NJSC «K.I. Satbayev Kazakh National Research Technical University»
E. Turkebayev Project Management Institute
Scientific and Educational Center of Mathematical Economics

CURRICULUM PROGRAM

«MATHEMATICAL ECONOMICS AND DATA ANALYSIS»
Bachelor of Information and Communication Technologies

Based on invalidated classification of specialty:
5B070500 – "Mathematical and Computer Modeling"
5B050600 – "Economics"
5B050900 – "Finance"

1st edition
in correspondence with the national standard of education of the Republic of Kazakhstan 2018

Almaty 2018

Designed by the Scientific and Educational Centre of Mathematical Economics	Reviewed by the Academic Committee of the Project Management Institute	Approved by the Academic Committee of Satbayev University	Page 1 of 30

The program is compiled and signed by

Программа составлена и подписана сторонами:

от КазНИТУ им К.Сатпаева:

1. Директор НОЦМЭ: А. Алдашев

2. Директор ИУП: Л. Салыкова

От работодателей:
    1. Олжас Худайбергенов, CSI, старший партнер (Центр
       стратегических инициатив, Астана)

Approved at the Session of Educational and Methodological Board of NJSC «K.I. Satbayev Kazakh National Research Technical University».
Protocol №3 of 19.12.2018.

Qualification:
Level 6 of the National Register of Qualifications:
6B061 Information and Communication Technologies (bachelor):
6B06 Information and Communication Technologies

Professional competency:
Analysis of economic data, programming languages, economic conclusions based on economic theory and empirical data.

Brief description of the program

- *Preparation of professional economists for work in the financial sector (including Central Banks), government and international organizations. Moreover students receive necessary knowledge to continue studies in the Master's program with similar specialization.*
- *Advance training in mathematics, statistics, economics and programming, in particular data analysis.*
- *The program includes preparation in three main subject blocks: economics; mathematics; statistics and data analysis.*

Requirements for incoming students

- *Description of the general requirements for admission:*
  - based on the application of an enrolee, who completed secondary, or specialized education in full;
  - on a competitive basis in accordance with the results of the Unified National Test with a minimum score of 65 points.
- Special requirements for admission to the program apply to the graduates of 12-year schools, colleges, applied bachelor's degree programs, NIS, etc.:
  - Level of English Language with an IELTS score of 6 or higher (5.5 or more in each section);
  - Score on the mathematics Cambridge exam of B or higher or Advanced Placement Calculus Exam score of 3 or more.

The rules for accepting credits for accelerated education on the basis of previous studies at 12-year schools, colleges and higher education.

Code	Type of competency	Description of competency	Result of competency	Department Responsible
GENERAL (means full training, depending on the level of knowledge)				
G1	Communication skills	- Fluent monolingual oral and written communication skills; - Ability to communicate in a second language; - Ability to use communication skills in different situations; - Basic academic writing skills in their native language; - Diagnostic test to determine the level of language ability.	Full 4-year training with a minimum of 240 academic credits (with 120 hours of in-person training) with a possible acceptance of credits in the second language, in which the student proves an advanced level of knowledge. The level of language ability is determined by the diagnostic test.	Department of Kazakh and Russian Languages, Department of English Language
SPECIALIZED (means accelerated education due to the acceptance of academic credits based on level of knowledge and competencies for graduates of 12-year schools, colleges and universities, including those specializing in humanities and economics)				
S1	Communication skills	- Fluent bilingual oral and written communication skills; - Ability to communicate in a third language;	Full acceptance of previous credits for languages (Kazakh and Russian)	Department of Kazakh and Russian Languages

		- Ability to write texts of different styles and genres; - Deep understanding and interpretation of one's own work with a certain level of complexity (essay); - Basic aesthetic and theoretical literacy as a condition for full perception, and interpretation of original text.			
S2	Mathematical Literacy	- Special mathematical thinking using induction and deduction, generalization and specification, analysis and synthesis, classification and systemization, abstraction and analogy; - Ability to formulate, substantiate and prove the theorems; - Application of common mathematical concepts, formulas and extended spatial awareness in order to solve mathematical problems; - Full understanding of the basics of mathematical analysis.	Full acceptance of previous credits for Calculus I course	Mathematics Department
S3	English language	- Readiness for further self-study in English language in different fields of knowledge; - Willingness to gain experience working with projects and in research using English language.	Full acceptance of previous credits for English language from academic to professional level (up to 15 credits)	Department of English Language
S4	Computer skills	- Basic programming skills in one modern language; - Using software and applications to study different subjects; - Receiving an internationally accepted certificate of programming language knowledge.	Full acceptance of previous credits for Introduction to Information and Communication Technologies and Information and Communication Technologies	Department of Software Engineering
S5	Social and humanitarian abilities and behaviour	- Understanding and awareness of responsibility of every citizen for the development of the country and the world; - Ability to discuss ethical and moral aspects of society, culture and science.	Full acceptance of previous credits for Modern History of Kazakhstan (excluding state exam)	Social Studies Department
		- Critical understanding and ability to discuss and debate	Full acceptance of previous credits for	

|		modern scientific hypotheses and theories.	Philosophy and other Social Studies subjects	
PROFESSIONAL (means accelerated education due to the acceptance of academic credits based on level of knowledge and competencies for graduates of 12-year schools, colleges and universities, including those specializing in humanities and economics)				
P1	Professional competencies	- Critical understanding and a deep knowledge of professional competencies at level 5 or 6 - Ability to discuss and debate professional issues as part of the mastered programme	Full acceptance of previous credits for basic professional subjects	Graduating department
P2	Socio-economic competencies	- Critical understanding and cognitive ability to discuss contemporary social and economic issues - Basic understanding of economic assessment and profitability of projects.	Full acceptance of previous credits for social studies, technology and economics as electives.	Graduating department

The University may refuse to accept the credits if low level of knowledge is confirmed or the final grades were lower than A and B.

Requirements for completing your studies and getting a diploma

- *Description of the general requirements for graduation and receiving a bachelor's degree:* passing at least 240 academic credits of theoretical studies and final diploma project or state exam.

Major Curriculum of the Program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN SATBAYEV UNIVERSITY
New School of Economics
Project Management Institute

SATBAYEV UNIVERSITY

APPROVED
Rector of Satbayev University
_____ Beisembetov I.
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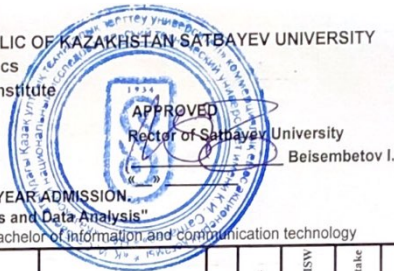
MAJOR CURRICULUM FOR 2019-2020 ACADEMIC YEAR ADMISSION.
6B06101, 6B04102, 6B04101-"Mathematical Economics and Data Analysis"

Full-time study   Study duration: 4 years   Academic degree: Bachelor of information and communication technology

Year of study	Code	Name of discipline	Cycle	Credits	lec/lab/pr/ ISW	Code of retake	pre-requisites	Year of study	Code	Name of discipline	Cycle	Credits	lec/lab/pr/ ISW	Code of retake	pre-requisites
		1 semester								**2 semester**					
1	LNG101	Kazakh (Russian) language (A2)	G	4	0/0/2/2	S1	test	1	NSE113	Introduction to calculus II	B	8	2/0/2/4	S2	
	NSE103	Introduction to calculus I	B	8	2/0/2/4	S2			NSE112	Introduction to statistics II	B	8	0/0/4/4	S3	
	NSE102	Introduction to statistics I	B	8	0/0/4/4	S3			NSE111	English language 2	G	12	0/0/6/6	S4	
	NSE101	English language (G1,G2,G3,G4)	G	12	0/0/6/6	S4	test		HUM100	Modern history of Kazakhstan	G	6	1/0/2/3	S6	
		TOTAL:		32	32					**TOTAL:**		34	34		
		3 semester								**4 semester**					
2	HUM124	Psychology	G	6	1/0/2/3	no		2	CSE174	Information and communication technologies	G	6	2/0/1/3	S5	
	NSE104	Introduction to economics: Microeconomics	B	8	2/0/2/4	no			NSE131	Introduction to economics: Macroeconomics	B	8	2/0/2/4	no	
	NSE105	Statistics 1	B	6	2/0/1/3	no	NSE112		NSE132	Statistics II	B	6	2/0/1/3	no	NSE112
	NSE106	Calculus 1	B	6	2/0/1/3	no	NSE113		NSE133	Calculus II	B	6	2/0/1/3	no	NSE113
	NSE107	Algebra 1	B	8	2/0/2/4	no	NSE113		NSE134	Algebra II	B	8	2/0/2/4	no	NSE113
									MNG113	Entrepreneurship	G	4	1/0/1/2	no	
		TOTAL:		34	34					**TOTAL:**		38	38		
		5 semester								**6 semester**					
3	NSE121	Academic writing	G	6	0/0/3/3	no		3	3218	Elective discipline	B	6	2/0/1/3	no	
	NSE403	Further Calculus 1	B	6	2/0/1/3	no	NSE133		NSE413	Further linear algebra II	B	4	1/0/1/2	no	NSE134
	NSE404	Further linear algebra 1	B	4	1/0/1/2	no	NSE134		NSE411	Macroeconomics	B	6	2/0/1/3	no	NSE131
	NSE401	Microeconomics	B	6	2/0/1/3	no	NSE104		NSE412	Econometrics II	S	6	2/0/1/3	no	NSE131, NSE132
	NSE402	Econometrics 1	B	6	2/0/1/3	no	NSE104, NSE132		CSE628	Python language in scientific activity	S	6	2/1/0/3	no	CSE155, MAT128
	NSE405	Abstract mathematics 1	B	6	2/0/1/3	no	NSE134		HUM126	Social & Political Knowledge	G	8	4/0/0/4	S6	
		TOTAL:		34	34					**TOTAL:**		36	36		
		7 trimester								**8 trimester**					
4	CSE164	Algorithms and data structures	B	6	2/1/0/3	no	CSE616	4	4307	Elective discipline	S	6	2/0/1/3	no	
	4303	Elective discipline	S	6	2/0/1/3	no			4308	Elective discipline	S	6	2/1/0/3	no	
	4304	Elective discipline	S	6	2/0/1/3	no			4309	Elective discipline	S	6	2/0/1/3	no	
	4305	Elective discipline	S	6	2/0/1/3	no			CSE633	R language in statistical analysis problems	S	6	2/1/0/3	no	MAT128
	4306	Elective discipline	S	6	2/0/1/3	no			ECA001	Preparation and writing of graduation diploma (project)	FA	4	0/0/2/2		
	ECA001	Preparation and writing of graduation diploma (project)	FA	4	0/0/2/2				ECA103	Thesis defense (project) / Passing the State Exam	FA	6	0/0/3/3		
		TOTAL:		34	34					**Total:**		34	34		

Year of study	Code	Name of dicsipline	Credits	Semester
		Additional academic programs (AAP)		
1	AAP106	Physical education I	0	1
1	AAP118	Physical education II	0	2
3	AAP103	Industrial and undergraduate internship	2	6
2-3	AAP500	Military training	0	3-6

Cycle of disciplines	compulsory	electives	total
	Total number of credits	**Credis**	
Cycle of general disciplines (G)	64	0	64
Cycle of Basic disciplines (B)	132	6	138
Cycle of Special disciplines (S)	18	42	60
Total of theoretical study:	214	48	262
Additional academic programs (AAP)	4	0	4
Final attestation (FA)	14	0	14
TOTAL:	232	48	280

Decision of the Academic Council Satbayev University. Minutes № , " " 20 .
Decision of the Educational and Methodological Board of Satbayev University. Minutes № " " 20 г.
Decision of the Academic Council of the SCIENTIFIC AND EDUCATIONAL CENTER OF MATHEMATICAL ECONOMICS .
Minutes № , " " 20 .

Vice-rector for academic affairs   Iskakov R.

Chairman of Academic Planning Committee   Tulegenova K. B.

Director of the Project Management Institute   Subalova M.

Director of scientific and educational center of mathematical economics   Aubakirova S.

Catalogue of elective disciplines for 2019-20 academic year admission

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN SATBAYEV UNIVERSITY

New School of Economics

Project Management Institue

SATBAYEV UNIVERSITY

APPROVED

Project management Institute

_____ M. A. Subalova

ELECTIVE DISCIPLINES FOR 2019-2020 ACADEMIC YEAR ADMISSION.

6B06101, 6B04102, 6B04101 -"Mathematical Economics and Data Analysis"

Full-time study   Study duration: 4 years   Academic degree: Bachelor of information and communications technology

Year of study	Elective code	Discipline code	Name of discipline	Cycle	Credits	Lec/lab/pr/ ISW	pre-requisites
6 semester (SPRING 2022)							
3	3218	NSE425	Abstract Mathematics II	B	6	2/0/1/3	
		NSE426	Game Theory			2/0/1/3	
		NSE424	Optimization theory			2/0/1/3	
			TOTAL:		6	6	
7 trimester (AUTUMN 2022)							
4	4303	NSE421	Indistrial Economics 1	S	6	2/0/1/3	
		NSE435	Financial Econometrics			2/0/1/3	
		NSE434	Labour Economics			2/0/1/3	
	4304	NSE426	Game Theory	S	6	2/0/1/3	
		NSE424	Optimization theory			2/0/1/3	
		NSE421	Indistrial Economics 1			2/0/1/3	
	4305	NSE421	Indistrial Economics 1	S	6	2/0/1/3	
		NSE424	Optimization theory			2/0/1/3	
		NSE434	Labour Economics			2/0/1/3	
	4306	NSE435	Financial Econometrics	S	6	2/0/1/3	
		NSE421	Indistrial Economics 1			2/0/1/3	
		NSE426	Game Theory			2/0/1/3	
			TOTAL:		24	24	
8 trimester (SPRING 2023)							
	4307	NSE431	Industrial Economics 2	S	6	2/0/1/3	
		CSE604	Database theory			2/0/1/3	
		CSE188	Machine learning			2/0/1/3	
	4308	CSIS045	Big Data	S	6	2/0/1/3	
		NSE431	Industrial Economics 2			2/0/1/3	
		CSE188	Machine learning			2/0/1/3	
	4309	CSE188	Machine learning	S	6	2/0/1/3	
		CSIS045	Big Data			2/0/1/3	
		CSE604	Database theory			2/0/1/3	
			TOTAL:		18	18	

Total number of elective discipline credits	
Cycle of disciplines	Credits
Cycle of general disciplines (G)	0
Cycle of Basic disciplines (B)	6
Cycle of Special disciplines (S)	42
Total:	48

Decision of the Academic Council of the Project Management Institute. Protocol #____ from _____

Director of Scientific and educational center of mathematical economics   Aubakirova S.

Descriptors of level and scope of knowledge, skills, and competencies

A – knowledge and understanding:

A1 – Understanding of the basics of micro- and macroeconomics, and probability theory. Knowledge of mathematical methods used in economic analysis.

A2 -

A3 -

B – application of knowledge and understanding

B1 – Self-study and development of different methods for solving professional problems using theoretical and practical knowledge.

B2 -

B3 -

C – formation of judgements

C1 – ability to make conclusions and give recommendations based on economic data.

C2 -

C3 -

D – personal abilities

D1 – demonstrate interest in using economic theory and advanced methods of quantitative analysis in order to understand economic processes.

D2 -

D3 -

Competencies at the completion of studies

B – Basic knowledge, abilities and skills

B1 - Understanding of the basics of micro- and macroeconomics, and probability theory. Knowledge of mathematical methods used in economic analysis.

B2 -

B3 -

P – Professional competencies, including required professional and industrial standards

P1 – Know programming basics in order to manage databases. Ability to analyse data using methods statistical and econometric analysis.
P2 -
P3 -

O - Human, social and ethical competencies
O1 – Fluent knowledge of English language for business communication, as well as reading professional literature in English.
O2 -
O3 -

C – Specialized and management competencies
C1 – Explanation of conclusions and their proof based on empirical data, correct usage of information. Ability to generalize conclusions and give recommendations based on economic data. Ability to make management decisions based on critical analysis.
C2 -
C3 -

Policy for receiving the Minor degree

In case of passing at least 12 academic credits from the Computer Science Programme, including the following required subjects (if offered):
M1 – Algorithms and Data Structures
M2 – Object-oriented programming
M3 – Database theory 1
the student receives an additional Minor degree in Computer Science with an addition to the main diploma.

In case of passing at least 12 academic credits from the Information Systems Programme, including the following required subjects (if offered):
M1 – Modern methods of database management
M2 – Introduction to Big Data
M3 – Basics of Cloud Technology
the student receives an additional Minor degree in Information Systems with an addition to the main diploma.

Diploma supplement based on the ECTS standard

ECTS – European Credit Transfer and Accumulation System is a pan-European system system of accounting for students' academic work during the study of an educational program or course. In practice, the ECTS system is used when students transfer from one educational institution to another throughout the European Union and other countries, who have adopted this system, including the Republic of Kazakhstan. The Diploma supplement based on the ECTS standard is an effective instrument for ensuring academic and professional mobility in the European Higher Education system.

The main aim of the supplement is to provide full independent data that ensures international transparency and leads to academic and professional acceptance of qualifications (diplomas, degrees, certificates, etc.).
To get a bachelor's degree you need to get 240 academic credits.
The supplement consists of 8 mandatory sections in English/Kazakh/Russian languages. It is a standardized text that confirms that the supplement is compliant with European standards.

Section 1: Information about the qualification holder: the full name (as recorded in the passport), date and place of birth, identification number or student code.

Section 2: Information about the qualification obtained: the name of the qualification, Major, Minor (if any), the name and status of the higher education institution conferring the qualification in the native language, the name and status of the higher education institution awarding the qualification in English, language of study and examination.

Section 3: Information on the level of qualification: the level of qualification - undergraduate (graduate, or doctoral), the duration of study, entry requirements.

Section 4: Information about the content of study and the results obtained: the form of studies (full, remote, or accelerated), the program requirement (the required amount of credits for the program), the content of the educational program (compulsory and elective disciplines, coursework completed by the student, internships, a diploma project showing the complexity of the subject, coursework and dissertations, status (mandatory, optional, additional), final grades) in the RK and ECTS credits, national assessment scale approved by the MOE of RK and its description, the mechanism for transferring grades to the European system, the general classification of qualifications.

Section 5: Professional qualification characteristics: does the qualification give an opportunity to move to the next level of education and what requirements for this must be fulfilled, professional status (which professional rights students acquire with the qualification).

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Section 6: Additional information: additional information about the university, additional sources of information.

Section 7: Supplement certification: indicate the date of qualification, date of issuance, name, name of the official certifying the diploma supplement, signing the diploma itself; All this information is stamped.

Section 8: Information on the National Higher Education System.

This supplement is issued only at the end of studies upon the application of a graduate on a remunerative basis according to the norms established by the university.

To obtain the supplement, you must submit a written (electronic) application to the university office with a copy of the payment receipt.

The supplement is issued by the Office of the Registrar within 15 business days from the date of application and is registered in the journal of issuance and registration of diplomas and applications. Application forms are stored in the Office of the Registrar. An electronic record of the issuance of this Diploma Supplement is generated in the graduate's personal portfolio on the university portal.

Introduction to Calculus I, II

CODE – NSE103-113
CREDITS – 16 (4/0/4/8)
PREREQUISITE – no

MAIN GOAL AND TASKS OF THE COURSE
The course is designed for students studying economics. Its main goal is to teach methods of calculus that are used in creating mathematical models for different economics and finance courses, including banking, management and accounting.

BRIEF DESCRIPTION OF THE COURSE
It includes four parts:
1) Functions and Graphs,
2) Limits and Continuity,
3) Derivatives,
4) Applications of Derivatives.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will acquire the ability to think analytically about problems, to solve them using mathematical techniques and to give correct interpretation of the results. This course prepares the students for the Advanced Placement Test.

Introduction to Statistics I, II
CODE – NSE102-112
CREDITS – 16 (4/0/4/8)
PREREQUISITE – no

MAIN GOAL AND TASKS OF THE COURSE
The main goal is to introduce students to the main concepts and tools used for collecting, analysing and interpreting information.

BRIEF DESCRIPTION OF THE COURSE
It includes four parts:
1) Statistics basics; summarizing data,
2) Selecting data and experiments: planning and conducting studies,
3) Probability Theory,
4) Assessment of population parameters and checking hypotheses.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will acquire the ability to use statistical methods to analyse data and check hypotheses.

Statistics I, II

CODE – NSE105-132
CREDITS – 12 (4/0/2/6)
PREREQUISITE – Introduction to Statistics I, II

MAIN GOAL AND TASKS OF THE COURSE
The main goal is to deepen the knowledge received during the Introduction to Statistics I, II courses. This subject will introduce students to regression, variance and time-series analysis.

BRIEF DESCRIPTION OF THE COURSE
The main topics are:
- Hypothesis testing
- Regressions
- Analysis of categorical data
- Analysis of variance
- Time-series analysis and forecasting

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will acquire the ability to use statistical methods to analyse data and check hypotheses. Students will be able to make conclusions based on the statistical data analysis. They will understand how to use assumptions and how to critically assess their veracity. They will also know how to choose the best statistical method for each problem.

Modern History of Kazakhstan

CODE – HUM113
CREDITS – 6 (1/0/2/3)
PREREQUISITE – no

MAIN GOAL AND TASKS OF THE COURSE

The aim of the course is to introduce technical students to the main theoretical and practical achievements of the national historical science on the problems of the history of modern Kazakhstan, a comprehensive and systematic study of the main stages of the formation and development of Kazakhstan's society.

1. Analyse the peculiarities and contradictions of Kazakhstan's history during the Soviet period;
2. Reveal the historical content of the basics of the regularities of political, socio-economic and cultural processes at the stages of the formation of an independent state;
3. Contribute to the civic position of students;
4. Educate students in the spirit of patriotism and tolerance, belonging to their people, the Motherland.

BRIEF DESCRIPTION OF THE COURSE

The Course Modern History of Kazakhstan is an independent discipline and covers the period from the beginning of the twentieth century to the present day. The modern history of Kazakhstan is studying the national liberation movement of the Kazakh intelligentsia in the early 20th century, the period of the establishment of the Kazakh ASSR, as well as the process of becoming a multinational society.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE

1. Knowledge of the events, facts and phenomena of Kazakhstan's modern history;
2. Knowledge of the history of the ethnic groups that inhabit Kazakhstan;
3. Knowledge of the main stages of the formation of Kazakh statehood;
4. Ability to analyse complex historical events and predict their further development;
5. Ability to work with all kinds of historical sources;
6. Ability to write essays and scientific articles on the history of the Motherland;
7. Ability to operate in historical terms;
8. Ability to lead a discussion;
9. Skills of independent analysis of historical facts, events and phenomena;
10. Public speaking skills.

Kazakh/Russian Language

CODE – LNG101
CREDITS – 4 (0/0/2/2)
PREREQUISITE – diagnostic test

MAIN GOAL AND TASKS OF THE COURSE
1. Listen to statements on well-known topics: home, studies, leisure time;
2. Understand texts on personal and professional topics containing the most common words and expressions;
3. Talk about common topics, describe your experiences, express your opinion; retell and evaluate the content of a book or a film;
4. Write simple texts on well-known topics, including those related to professional activities.

BRIEF DESCRIPTION OF THE COURSE
The material of the course was designed so that the student, who knows the minimum level of lexicon and grammar, can learn about typical situations and communication strategies associated with them. He should be able to correctly assess them and choose the appropriate model (strategy) of speech and behaviour. The main focus of the training is shifted from transferring knowledge to teaching students the ability to use the language through various activities, such as reading, listening (under the same conditions) and writing complex texts with a certain degree of grammatical and lexical correctness.
The material for the lessons is chosen so that the students acquire the skills of reading, writing and listening comprehension. They will also master the basics of grammar (phonetics, morphology and syntax).

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
If the student actively participates in classes and works diligently at home, he will acquire language skills corresponding to level A2 in the pan-European ALTE classification, which means that he has mastered the basics of the language.

English Language I, II
CODE – NSE101-111
CREDITS – 24 (0/0/12/12)
PREREQUISITE – diagnostic test

MAIN GOAL AND TASKS OF THE COURSE
(1) To raise the students' English language proficiency to the level of a modest user (IELTS 5.0 – 5.5)
(2) To prepare students to use English in their further academic study
(3) To foster the students' interest in learning

BRIEF DESCRIPTION OF THE COURSE
The course is offered to students who have achieved a 4.0 on the IELTS test. It is designed to raise the students' language competence to the required international standards of academics and future professional needs. The course requires regular guided practice for all four skills (listening, speaking, reading and writing) concentrating on teaching written and spoken expression that is precise and demonstrates higher level thinking skills. Academic English has its own vocabulary and special characteristics that distinguish it from General or Professional English.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Upon successful completion of the course, the student will be able to:
• recognize and understand selected academic words when seen in context;
• develop the micro skills of a competent reader, including skimming, scanning, note-taking, and guessing the meanings of unknown words;
• identify the topic, main idea/thesis, and argument structure when reading and listening;
• distinguish fact from opinion and recognize point of view in reading and listening passages;
• choose a note-taking strategy that enables him or her to best understand and remember lecture content;
• use the writing process (planning, drafting, editing, revising) to clearly express and support an opinion in paragraphs and essays;
• write an extended essay using basic research;
• use APA references and citation style.
The course is designed to help the students develop their English language competence for their current academic studies. It aims to broaden and expand the students' proficiency and knowledge in General and Academic English by developing Listening, Reading, Writing and Speaking skills and providing opportunities for building up vocabulary and improving grammar.

Information and communication technologies

CODE – CSE174
CREDITS – 6 (2/0/1/3)
PREREQUISITE – no

MAIN GOAL AND TASKS OF THE COURSE
Learning how to apply modern information technology in their professional activities. The course's objectives include:
1. Discover the basic concepts of computer system architecture;
2. Discover the basic concepts of information and communication technologies and substantive terminology;
3. Work with software interfaces of operating systems;
4. Work with data in different views, both structured and unstructured;
5. Apply the basic principles of information security;
6. Discover the concepts of data formats and media content; learn how to work with typical media data-processing applications; use modern presentation approaches;
7. Discover the concepts of modern social, cloud and email platforms and how to work with them;
8. Learn to use algorithms and programming techniques to solve business process automation problems

BRIEF DESCRIPTION OF THE COURSE
The course contains a training program aimed at giving students' basic knowledge in the field of information and communication technologies. It contains a complete set of topics from the Standard Government-Approved Curriculum, with an emphasis on practical data skills, algorithmization and programming. The course is designed to teach students not only basic concepts of architecture and modern infrastructure of information and communication technologies, but also how to use these tools in practice. Students learn how to:
- optimize processes,
- apply appropriate models and methods and solve practical problems using modern methods and tools of information technology,
- automate routine processes,
- be productive and effective.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will know about:
- Computers;
- Architecture of the computing systems;

- Information and communication technology infrastructure;
- Interfaces of modern operating systems;
- Modern tools for dealing with data of various nature and purpose;
- Types of information security threats, principles, tools, and methods for data protection;
- Python programming language.

Students will be able to:
- Work with interfaces of modern operating systems;
- Use state-of-the-art applied software to work with different types of data;
- Apply modern social, cloud, mail platforms to organize business processes;
- Program in an algorithmic programming language;
- Analyze, design, implement, test and evaluate information and communication technology systems.

Introduction to Microeconomics

CODE – NSE104
CREDITS – 8 (2/0/2/4)
PREREQUISITE – no

MAIN GOAL AND TASKS OF THE COURSE
The main goal is introducing students to economic theory as a social science. Students will learn how to use the main analytical tools for economic analysis

BRIEF DESCRIPTION OF THE COURSE
Main topics:
Consumer Choice Theory: utility, indifference curves, income and substitution effects, elasticity, consumer surplus;
Theory of the firm: production function; isoquants and isocosts; profit maximization; short-run and long-run costs;
Markets: supply and demand; perfectly competitive market; monopoly; monopolistic competition; oligopoly; game theory;
Markets for factors of production: supply and demand for inputs;
Externalities and public goods.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will learn how to use economic models to describe and analyse real-life economic problems. They will also know the benefits and limitations of the different methods of economic analysis. By the end of the course students will understand the main conclusions derived from economic analysis and their organisational and policy implications. They will be able to participate actively in debates on economic matters and think about the world around them as economists.

Introduction to Macroeconomics

CODE – NSE131
CREDITS – 8 (2/0/2/4)
PREREQUISITE – no

MAIN GOAL AND TASKS OF THE COURSE

The main goal is introducing students to the principles of macroeconomics and its differences with microeconomics. Students will learn how to use the main analytical tools for macroeconomic analysis. They will understand the differences in the assumptions of Keynesian and Neoclassical theories.

BRIEF DESCRIPTION OF THE COURSE

Main topics:

Aggregation: problem of aggregation; added value; real and nominal GDP;

Market for goods: consumption; investment; government spending; spending multiplier; imports and exports; IS curve

Money market: demand and supply of money; role of Central Bank; interest rate and bonds market; LM curve;

Equilibrium: IS-LM model; fiscal and monetary policies;

Inflation: Keynesian and Neoclassical approaches to price and wage-setting; Phillips curve; quantity theory of money;

Unemployment: types of unemployment; causes of unemployment;

Open economy: exchange rate regimes; capital mobility; interest rate; effect of fiscal and monetary policies with no capital mobility and perfect capital mobility;

Economic growth: technological progress; capital accumulation; convergence; endogenous growth;

International trade: absolute and comparative advantage; gains from trade.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE

Students will learn how to use economic models to describe and analyse real-life economic problems. They will also know the benefits and limitations of the different methods of economic analysis. By the end of the course students will understand the main conclusions derived from economic analysis and their organisational and policy implications. They will be able to participate actively in debates on economic matters and think about the world around them as economists.

Calculus I, II

CODE – NSE106-133
CREDITS – 12 (4/0/2/6)
PREREQUISITE – Introduction to Calculus I, II

MAIN GOAL AND TASKS OF THE COURSE

The course is designed for students studying economics. Its main goal is to teach methods of calculus that are used in solving problems in economics and finance.

BRIEF DESCRIPTION OF THE COURSE

This course develops basic mathematical methods and concepts of calculus and will include their applications to problems in economics, management and related areas.

Basics: Revision of basic algebra; powers; sets; functions (including trigonometric functions); graphs; factorisation; inverse and composite functions; exponential and logarithm functions; conic sections; trigonometric identities.

Differentiation: The meaning of the derivative; standard derivatives; Product rule, quotient rule and chain rule; Tangent lines; Taylor series; using derivatives for approximations; marginals; elasticities.

One-variable optimisation: First-order conditions; first and second-order tests for nature of a critical point; convexity and concavity; profit maximisation; the effects of taxation; curve sketching.

Integration: Indefinite integrals; Definite integrals; Standard integrals; Substitution method (including trigonometric substitutions); Integration by parts; Partial fractions; consumer and producer surplus.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE

At the end of the course and having completed the essential reading and activities students should be able to:

• use the concepts, terminology, methods and conventions covered in the unit to solve mathematical problems in this subject,

• solve unseen mathematical problems involving understanding of these concepts and application of these methods

• see how calculus can be used to solve problems in economics and related subjects

• demonstrate knowledge and understanding of the underlying principles of calculus.

Algebra I, II

CODE – NSE107-134
CREDITS – 16 (4/0/4/8)
PREREQUISITE – Introduction to Calculus I, II

MAIN GOAL AND TASKS OF THE COURSE
The course is designed for students studying economics. Its main goal is to give students skills in the methods of algebra, as required for further mathematics and economics courses.

BRIEF DESCRIPTION OF THE COURSE
This course develops basic mathematical methods and concepts of calculus and will include their applications to problems in economics, management and related areas.
It includes six parts: 1) Matrices and Vectors, 2) Systems of Linear Equations, 3) Matrix Inversion and Determinants, 4) Rank, Range and Linear Equations, 5) Sequences, Series and Difference Equations.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
At the end of the course and having completed the essential reading and activities students should be able to:

- use the concepts, terminology, methods and conventions covered in the course to solve mathematical problems;
- solve unseen mathematical problems involving understanding of these concepts and application of these methods;
- see how algebra can be used to solve problems in economics and related subjects;
- demonstrate knowledge and understanding of the underlying principles.

Further Calculus

CODE – NSE403
CREDITS – 6 (2/0/1/3)
PREREQUISITE – Calculus I, II

MAIN GOAL AND TASKS OF THE COURSE
The main goal of the course is to teach students practical methods of calculus that are used in solving problems in economics and finance and demonstrate why these methods are successful. It will prepare students for further mathematics and economics courses.

BRIEF DESCRIPTION OF THE COURSE
The main topics are:
- Limits;
- The Riemann integral;
- Improper integrals;
- Double integrals;
- Manipulation of integrals;
- Laplace transforms.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
At the end of the course and having completed the essential reading and activities students should be able to:
• use the concepts, terminology, methods and conventions covered in the unit to solve mathematical problems in this subject,
• solve unseen mathematical problems involving understanding of these concepts and application of these methods
• see how calculus can be used to solve problems in economics and related subjects
• demonstrate knowledge and understanding of the underlying principles of calculus.

Further Linear Algebra I, II
CODE – NSE404-413
CREDITS – 8 (2/0/2/4)
PREREQUISITE – Algebra I, II

MAIN GOAL AND TASKS OF THE COURSE
The course is designed for students studying economics. Its main goal is to give students necessary skills to analyse problems in multi-variable statistics, including regression analysis.

BRIEF DESCRIPTION OF THE COURSE
The main topics are:
- Complex vector spaces;
- Nilpotent matrices and Direct sums;
- Invariant subspaces and Generalized Eigenspaces;
- Jordan Canonical Form;
- Applications to Differential Equations;
- Inner Product Spaces.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
At the end of the course and having completed the essential reading and activities students should be able to:
- use the concepts, terminology, methods and conventions covered in the course to solve mathematical problems;
- solve unseen mathematical problems involving understanding of these concepts and application of these methods;
- see how algebra can be used to solve problems in economics and related subjects;
- demonstrate knowledge and understanding of the underlying principles.

Microeconomics

CODE – NSE401
CREDITS – 6 (2/0/1/3)
PREREQUISITE – Introduction to Microeconomics

MAIN GOAL AND TASKS OF THE COURSE
The main goal is deepening knowledge received as part of Introduction to Microeconomics course. Students will learn about strategic interaction, consumer choice under uncertainty, market failure, game theory, asymmetric information and monopoly.

BRIEF DESCRIPTION OF THE COURSE
Main topics:
Consumer Choice Theory under Uncertainty: expected utility; von Neumann-Morgenstein utility function;
Theory of the firm: production function; cost function;
Oligopoly and game theory: games in normal form; games in extended form; Nash equilibrium; subgame perfect Nash equilibrium; Cournot, Bertrand and Stackelberg models;
Monopoly: price discrimination of first, second and third degrees;
General Equilibrium: equilibrium in competitive markets and efficiency;
Intertemporal Consumer Choice: saving and investment;
Information Economics: asymmetric information; moral hazard; adverse selection; role of contracts and institutions.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will learn:
- which factors affect consumer choice under uncertainty;
- how to explain firm behaviour in different types of markets;
- how to analyse efficiency of perfectly and imperfectly competitive markets;
- how to analyse externalities;
- how strategic interaction and asymmetric information affect the efficiency of markets.

Macroeconomics

CODE – NSE411
CREDITS – 6 (2/0/1/3)
PREREQUISITE – Introduction to Macroeconomics

MAIN GOAL AND TASKS OF THE COURSE
The main goal is deepening knowledge received as part of Introduction to Macroeconomics course. Students will learn about factors that affect economic growth; determinants of inflation and unemployment; how macroeconomic policies affect business cycle in the short and long run.

BRIEF DESCRIPTION OF THE COURSE
Main topics:
Aggregate Demand in the closed economy: consumption; investment; government spending; demand and supply of money; IS-LM model;
Aggregate Demand in the open economy: exchange rate regimes; capital mobility; IS-LM-BP model; macroeconomic policy recommendations; international trade;
Aggregate Demand, Aggregate Supply and price level: short-run and long-run Aggregate Supply; AD-AS model;
Inflation and Unemployment: types of unemployment; causes of unemployment; inflation models; costs and benefits of inflation; full employment; natural rate of unemployment; stagflation;
Economic growth: neoclassical Solow growth model; endogenous growth theories.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will learn how to use economic models to describe and analyse real-life historical and current economic problems. They will also know the benefits and limitations of the different methods of economic analysis. By the end of the course students will understand the main conclusions derived from economic analysis and their organisational and policy implications. They will be able to participate actively in debates on economic matters and think about the world around them as economists. Students will be able to analyse factors that affect economic growth, inflation and unemployment, business cycle in the short and long run.

Econometrics I, II

CODE – NSE402-412
CREDITS – 12 (4/0/2/6)
PREREQUISITES – Introduction to Macroeconomics, Introduction to Macroeconomics, Statistics II

MAIN GOAL AND TASKS OF THE COURSE
The main goal is introducing students to regression analysis for testing economic hypotheses and quantifying economic relationships. Students will learn how to use Stata software for economic model analysis.

BRIEF DESCRIPTION OF THE COURSE
Main topics:

- Simple regression analysis;
- Properties of the regression coefficients and hypothesis testing;
- Multiple regression analysis;
- Nonlinear models and transformations of variables;
- Dummy variables and testing for the joint significance of a group of variables;
- Specification of regression variables;
- Linear restrictions in regression;
- Heteroscedasticity and its implications;
- Tests and remedies for heteroscedasticity;
- Stochastic regressors and measurement error;
- Endogeneity and instrumental variable estimation.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE
Students will learn about regressions with cross-sectional data with some advanced techniques like instrumental variables being explained. The students will become familiar with potential of OLS and its limitations, potential problems with data. Students will be able to run simple econometric models using statistical software.

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