvili |
| | Food Expertise, Standardization and Certification ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | K.Laperashvili |
| | Food Toxicology and Allergy ***** | 5 | 45/80 | 1/2/0/0 | None | III ( fall) | N.Mitskevich |

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| | | | | | | | K.Laperashvili |
| | GMOs/LMOs Food and Environmental Safety ***** | 5 | 45/80 | 1/0/0/2 | Genome Science; Microbial Technology | III ( fall) | M. Gaidamashvili |
| **Specialization Optional Courses/Modules ( Sub-Programme "Environmental Biotechnology") (minimum 20 ECTS)** | | | | | | | |
| | Environmental Chemistry and Methodologies in Environmental Monitoring | 5 | 45/80 | 1/0/0/2 | Advances in Applied Biosciences | III ( fall) | G. Supatashvili<br>M.Murvanidze<br>Z. Laoshvili |
| | Environmental Legislation, Strategies and Policies | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | N.Inasaridze |
| | Biotechnologies for Treatment of Wastes | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | N.Inasaridze<br>A. Chogoshvili |
| | Biodiversity and Human Health ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | A.Gegechkori<br>Sh.Shetekauri<br>M.Gedevanishvili |
| | Topics in Environmental Health ***** | 5 | 45/80 | 1/0/0/2 | None | III ( fall) | A.Chogoshvili<br>M.Murvanidze<br>E.Cherkezia |
| **Master's Thesis ( Research project) ( 30 ECTS) – IV ( spring) semester** | | | | | | | |

## VIII. MODULE SYLLABI (see attached files)

## IX. RESEARCH

The research component of the program is focused on a Master's thesis. The choice for the research project will be made in correspondence with the selected strand (Healthcare Biotechnology, Food Biotechnology, Environment Biotechnology or Agro Biotechnology).

The students can do their Master's thesis in the laboratory for the Applied Biosciences Program students; at different streams of Biology Department; in partner universities; in the institutions and organizations that have signed Memorandum of Understanding with TSU, etc.

To select a theme for Master's thesis, the students will be proposed the list of topics for Master's thesis research approved by the Program Management Committee.

The Master's thesis must be a completed scientific work that gives comprehensive outline of the subject matter and displays the student's knowledge and capability to independently identify and analyze problem area; formulate and discuss actual issues; critically evaluate the literature relevant to the issue. The experiments should be done with appropriate scientific accuracy. The student must be able to analyse and interpret the results, to apply statistical methods, to visualize the results using computer programs, to discuss and present adequate conclusions. The thesis must be submitted in the appropriate format and defended in a public presentation in the presence of exam commission. The student must demonstrate the ability to argue and defend his/her findings. The thesis must be accompanied by the written reviews submitted by the thesis supervisor and the reviewer.

## X. MATERIAL AND TECHNICAL BASIS FOR THE SCIENTIFIC RESEARCH WORK

The Master's degree students will conduct scientific-research work in:

- The well-equiped laboratory, functioning as a basis for the MSc programme "Applied Biosciences", as well as for BSc programme "Applied Biosciences and Biotechnology".

  The following modern equipment and devices have been purchased for this purpose:
  - **DNA Gel Electrophoresis Apparatus** for extraction and analysis of DNA fragments
  - **Polymerase Chain Reaction (PCR) Apparatus**: Thermocycler, Vertical Electrophoresis, Transiluminator
  - **Laminar Boxes** for Tissue Cultures
  - **High Performance Liquid Chromatography system (HPLC)**
  - **Microscopes (Auxilab, Carl Zeiss)**
  - **Thermostat with $CO_2$ and Dry Air Thermostat**
  - **Autoclave Apparatus** for sterilizing objects
  - **ELIZA for immunenzimatic reactions**
  - **Other lab facilities:** Analytical, Technical Scales; pH-meter; Photoelectric Colorimeter, Centrifuges; Eppendorf Pipettes

The Lab is designed to familiarize students with modern techniques applied in molecilar biology and biotechnology. The students will acquire knowledge in using molecular genetic research methods; physical-chemical, immunological, histological, morphological and other diagnostic technologies; microbiological testing methods; in particular: Polymerase Chain Reaction (PCR) method; human, animal and plant cell culturing for application in different *in vitro* experiments; working with HPLC –

High Performance Liquid Chromatography and other chromatographic systems for medical-pharmaceutical purposes, as well as in agricultural and food biotechnology.

- **Other scientific-teaching laboratories at different divisions of the Department of Biology, including:**

    - Laboratory of Human and Animal Physiology
    - Laboratory of Biodiversity
    - Laboratory of Biophysics
    - Laboratory of Genetics
    - Laboratory of Immunology and Microbiology
    - Laboratory of Morphology
    - Laboratory of Physical and Chemical Biology
    - Jandara Laboratory

- **In the partner universities; in the institutions and organizations that have signed Memorandum of Understanding with TSU, etc.**

The Master's degree students are encouraged to use computer classes and internet facilities for seeking information; use the Hinari program, that gives the students free access to the leading worldwide scientific journals and other scientific electronic resources.

# CURRICULUM VITAE

## ELENA CHERKEZIA

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| **First, Last Name** | **Elena Cherkezia** |
| **Personal Information** | Date of Birth: 29.06.68<br>Place of Birth: Tbilisi, Georgia<br>Nationality: Georgian<br>Marital status: Married |
| **Education** | **1985 - 1990**<br>Iv.Javakhishvili Tbilisi State University, Faculty of Biology<br>Diploma in cytology.<br>Educated as a biologist and a teacher of biology and chemistry.<br>**1995**<br>Iv.Javakhishvili Tbilisi State University, Faculty of Biology<br>The Degree of a Candidate of Biological Sciences (PhD) |
| **Professional experience** | 1998-2007<br>Iv.Javakhishvili Tbilisi State University.<br>Faculty of Exact and Natural Sciences<br>Department of Cytology, Histology and Developmental Biology.<br>Group of Computed 3D-Analysis of Biostructures and Tissues<br>*Scientific Researcher*<br>2005- till present<br>Educational Research Center "Environment and Health"<br>*Co-Founder, Member of the Board*<br>2007-till present<br>Iv.Javakhishvili Tbilisi State University.<br>Faculty of Exact and Natural Sciences<br>Department of Biology<br>*Invited Lecturer*<br>Research-Educational Institute of Fundamental Research of Bioeffective Technologies<br>*Researcher* |
| **Publications** | Total number of publications 31<br>**2003**<br>The Correlation of Nucleolar Organizer Quantitative and Structural Parameters with Cell Differentiation. I. Mice Proerythroblasts Proceedings of Georgian Academy of Science, Biol.Series A, V.29, N 1-2, p.167-173<br>The Correlation of Nucleolar Organizer Quantitative and Structural Parameters with Cell Differentiation. I Mice basophilic erythroblasts Proceedings of Georgian Academy of Science, Biol.Series A, V.29, N3-4, p.451-455<br>**2005**<br>The low-molecular organization and dynamics of nucleoli fibrillar center |

structure
Tsitologiya, T.47, N9,p. 838
**2011**
Endogenous Inhibitors. Postnatal Growth and Regeneration
FASEB J, 25, 791-799
Research Design and Methodology ( textbook) Tempus project, ( in print)
Benchmark Statements for Biosciences, Tempus project, ( in print)

**Participation in Scientific Grant Projects**

**2006-2010**
TEMPUS Project CD_JEP-27218-2006 (GE) "Developing New Applied Biosciences and Biotechnology Curricula at Tbilisi State University
*Curriculum Management Coordinator;*
*Healthcare Biotechnology Subprogramme Leader*
**2009-2011**
GNSF/ST08/2-382
"The New Approaches in Evaluation of The Growth Endogenous Inhibitors in Organ Regeneration"
*Project Manager*
**2010-2013**
TEMPUS Project CD_JEP-27218-2006 (GE) "MAPB"
*Academic Coordinator*

**Participation in international scientific forums and trainings**

**2000**
**Nucleolus Colloquium, Royal Veterinary and Agricultural University, Copenhagen**
*The correlation of nucleolus organizing regions quantitative and structural parameters (number, size, and 3D organization) with cell differentiation*
**2005**
**Structure and Function of Cell Nucleus, Saint-Petersburg, Russia**
*The low-molecular organization and dynamics of nucleoli fibrillar center structure*
**2008**
EC TEMPUS-funded Staff Development and Training
University of the West of England, Bristol, UK
**2010**
INTARESE Annual Meeting
Rome, Italy
"*Environmental Health Status in Georgia"*
**2010**
EC TEMPUS-funded MAPB study visit
University of Alicante, Spain
2011
EC TEMPUS-funding Staff Development and Training
University of the West of England, Bristol, UK
2011
Curriculum Development
TSU, Tbilisi, Georgia
Member of AIRR (from**1999**)

**Additional information**

**2007** Student's Conference "Genetic Engineering – Perspectives, Problems" (Member of the Organizing Committee)
**2009** 1st International Conference of Morphologists, Tbilisi, Georgia (Member of the Organizing Committee)
**2010** Student's Conference "Cancer: New Approaches in Treatment"

(Member of the Organizing Committee)

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| **Languages** | Georgian, Russian - native<br>English – fluent<br>Italian – with vocabulary |

## Appendix 2 - Module Syllabi - ( see in separate files)