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GEORGIAN INSTITUTE
OF PUBLIC AFFAIRS

Name of the Educational Program Software Engineering

Degree title: Master of Software Engineering

Total number of credits required to complete programme: 120

Language of Instruction: Georgian

Level of Higher Education: Master's s degree

Type of the Educational Program: Academic

Program description:

The goal of the Software Engineering master program is to prepare competitive software engineers equipped with modern knowledge and practical skills in the field of information technology and communication, who will be able to respond to the dynamic requirements of the field with innovative methods and approaches and contribute to the development of this field and simultaneously facilitate the open and transparent dissemination of information as well as the establishment of professional ethics in the employment market. The program will prepare professionals with systematic, in-depth theoretical knowledge and the ability to apply it in practice, who will be able to design and create high-performance, reliable and scalable programs.

Goals of the program:

The goal of the Software Engineering master's program is:

- to provide the student with in-depth knowledge of the basic concepts, theories, methods, approaches and international standards of software engineering;
- to provide the student with deep theoretical knowledge and practical experience required for designing modern, high-capacity, high-reliability, high-quality, scalable, easy-to-maintain software in the field of technology;
- to provide the student with practical skills required for inclusive, tailored to the customer's need, high-quality, documented, innovative software;
- to develop the ability of solving complex problems and making decisions based on the analysis of the latest methods and technologies of the field;
- to develop the ability of using tools necessary for the creation of various types of digital product software for state, private and non-governmental organizations, the ability to implement and develop innovative technologies of systematic design and architecture, quality management and testing;
- to develop the ability of working independently and in a team in multidisciplinary environment in compliance with professional ethical norms and principles.

Preconditions for the admission to the program:

The Master's Program in Software Engineering is intended for individuals, who already possess a higher education degree in any field and wish to continue their studies in the field of Software Engineering.

The obligatory prerequisites for enrolling the Master's Degree are:

1) Bachelor's degree or equivalent academic degree;
2) Successfully passing Unified National Master's Examinations;
3) Successfully passing internal procedure of admission, which consists of following steps:
- Analyzing candidate's documentation
- Analysis of the application form, submitted by the candidate, which considers assessment of the applicant's professional biography;

- Successfully passing English language test (B2 level) *. The candidates, who by the moment of the application can either demonstrate a valid language certificate, confirming their corresponding level of fluency (TOEFL IELTS), or proof of graduation from an English-taught undergraduate or postgraduate program, is not required to pass the English language test.
- Successfully passing examination in specialty*, which in its turn aims to assess the candidate's knowledge of the software engineering field.

* Sample examination questions (in English language and specialty) will be posted on the website of the University.

Learning outcomes

Knowledge and understanding

Master student:

- Learning outcome 1 - describes in depth the modern principles, theories, international standards, which are approved and recognized in the field of information technology and communication, the latest trends and approaches necessary for the creation of software;
- Learning outcome 2 - systematically identifies both ethical and legal issues necessary for creating quality, secure and tailored to the customer's need software.
- Learning outcome 3 - defines and outlines in-depth practical and scientific ways to solve problems in the software creation process.

<u>Skills:</u>

Master student:

- Learning outcome 4 - uses the latest tools needed to create various types of digital products and software and independently establishes short-term and/or long-term implementation plans;
- Learning outcome 5 - critically analyzes, using new, original and innovative approaches and based on modern technologies independently implements the practical realization of a high-quality software product in full life cycle from the idea - to the customer, both in a sectoral and interdisciplinary context;
- Learning outcome 6 - independently investigates data based on the newest research methods and technologies, systematically processes and critically analyzes modern and complex professional/academic scientific approaches and information and based on all of it prepares a research paper and develops complex software products;
- Learning outcome 7 - presents the research results, personal conclusions and arguments to the academic and professional society in written and oral form, adhering to the principles of academic integrity and ethics;

<u>Responsibility and autonomy</u>

<u>Master student:</u>

- Learning outcome 8 - directs the work process in the field of software, both - independently and in the team working process, in compliance with professional, ethical and legal norms, and independently adopts new information technologies and communication tools;
- Learning outcome 9 - independently makes decisions and takes responsibility for ways to solve the problems raised during the work process and by introducing original ideas contributes to the development of the software industry;
- Learning outcome 10 - independently assesses its own and team members' professional development needs and plans the long-term future professional development process;

Map of Software Engineering Master Program Goals and Outcomes:

Goals/ learning outcomes	Learning outcome 1	Learning outcome 2	Learning outcome 3	Learning outcome 4	Learning outcome 5	Learning outcome 6	Learning outcome 7	Learning outcome 8	Learning outcome 9	Learning outcome 10
in-depth knowledge of software engineering basic concepts, theories, methods, approaches and international standards;	X		X						X	
deep theoretical knowledge and practical experience required for designing modern, high-capacity, high-reliability, high-quality, scalable, easy-to-maintain software in the field of technology;	X	X	X			X			X	
practical skills required for inclusive, tailored to the customer's need, high-quality, documented, innovative software;				X	X	X			X	
the ability of solving complex problems and making decisions based on the analysis of the latest methods and technologies of the field;					X	X			X	
the ability of using tools necessary for the creation of various types of digital product software for state, private and non-governmental organizations, the ability to implement and develop					X	X	X		X	

innovative technologies of systematic design and architecture, of quality management and testing;										
the ability of working independently and in a team in multidisciplinary environment in compliance with professional ethical norms and principles.							X	X	X	X

Teaching and learning methods:

☒ lecture

☒ team work

☒ practical work

☒ seminar

☒ learning with electronic resources

□ e-learning

☒ other

Academic and visiting staff may use one or more of the abovementioned methods or any other one depending on the task of the particular course. The teaching-learning methods of a specific course are outlined in the syllabus of the relevant study course.

Evaluation system for student knowledge:

The learning component of Master Program of Software Engineering encompasses students' active participation in the teaching process and is based on the principle of continuous assessment of acquired knowledge.

Assessment of acquired knowledge of the program is organized in accordance with the Order No. 3 by the Minister of Education and Science of Georgia, January 5th, 2007 - “The Rule of Calculation of Higher Education Program Credits”.

Evaluation of student’s learning results in each component of the program must include mid-term (Onetime or Multiple) and summative evaluation, the sum of which constitutes final assessment (100 Points).

Mid-term and summative evaluations (evaluation forms) include evaluation component/components, which determine ways/methods to assess student’s knowledge and/or skill and/or competence (written/verbal exam, written/verbal quiz, homework, practical/theoretical work, etc.). Assessment component unites homogeneous assessment methods (test, demonstration, presentation, discussion, practical/theoretical assignment, working in a team, participating in a discussion, etc.). Assessment method/methods are measured by assessment criteria, on the basis of which the level of achievement of learning outcomes is being measured.

Each assessment form and component has certain value, allocated from the final score (100 Points) that is indicated in each Syllabus and is being communicated to students during the beginning of the academic semester.

Credits shall not be awarded by using only one form of evaluation (mid-term or summative evaluation). Student will be granted a credit only on the basis of positive assessment.

The specific share of the minimum competence limit of the software engineering master's program student's midterm and final assessment is reflected in a specific syllabus and is communicated to the student at the beginning of the study semester.

Under the evaluation system there are five types of positive evaluation:

(A) Excellent –91-100 points of evaluation;
(B) Very good –81-90 points of evaluation;
(C) Good – 71-80 points of evaluation;
(D) Satisfactory –61-70 points of evaluation;
(E) Sufficient –51-60 points of evaluation.

Two types of negative evaluation:

(FX) Did not pass – 41-50 out of the maximum evaluation, which means that the student needs to work more to pass the exam and he/she shall be given the possibility only once to retake the examination after the self-study;
(F) Fail – 40 points or less out of the maximum evaluation, which means that the work done by the student is not enough and he/she has to retake the course.

In case of (FX) evaluation in any component of the Software engineering educational program, an additional examination is hold within not later than 5 days after the announcement of the results of the summative examination. The points, awarded to the student at the additional examination shall not be added to the summative evaluation of the student. The evaluation obtained by the student at the additional examination is the summative evaluation and shall be included in the final evaluation of the component of the educational program. In case of taking 0-50 points in the final evaluation, including the evaluation obtained at the additional examination, the student evaluation will be F-0 points.

The evaluation system of the educational component of the master's program of Software Engineering allows:

Five types of positive evaluation

(A) Excellent –91-100 points of evaluation;
(B) Very good –81-90 points of evaluation;
(C) Good – 71-80 points of evaluation;

(D) Satisfactory –61-70 points of evaluation;
(E) Sufficient –51-60 points of evaluation.

Two types of negative evaluation:

(FX) Did not pass – 41-50 out of the maximum evaluation, which means that the master's student is allowed to present the revised master's thesis during the next semester;

(F) Fail – 40 points or less out of the maximum evaluation, which means that the master's student loses the right to present the same master's thesis.

The calculation of the Grade Point Average (GPA) is part of the system of evaluation of the student's knowledge. The student's Grade Point Average (GPA) is calculated by multiplying the evaluation, obtained by the student in every subject of the educational program, to the credits of that subject. The product of multiplication of the subjects and credits is summed up and divided by the total number of the credits of the taken subjects. The weight of the point in the calculation of the average number is:

A = 4
B = 3, 2
C = 2, 4
D = 1, 6
E = 0, 8

Scientific-research component of master's program in Software Engineering (execution and presentation of master's thesis) shall be evaluated either during the same semester or during the following semester, in which student finished the work on it. The scientific-research component of the Software Engineering master's program includes research and practical aspects, the mentioned component must be completed in the field of software engineering and is evaluated only once (final evaluation).

Field of employment:

The Master's program in Software Engineering enables graduates to build successful careers in the private, public and non-governmental sectors which require software design, creation and development. Graduates will also be able to implement independent projects, in the form of individual orders - to create digital products adapted to various purposes and devices. Graduates will be able to use their knowledge and skills in the Georgian and international employment market.

The master of software engineering can be employed in the following positions:

- Software engineer
- System architect
- Database engineer
- System analyst
- Product manager
- DevOps specialist

- Project manager
- Other

Opportunity for continuing education process:

Software Engineering master's program graduates are entitled to continue their studies in other Georgian or Foreign Higher Educational Institutions on a PHD in Information Technologies, which is focused on further training of a specialist and researcher.

A graduate can also continue the studies in a doctoral program in any other field, if the prerequisite for admission to this program is not limited to a master's degree in another field.

Human resources necessary for the program implementation:

Sufficient human resources are being involved in the implementation of the Software Engineering master's program. Educational program components are being led by academic personnel of the University, as well as invited specialists with sufficient experience and competence.

For more information on human resources, see Appendix №2.

Material resources necessary for the program implementation:

To achieve the learning outcomes of the Master's Program in Software Engineering, the University infrastructure and material and technical resources available to students without restrictions will be used, in particular:

- Academic audits and conference halls equipped with appropriate inventory;
- Library, equipped with computer hardware and informational-communicational technologies
- Computer classes, computer hardware connected to internet and internal network and adequate computer software in learning/teaching process;
- Different technical equipment etc.

The educational program is provided with appropriate literature. The University's library provides students with electronic textbooks relevant to the syllabus, educational-methodical and scientific literature, as well as the library's database.

Material resources owned and possessed by the University, ensures the realization of the goals of the Master's Program in Software Engineering to implement its objectives and achieve planned learning outcomes:

Buildings and Structures - the Master's Program in Software Engineering is carried out in the buildings and structures owned and leased by the university, where sanitary-hygienic and safety norms are highly respected (the buildings are equipped with installed alarms, fire extinguishers, video control system takes place on the perimeter, order is maintained by the custodial servant of the university). The building is in full accordance with the technical requirements established for the institutions, lecturing and practicum auditoriums are equipped with relevant technique and inventory (projector, chairs, desks, boards etc.).

Library - In the library of the University the relevant printed and electronic fund of the Master's Program in Software Engineering is preserved, which is available for the students, invited and academic personnel. The library has a reading hall equipped with appropriate equipment (chairs, tables, computers, copier). In the reading hall, students have the opportunity to use internet and international electronic resources (EBSCO; JSTOR; Cambridge Journals Online; BioOne Complete; e-Duke Journals Scholarly Collection; Edward Elgar Publishing Journals and Development Studies e-books; IMechE Journals; New England Journal of Medicine; Open edition Journals; Royal Society Journals Collection; SAGE Premier). The library of the university has electronic catalogue. The library resources include the program's study literature and electronic fund, which ensure the achievement of the intended program outcomes.

Working Space of Academic Personnel:

The working space of academic personnel is equipped with the relevant inventory and technical equipment (chairs, tables, wardrobes, computers with the access to internet, Xerox multifunctional machine).

Information/communication technologies and tools:

The University uses information/communication technologies and tools in order to facilitate the implementation and administration of Master's educational program in Software Engineering. There are computers and relevant programs for the Software Engineering master's program: Visual Studio Community, SQL Management studio, macOS, Xcode, Cisco Packet Tracer, visual studio code, node.js, git client(optional). The auditorium is equipped with appropriate educational equipment (computer, audio-video equipment, projector, table, chair, blackboard). Computer equipment responds to modern requirements, is connected to the Internet and is available for students, academic, visiting and administrative staff. The electronic system of evaluating students' knowledge and organizing teaching process lmb.gipa.ge. is used for the availability of evaluations for students, for the administration staff to monitor students' academic performance and to promote the learning process. Through the web-page, which contains educational programs catalog and information about the learning process, the University provides publicity and accessibility of information.

Heads of the Program:

1. Anastasia Bajiashvili, professor, N 2 Mari Brosset str; Tbilisi, Georgia
   mobile: 999 29 82 25
   e-Mail: n.bajiashvili@gipa.ge

2. Pavle Tabatadze, Associated professor, N 2 Mari Brosset str; Tbilisi, Georgia
   mobile: (995) 555 71 81 66
   e-Mail: p.tabatadze@gipa.ge

Course Distribution of the Soft Engineering Master Program

№	Code of the Course	Prerequisite	Course/module	ECTS credit/hours[1]				Hour Distribution for Students	
				I year		II year		Contact hours 3	Independent hours 4
				semester					
				I	II	III	IV		
			Mandatory/core courses	35	30	30	25		
1.	SE 101	N/A	Software engineering: paradigms	6/150				32	118
2.	SE 102	N/A	Database design	6/150				32	118
3.	SE 103	N/A	Algorithms and data structures	6/150				32	118
4.	SE 104	N/A	Computer network engineering	6/150				32	118
5.	SE 105	N/A	Interactive design	6/150				32	118
6.	SE 106	N/A	Cyber Law	5/125				32	93
7.	SE 201	SE 101 SE 102	Software architecture		6/150			32	118
8.	SE 202	SE 101	Design samples		6/150			32	118
9.	SE 203	N/A	Research methods		6/150			32	118
10.	SE 301	SE 201	Software development and IT operations (DevOps)			6/150		32	118

11.	SE 302	SE 201	IT Project management			6/150		32	118
12.	SE 303	SE 101 SE 104	Software security			6/150		32	118
			Elective Mandatory Courses	6					
1.	SE 204	SE 101 SE 102	Web Apps Engineering ASP.NET Core on the basis of MVC	6/150				32	118
2.	SE 205	SE 101 SE 102	Android Apps Engineering	6/150				32	118
3.	SE 206	SE 101 SE 102	iOS Apps Engineering	6/150				32	118
4.	SE 207	SE 101 SE 102	Games programming	6/150				32	118
5.	SE 208	SE 101 SE 102	Web apps engineering on the basis of React	6/150				32	118
			Elective courses of the specialty	6		12			
1.	SE 209	SE 101	Software testing	6/150				32	118
2.	SE 210	SE 104	Computer network administration	6/150				32	118
3.	SE 211	N/A	Product management	6/150				32	118
4.	SE 304	SE 201	Distribution systems			6/150		32	118
5.	SE 305	SE 205 ან SE 206	Scalable Mobile Apps			6/150		32	118
6.	SE 306	SE 201	Technical interview			6/150		32	118
7.	SE 307					6/150		32	118

		SE 201	Cloud services based on Azure						
8.	SE 308	SE 210	Diagnosing and fixing network problems			6/150		32	118
9.	SE 309	N/A	Artificial Intelligence (Machine Learning)			6/150		32	118
10	SE 310	SE 201	Agile project management			6/150		32	118
		Master thesis							
1	SE 401	All mandatory courses	Master thesis				25/625		
Semester credits				35	30	30	25		
Year credits				65		55			
Total				120					

Curriculum map

The map presents learning outcomes in relation to mandatory courses, the information which course leads to which learning outcome, by indicating the appropriate level.

Courses are presented in three levels:

a) Courses oriented on introduction (I-Introduction)
b) Courses oriented on deepening (D -Development)
c) Courses oriented on reinforcement (M - Mastering).

Course and outcomes intersection box indicates the level - I, D or M.

To access the program outcomes, each course is presented in relation to the program outcomes. If the study of a course leads to learning outcome, one or more outcome indicators - I, D, M - are indicated in the box of the intersection of the course and the outcome.

Learning outcome	Learning outcome 1	Learning outcome 2	Learning outcome 3	Learning outcome 4	Learning outcome 5	Learning outcome 6	Learning outcome7	Learning outcome 8	Learning outcome 9	Learning outcome 10
I semester										
Name of the course										
Software engineering: paradigms	I		I	I				I		
Database design	I		I	I				I	I	

Algorithms and data structures	I		I			I		I	I	
Computer network engineering	I		I							
Interactive design		I	I		I		I			
Cyber law	I	I					I	I		I
II semester										
Software architecture	D	I	D		D			D	D	
Design samples	D		D	D				M	D	D
Research methods						D	M		D	

III semester										
Software development and IT operations (DevOps)			M	D	M					D
IT project management					M		D	M	D	M
Software security		D	D						D	
IV semester										
Master thesis	M	M	M	M	M	M	M		M	

Appendix №1

Head of the Program
(CURRICULUM VITAE)

Name, surname	Anastasia Bajiashvili			
Position	Academic staff, professor			
Contact information	mobile:	599 29 82 25	e-mail:	n.bajiashvili@gipa.ge
Thesis Defended and Areas of academic/scientific research	Dissertation title: "Design and optimization of business processes in a large enterprise" Information technologies, IT management, optimization, automation, complex architecture projects			
Publications	Publications: - "The role of information technology in the international division of labor and the operation of transnational corporations” - "Modern Bank Business and IT Strategy in Financial Crisis" - "Methods of business analysis in business processes" - "Process-oriented management in modern organization" - "Design of organizational structures" - "Computer modeling of business processes" - "Types of business processes and their computer analysis" - "Design and optimization of business processes in large enterprises" - "Development of the economic variable over time" - "Marketing management and its informational support" - "The impact of information technology strategy on business" - "Use of models and modeling in the theory of business processes" - "Methods of information system assessment"			

	- "Implementation of the ideology of business processes in a higher educational institution" - "Research, Evaluation and Improvement of Management Methods of Educational Process in Higher Educational Institutions" - "The role of information technologies in the reengineering of the organization" - "Building Successful Project Teams" Monographs: - "The role of information systems and technologies in effectiveness of business process management and their impact on the organization's activities on the example of banks" - "The role of modeling in designing and optimizing business processes" - "Design and optimization of business processes of a large enterprise"

Name, surname	Pavle Tabatadze			
Position	Academic staff, associated professor			
Contact information	mobile:	555 71 81 66	e-mail:	p.tabatadze@gipa.ge
Thesis Defended and Areas of academic/scientific research	Dissertation title: "Smart farm - management of agricultural processes"			
Publications	1. "IOT systems and automation mechanisms" 2. Farming automation and control 3. System security and modern farm management systems			

Appendix №2

Information about Human Resources

№	Name, surname	Status	Course
1.	Anastasia Bajiashvili	Professor	IT project management Interactive design; Web apps engineering on the basis of React
2.	Pavle Tabatadze	Associated professor	Design samples Game programmimg Android Apps engineering Agile Projects management Product management
3.	Shota Ioramishvili	Assistant	iOS Apps engineering Scalable Mobile Apps
4.	Alex Amniashvili	Assistant professor	Design of data Cloud services based on Azure
5.	Mari Melikishvili	Assistant professor	Software engineering: Paradigms Web. Apps engineering ASP.NET Core on the basis of MVC
6.	Vano Tsertsvadze	Professor	Research methods
7.	Tamar Kapanadze	Assistant professor	Software architecture Distribution systems Technical interview
8.	Nino Lolashvili	Professor	Artificial Intelligence (Machine Learning)

9.	Gulnara Kotrikadze	Invited lecturer	• Software security
10.	Tato Chutlashvili	Invited lecturer	• Software engineering • Computer network administration • Diagnosing and fixing network problems
11.	Alina Tkabladze	Invited lecturer	• Software testing
12.	Zakro Kapanadze	Invited lecturer	• Cuber law
13.	Sopho Gelashvili	Invited lecturer	• Software development and IT operations (DevOps)
14.	Sopho Gogoladze	Professor	• Algorithms and data structures