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**Curriculum**

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| --- | --- | --- | --- |
| **Program** | | Bachelor degree program – **Mathematics** | |
| **Degree awarded** | | **Bachelor of Science in Mathematics** | |
| **Faculty** | | **Faculty of Exact and Natural Sciences** | |
| **Program coordinator/coordinators** | | **Professor Giorgi Oniani** | |
| **Length of the program (semester, ECTS)** | | **4 year / 8 semesters / 240 credits**  Basic (Major) Programme – 180 cr.  Minor Program/Free credits – 60 cr. | |
| **Language of the Program** | | | **Georgian** |
| **Program development and renewal date of issue** | | | The Accreditation Decision #66. 23.09.2011  Faculty of Exact and Natural Sciences Board protocol №7; 25.04.2011  Academic Board protocol №1 (11/12) 31.08.2011;  Faculty Board Protocol #8, 24.05.2012  Academic Board protocol #17, 25.05.2012  Mathematics Department Meeting Protocol #5, 22.01.2014  Mathematics Department Meeting Protocol #7, 16.05.2014  Faculty Board Protocol #3, 16.05.2014  Faculty Board Protocol #12, 15.06.2016  Academic Board protocol #2, (15/16) 22.09.2016  Faculty Board Protocol #1, 11.09.2017  Academic Board protocol #1 (17/18) 15.09.2017 |
| **Program prerequisites** | | | |
| **-** Certificate of general education;  **-**  Certificate of confirmation of passing the unified national exams;  For International Students/ non-citizens of Georgia  – secondary or equivalent education in a foreign country; certificate of confirmation of passing the unified national exams;  - Certificate recognized under inter-country agreement | | | |
| **Aim of the Program** | | | |
| * Provide a student with wider knowledge of mathematics; * Assist to develop skills to deal with theoretical and practical issues with a use of math theories and methods; * Assist to develop skills for Logical thinking, critical thinking and analysis, and proper data inference ; * Assist to develop skills for written and oral communication with professionals and non-professionals over math issues; * Assist to develop skills for organization of studies; * Provide with professional ethics and values. | | | |
| **Learning outcomes (the map of competences):** | | | |
| **Knowledge and understanding** | * Basic competencies of the fundamengtal math theories, principles and concepts; * Apprehension of proof and logical math discussion skills accurately identifying the task, admissibility and conclusion Determination of the types of operational systems and microcomputer operating system; * Knowledge of specialized program packet/programming language for math calculations; * Knowledge of the history of mathematics and its impact on the scientific thinking; * Deep knowledge of Elementary Mathematics; * Foreign language competence to use reference literature in mathematics | | |
| **Applying knowledge** | * Skills for the use of mathematical regulations, principles and methods to solve problems; Ability to construct batabase structure * Ability of appling numerical methods, computational technology and specialized program packet/programming language to deal with mathematical problems; * Ability to use mathematic simulation to model the real world problems; * Ability to plan experiment and observation, and analyze the outcome data. | | |
| **Making judgement** | After the completion of the program, the graduate will have:   * Ability of Abstract thinking, analyzing and synthesizing * Ability of problem identification, statement and resolution; * Ability of meaningful decision-making. | | |
| **Communication skills** | * Communicating through discussions and conclusions clearly and accurately to the adresee orally and in wrting; * Applying information and communication technologies to properly search, work on and present information in different resources; * Communicating in foreign language. | | |
| **Learning skills** | * Ability to work independently; * Ability to manage time. | | |
| **Values** | * Ability of critical thinking and self-criticism; * Ability to realize responsibility; * Knowledge of scientific and pedagogical ethics; * Awareness of environmental protection responsibility; * Awareness of the necessity to act in terms of social responsibility and civil consciousness. | | |
| **Teaching methods** | | | |
| From traditional teaching methodology we offer:  Induction, deduction, analysis, and synthesis; verbal and explanatory, writing, heuristic and demonstrative;  Also:  Case-technologies: method of situational analysis, situational tasks and problems, and case-study;  Action-oriented learning and etc. | | | |
| **Structure of the Program** | | | |
| The program covers 180 credits of major and 60 credits of minor courses equaling a total of 240 credit hours. Major course combines: compulsory university courses (15 credits), compulsory faculty courses (20 credits), elective compulsory faculty modes (5 credits), compulsory courses of specialization (115 credits) and elective modules of specialization (25 credits).  **See Appendix 1.** | | | |
| **Assessment System** | | | |
| Final assessment of a student is obtained from the add-up of mid-term and final exams throughout the semester. The educational course has a grading scale of 100 points. The student has the right to take the final exam, if his/her minimum competency equals 18 points.Minimum margin of assessment received by the student on the final exam is 15 points. Below than this, is assessed with FX (fail).  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:  (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 make-up exam only once through personal study  (F) (Academic Fail) – A student gets 0 – 40 points from maximum evaluation; it means that the work done by him/her is not sufficient and she/he has to retake the course.  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 make-up final exam, is not added to the final assessment received by the student.  According to the assessment 0-50 points received from the make-up final exam, in the final evaluation of the educational component, the student will receive a grade of F-0.  (Midterm and final exams take place in exam center of ATSU)  Specific assessment criteria are outlined in the syllabus of any academic course. | | | |
| **Employment opportunities** | | | |
| Areas of professional activities for the graduates are practically unlimited as Information Technologies play leading role in almost all spheres of social life and this role increases day by day.  The role of IT is especially important in science, education, economy, communications, transport, production and others.  In addition, the one who completes this program can apply to graduate courses in Computer Science as well as to multiple interdisciplinary graduate programmes. | | | |
| **Supportive resources** | | | |
| See Addendixes 2.1-2.42 | | | |
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**Curriculum 2017-2021**

**Programme: Mathematics**

**Qualification: Bachelor of Mathematics**

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| № | Course | | | Contact hrs. per week | Credit Number | The number of hours | | | | | Lectures/practical/group work/laboratory | Semester | | | | | | | | | | | | | | | | Precondition | |
| Total | | Contact | | Independent | I | | II | | III | | IV | | V | | VI | | VII | | VIII | |
| Auditory | Midterm and final exam |
| 1 | 2 | | | 3 | 4 | 5 | | 6 | 7 | 8 | 9 | 10 | | 11 | | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | |
| 1 | **University Compulsory (15 ECTS)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1 | Foreign Language-1 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 0/3/0/0 | 5 | |  | |  | |  | |  | |  | |  | |  | |  | |
| 1.2 | Foreign Language-2 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 0/3/0/0 |  | | 5 | |  | |  | |  | |  | |  | |  | | 1.1 | |
| 1.3 | Foreign Language-3 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 0/3/0/0 |  | |  | | 5 | |  | |  | |  | |  | |  | | 1.2 | |
| **Total:** | | | |  | **15** | **375** | | **180** | **9** | **186** | **-** |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 2 | **Faculty Compulsory Courses (10 ECTS – 4 courses)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1 | Programming Basics | | | 3 | 5 | 125 | | 45 | 3 | 77 | 1/0/2/0 | 5 | |  | |  | |  | |  | |  | |  | |  | | - | |
| 2.2 | Computer Skills | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/0/2/0 | 5 | |  | |  | |  | |  | |  | |  | |  | | - | |
| **Total:** | | | |  | **10** | **250** | | **105** | **6** | **139** | **-** |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 3 | **Faculty Compulsory Courses (127 ECTS)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | Mathematical Analysis - 1 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 | 5 | |  | |  | |  | |  | |  | |  | |  | | - | |
| 3.2 | Mathematical Analysis – 2 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 |  | | 5 | |  | |  | |  | |  | |  | |  | | 3.1 | |
| 3.3 | Mathematical Analysis – 3 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 |  | |  | | 5 | |  | |  | |  | |  | |  | | 3.2 | |
| 3.4 | Mathematical Analysis - 4 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 |  | |  | |  | | 5 | |  | |  | |  | |  | | 3.3 | |
| 3.5 | Linear Algebra and Analytical Geometry | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 | 5 | |  | |  | |  | |  | |  | |  | |  | | - | |
| 3.6 | Algebra-1 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 |  | | 5 | |  | |  | |  | |  | |  | |  | | 3.5 | |
| 3.7 | Algebra-2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | | 5 | |  | |  | |  | |  | |  | | 3.5 | |
| 3.8 | Algebra-3 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | | 5 | |  | |  | |  | |  | | 3.7 | |
| 3.9 | Analytic Geometry | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 |  | | 5 | |  | |  | |  | |  | |  | |  | | 3.5 | |
| 3.10 | Differential Geometry | | | 3 | 5 | 125 | | 45 | 3 | 77 | 1/2/0/0 |  | |  | | 5 | |  | |  | |  | |  | |  | | 3.9 | |
| 3.11 | Topology | | | 2 | 3 | 75 | | 30 | 3 | 42 | 1/1/0/0 |  | |  | |  | | 3 | |  | |  | |  | |  | | 3.1 | |
| 3.12 | Number Theory | | | 2 | 3 | 75 | | 30 | 3 | 42 | 1/1/0/0 |  | |  | |  | | 3 | |  | |  | |  | |  | | 3.6 | |
| 3.13 | Set Theory and Mathematical Logics | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | | 5 | |  | |  | |  | |  | |  | |  | | 3.5 | |
| 3.14 | Normal Differential Equations-1 | | | 4 | 5 | 125 | | 60 | 3 | 62 | 2/2/0/0 |  | |  | |  | | 5 | |  | |  | |  | |  | | 3.2 | |
| 3.15 | Integral equations | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | | 5 | |  | |  | |  | | 3.14 | |
| 3.16 | Mathematical Physics Equations-1 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | | 5 | |  | |  | | 3.4 | |
| 3.17 | Functional analysis -1 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | | 5 | |  | |  | |  | | 3.4 | |
| 3.18 | Functional analysis -2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | | 5 | |  | |  | | 3.17 | |
| 3.19 | Size and Integral | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | | 5 | |  | |  | |  | | 3.4 | |
| 3.20 | Complex analysis -1 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | | 5 | |  | |  | | 3.19 | |
| 3.21 | Probability Theory and Mathematical Sytatistics -1 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 1/2/0/0 |  | |  | |  | |  | |  | |  | | 5 | |  | | 3.4 | |
| 3.22 | Probability Theory and Mathematical Sytatistics - 2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 1/2/0/0 |  | |  | |  | |  | |  | |  | |  | | 5 | | 3.21 | |
| 3.23 | Numerical Analysis -1 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | |  | | 5 | |  | | 3.2 | |
| 3.24 | Applied software Packages | | | 3 | 5 | 125 | | 45 | 3 | 77 | 1/0/2/0 |  | |  | |  | |  | |  | |  | | 5 | |  | | 3.5 | |
| 3.25 | Mathematical Modelling | | | 2 | 3 | 75 | | 30 | 3 | 42 | 1/1/0/0 |  | |  | |  | |  | |  | |  | |  | | 3 | | 3.14 | |
| 3.26 | History of Mathematics | | | 2 | 3 | 75 | | 30 | 3 | 42 | 1/0/1/0 |  | |  | |  | |  | |  | |  | |  | | 3 | | 3.2 | |
| 3.27 | Methods of Optimization | | | 3 | 5 | 125 | | 45 | 3 | 77 | 1/2/0/0 |  | |  | |  | |  | |  | |  | |  | | 5 | | 3.14 | |
| **Total:** | | | | **-** | **125** | **3175** | | **1260** | **81** | **1834** | **-** |  | | | | | | | | | | | | | | | | | |
| **Elective Courses (28 ECTS)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **4** | **Elective Course - 1** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Introduction to Physics | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 | 5 | |  | |  | |  | |  | |  | |  | |  | | - | |
| 4.2 | Introduction to Chemistry | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/0/1/0 | x | |  | |  | |  | |  | |  | |  | |  | | - | |
| 4.3 | Introduction to Biology | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 | x | |  | |  | |  | |  | |  | |  | |  | | - | |
| 4.4 | Introduction to Geography | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 | x | |  | |  | |  | |  | |  | |  | |  | | - | |
| **5** | **Elective Course – 2** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1 | Philosophy | | | 3 | 4 | 100 | | 45 | 3 | 52 | 2/0/0/1 |  | | 4 | |  | |  | |  | |  | |  | |  | | - | |
| 5.2 | History of Georgia | | | 3 | 4 | 100 | | 45 | 3 | 52 | 2/0/0/1 |  | | x | |  | |  | |  | |  | |  | |  | | - | |
| 5.3 | Pedagogics | | | 3 | 4 | 100 | | 45 | 3 | 52 | 1/2/0/0 |  | | x | |  | |  | |  | |  | |  | |  | | - | |
| **6** | **Elective Course – 3** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | Normal Differential Equations - 2 | | | 3 | 4 | 100 | | 45 | 3 | 52 | 2/1/0/0 |  | |  | |  | |  | | 4 | |  | |  | |  | | 3.14 | |
| 6.2 | Theoretical Mechanics | | | 3 | 4 | 100 | | 45 | 3 | 52 | 2/1/0/0 |  | |  | |  | |  | | x | |  | |  | |  | | 3.4 | |
| **7** | **Elective Course – 4** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.1 | Optimal Operation Theory | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | | 5 | |  | |  | | 3.14 | |
| 7.2 | Real Analysis | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | | x | |  | |  | | 3.19 | |
| 7.3 | Foreign Language - 1 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 0/3/0/0 |  | |  | |  | |  | |  | | x | |  | |  | | - | |
| **8** | **Elective Course – 5** | | | | | | | | | | |  | | | | | | | | | | | | | | | | | |
| 8.1 | Complex Analysis - 2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | |  | | 5 | |  | | 3.20 | |
| 8.2 | Discrete Mathematics | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | |  | | x | |  | |  | |
| 8.3 | Foreign Language - 2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 0/3/0/0 |  | |  | |  | |  | |  | |  | | x | |  | | 7.3 | |
| **9** | **Elective Course – 6** | | |  |  |  | |  |  |  |  |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| 9.1 | Numerical Analysis -2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | |  | |  | | 5 | | 3.23 | |
| 9.2 | Mathematical Physics Equation - 2 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 2/1/0/0 |  | |  | |  | |  | |  | |  | |  | | x | | 3.16 | |
| 9.3 | Foreign Language - 3 | | | 3 | 5 | 125 | | 45 | 3 | 77 | 0/3/0/0 |  | |  | |  | |  | |  | |  | |  | | x | | 8.3 | |
| **Total:** | | | |  | **30** | **750** | | **270** | **18** | **462** | **-** |  | | | | | | | | | | | | | | | | | |
| **Overall Total:** | | | |  | **180** | **4550** | | **1815** | **114** | **2621** | **-** |  | | | | | | | | | | | | | | | | | |
|  | **Minor Modules** | | |  | **60** |  | |  |  |  |  |  | |  | | **10** | | **10** | | **10** | | **10** | | **10** | | **10** | |  | |
|  | | **Program Components** |  | | | |  | | | | | |  | |  | |  | |  | |  | |  | |  | |  | |  | |
| University Compulsory Course (Foreign Language) | | | | | | | | | | | | | 5 | | 5 | | 5 | |  | |  | |  | |  | |  | | 15 | |
| Faculty Courses | | | Compulsory | | | | | | | | | | 10 | |  | |  | |  | |  | |  | |  | |  | | 10 | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Specialization Courses | | | Compulsory | | | | | | | | | |  | |  | |  | |  | |  | |  | |  | |  | | 135 | |
| Elective | | | | | | | | | |  | |  | |  | |  | |  | |  | |  | |  | | 30 | |
| ***Note:*** *Academic degree is awarded to a student after passing Minor or Teacher training education Program together with Major Program. Students of the Faculty of Exact and Natural Sciences are offered Minor programs in Mathematics, Physics, Chemistry, Biology, Ecology, Applied Biosciences, Geography, Business Management, Economics, and Tourism. These programs are introduced in 3 – 8 semesters with 10 credit scale each.* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor Credits | | | | | | | | | | | | |  | |  | | 10 | | 10 | | 10 | | 10 | | 10 | | 10 | | 60 | |
| **Total** | | | | | | | | | | | | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | | 240 | |

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| **Program Components** |  |  | |  |  |  |  | |  | |  | |  | |  | |  | |
| University Compulsory Course (Foreign Language) | | | | | | | | 5 | | 5 | | 5 | |  | |  | |  | |  |  | 15 |
| Faculty Courses | | | Compulsory | | | | | 10 | |  | |  | |  | |  | |  | |  |  | 10 |
|  | | | | | | | | | | | | | | | | | | | |
| Specialization Courses | | | Compulsory | | | | |  | |  | |  | |  | |  | |  | |  |  | 135 |
| Elective | | | | |  | |  | |  | |  | |  | |  | |  |  | 30 |
| ***Note:*** *Academic degree is awarded to a student after passing Minor or Teacher training education Program together with Major Program. Students of the Faculty of Exact and Natural Sciences are offered Minor programs in Mathematics, Physics, Chemistry, Biology, Ecology, Applied Biosciences, Geography, Business Management, Economics, and Tourism. These programs are introduced in 3 – 8 semesters with 10 credit scale each.* | | | | | | | | | | | | | | | | | | | | | | |
| Minor Credits | | | | | | | |  | |  | | 10 | | 10 | | 10 | | 10 | | 10 | 10 | 60 |
| **Total** | | | | | | | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | | 30 | 30 | 240 |