

*Federal State Autonomous Educational establishment of higher education
RUDN-University*

Engineering Academy

Recommended by ICSS

PROGRAMME STRUCTURE AND SYLLABUS

Name of the course: Modeling social and economic systems

Recommended for the program track: 09.06.01 Informatics and computer engineering

Educational program specialization: Management in social and economic systems (engineering science):
strategic management

1. Course objectives and learning outcomes:

Aim: to form professional competencies and in-depth theoretical knowledge in the field of economic and mathematical modeling of management processes in social and economic systems using modern computer technologies.

Learning outcomes:

1. To get skills of applying the theoretical foundations and methodology of economic and mathematical modeling and instrumental methods of economics in solving practical problems.
2. Be able to solve independently typical problems of logistics, marketing, risk management and optimization of the investment process using economic and mathematical methods, referring, if necessary, to special literature on these issues.
3. To get skills of professional communication on the problems of applying mathematical methods in business and management with specialists in this field.
4. To develop and consolidate basic skills for preparing and making management decisions based on the use of economic and mathematical methods, taking into account the boundaries of their cognitive capabilities and risks associated with their application.

The discipline is implemented and mastered with the aim of in-depth mastery by graduate students of the theoretical knowledge necessary for solving specific problems of managing socio-economic processes based on modeling and applying modern economic and mathematical methods that are adequate to the specifics of doing business in a post-industrial information society, and the acquisition of appropriate practical skills. It is assumed that graduates will apply the acquired knowledge in conditions of a high degree of uncertainty and economic risks, intense competition, high labor productivity and associated difficulties in the distribution of the social product, accelerated rates of implementation and dissemination of innovations.

2. Place of the course in the structure of GEP (General Education Programme)

The discipline belongs to the variable part of Block 1 of the curriculum. Table 1 shows the previous and subsequent components of the educational program aimed at the formation of competencies in accordance with the competence matrix of Education Programme of High Education Competence-based education.

Table No. 1

Preceding and subsequent courses, directed to the competences forming

№ п/п	Competence and its code	Preceding courses	Following courses
Professional competences			
1	PC-3	Management in social and economic systems Research Seminar Research methodology Practice for obtaining professional skills and professional experience (research practice)	Scientific research (preparation of a scientific and qualifying work (dissertation) for a candidate of sciences (Ph.D.)

3. Requirements to the outcome of the course:

The learning outcomes of the course are special knowledge, abilities, relevant skills and experience, which will ensure the achievement of the planned results of mastering the educational program and will characterize the stages of the formation of the following competence:

- be ready for independent (including leading) research activities that require broad fundamental training in modern areas of industry science, deep specialized knowledge and research in the chosen areas, and possession of the skills of modern research methods (PC-3).

4. Workload of the course and forms of study work

General workload of the course is 3 credit units (108 academic hours).

academic hours

Form of study work	Total academic hours								
	Semester								Total
	1	2	3	4	5	6	7	8	
Class hours (total)	-	-	-	40	-	-	-	-	40
Including:									
Lectures	-	-	-	20	-	-	-	-	20
Practical classes (PC)	-	-	-	20	-	-	-	-	20
Self-study	-	-	-	68	-	-	-	-	68
Assessment	-	-	-	-	-	-	-	-	-
Total hours:	-	-	-	108	-	-	-	-	108
credits:	-	-	-	3	-	-	-	-	3

5. Content of the course

5.1. Course Units

№ п/п	Name of the course part	Subject matter of the part
1	Models and modeling methods in microeconomics	Marginal utility and marginal rate of substitution. Numerical differentiation. Consumption theory. Consumer demand models taking into account the utility function and compensation effects.
2	Models and modeling methods in macroeconomics	Market. General equilibrium model.
3	Analysis of intersectoral links	Input-output model. Model parameters and dependencies. Final product. Determination of equilibrium output by an iterative, direct method. Determination of equilibrium prices
4	Discrete-time dynamic macroeconomic models	Mathematical research methods for dynamic economic systems. Economic development model. Dynamic model of input-output balance (Leontief model). Dynamic model of input-output balance (von Neumann model).
5	Nonlinear dynamic models of macroeconomics	Analysis and synthesis of dynamic systems, transient processes in them. Non-linear dynamical systems. Conjunctural cycles in the economy. Production functions. Models of stagnation and balanced economic growth. Financial market mathematical models. Forecasting currency crises and financial risks. Modeling inflation.
6	Models of behavior and interaction between consumers and producers	Foreign trade modeling (gravity model, vector error correction model, cointegration analysis). The model of the firm. The behavior of firms in competitive markets. Equilibrium price setting models. Walras model. Game theory. Making decisions in the face of uncertainty and risk. Mathematical theory of public choice. Models of cooperation and competition. Predictive models of enterprise performance results. Model of optimization of the company's development budget. Models of the formation of the production program. Inventory management models.

5.2 Course Units and Academic Activities

academic hours

№ п/п	Subject matter of the part	Lectures	Seminars	Self-study	Total workload, hours
1	Models and methods of modeling in microeconomics	3	3	11	17
2	Models and methods of modeling in microeconomics	3	3	11	17
3	Analysis of cross-industry relations	3	3	11	17
4	Dynamic models of macroeconomics with discrete time	3	3	11	17
5	Nonlinear dynamic models of macroeconomics	3	3	11	17
6	Models of behavior and interaction of consumers and producers	5	5	13	23
Total:		20	20	68	108

6. Seminars/practical classes

№ п/п	Course unit	Topics and issues for discussion	Total workload, hours
1	1	Marginal utility and marginal rate of substitution. numerical differentiation. Theory of consumption. Models of consumer demand taking into account the utility function and compensatory effects.	3
2	2	Market. General equilibrium model.	3
3	3	The input-output model. Parameters and dependencies of the model. The final product. Determination of the equilibrium output by an iterative, direct method. Determination of equilibrium prices	3
4	4	Mathematical methods of research of economic dynamical systems. Model of economic development. Dynamic model of intersectoral balance (Leontiev model). Dynamic model of intersectoral balance (von Neumann model).	3
5	5	Analysis and synthesis of dynamic systems, transient processes in them. Nonlinear dynamical systems. Market cycles in the economy. Production functions. Models of stagnation and balanced economic growth. Mathematical models of the financial market. Forecasting of currency crises and financial risks. Inflation Modeling.	3
6	6	Modeling of foreign trade (gravitational model, vector model of error correction, which is a cointegration analysis). Model of the company. Behavior of firms in competitive markets. Equilibrium price models. The Walrasian Model and Walrasian Equilibrium. game theory. Decision-making in the face of uncertainty and risk. Mathematical theory of public choice. Models of cooperation and competition. Predictive models of the company's performance. Model of optimization of the company's development budget. Models of production program formation. Inventory Management Models.	5

7. Technical Support Requirements

Classrooms with technical support	Address
Classroom for lectures, seminars and midterm assessments № 493 Projector Epson EH-TW5300 (LCD, 1080p 1920 x 1080, 2200Lm, 35000:1, 2 x HDMI, MHL Screen Draper Baronet NTSC (3:4) 244/96(8) 152*203 MW Set of specialized furniture	Moscow, Ordzhonikidze str., 3
Education and methodology Classroom for self-study № 345 Equipment and furniture: - personal computers with access to the Internet; - desks, chairs	Moscow, Ordzhonikidze str., 3

8. Study-methodical and information sources:

Databases, reference systems and search engines:

- Electronic library system (ELS) РУДН and third-party ELS:
 - ELS RUDN <http://lib.rudn.ru/MegaPro/Web>
 - ELS «University Library Online» <http://www.biblioclub.ru>
 - ELS Юрайт <http://www.biblio-online.ru>
 - ELS « Student's Consultant » www.studentlibrary.ru
 - ELS «Лань» <http://e.lanbook.com/>
- Websites of ministries, departments, services, production enterprises and companies whose activities are specialized for the course:
 - <http://economy.gov.ru/minec/main/> - website of the Ministry of Economic Development of the Russian Federation
- Databases and search engines:
 - electronic fund of legal and normative-technical documentation <http://docs.cntd.ru/>
 - Yandex search engine <https://www.yandex.ru/>
 - search engine Google <https://www.google.ru/>

9. Educational methodology resources

Basic literature:

1. Салмина, Н.Ю. Моделирование социально-экономических систем и процессов: учебное пособие / Н.Ю. Салмина; Министерство образования и науки Российской Федерации, Федеральное государственное бюджетное образовательное учреждение высшего профессионального образования Томский государственный университет систем управления и радиоэлектроники (ТУСУР), Кафедра автоматизации обработки информации. - Томск: ТУСУР, 2016. - 198 с.: ил. - Библиогр. в кн.; То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.php?page=book&id=480945> (17.09.2018).
2. Эконометрика: учебник / К.В. Балдин, В.Н. Башлыков, Н.А. Брызгалов и др.; под ред. В.Б. Уткина. - 2-е изд. - Москва: Издательско-торговая корпорация «Дашков и К°», 2017. - 562 с.: ил. - Библиогр.: с. 473-477. - ISBN 978-5-394-02145-9; То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.php?page=book&id=452991> (17.01.2018).
3. Долгушин В.Д. Экономико-математические методы и модели. Электронный учебник. http://web-local.rudn.ru/web-local/prep/rj/index.php?id=571&mod=disc&disc_id=11357&p=-1
4. Матюшок В.М. Основы эконометрического моделирования с использованием Eviews: Учебное пособие / В. М. Матюшок, С.А. Балашова, И.В. Лазанюк. - 3-е изд., перераб. и доп. - М.: Изд-во РУДН, 2015. - 228 с.

Supplementary literature:

1. Теория систем и системный анализ: учебник / В.М. Вдовин, Л.Е. Суркова, В.А. Валентинов. - 3-е изд. - Москва: Издательско-торговая корпорация «Дашков и К°», 2016. - 644 с.: ил. - (Учебные издания для бакалавров). Библиогр. в кн. - ISBN 978-5-394-02139-8; [Электронный ресурс]. URL: <http://biblioclub.ru/index.php?page=book&id=453515> (17.01.2018).
2. Зариковская, Н.В. Математическое моделирование систем: учебное пособие / Н.В. Зариковская; Министерство образования и науки Российской Федерации, Томский Государственный Университет Систем Управления и Радиоэлектроники (ТУСУР). - Томск: Томский государственный университет систем управления и радиоэлектроники, 2014. - 168 с.: схем., ил. - Библиогр. в кн.; То же [Электронный ресурс]. - URL: <http://biblioclub.ru/index.php?page=book&id=480523> (19.01.2018).
3. Управление информационными системами: лабораторный практикум / Министерство образования и науки Российской Федерации, Федеральное государственное автономное образовательное учреждение высшего профессионального образования «Северо-Кавказский федеральный университет»; авт.-сост. А.Ю. Орлова. - Ставрополь: СКФУ, 2016. - 138 с [Электронный ресурс].
4. URL: <http://biblioclub.ru/index.php?page=book&id=459314> (17.01.2018).

Periodicals:

1. Ханова Анна Алексеевна, Хортонен Анастасия Сергеевна, Парамзина Людмила Владимировна Системные взаимосвязи стратегического управления и моделирования социально-экономических систем на основе сбалансированной системы показателей // Вестник Астраханского государственного технического университета. Серия: Управление, вычислительная техника и информатика. 2014. Выпуск 2, С.109-116
2. Киселева Вера Алексеевна Моделирование системы мониторинга и управления социально-экономическим развитием региона // Новые технологии. 2010. Выпуск 4, С.95-98
3. Сенин А.С. Инновационное развитие социально-экономических систем и структур: проблемы прогнозирования и моделирования // Экономика и социум: современные модели развития. 2015. Выпуск 9, С.35-44
4. Белов Михаил Валентинович Математическое моделирование жизненных циклов сложных

социально-экономических и бизнес-систем // Проблемы управления. 2016. Выпуск 2, С.49-61
5. Скопина Ирина Васильевна Моделирование эффективности социально-экономических систем // Управление экономическими системами: электронный научный журнал. 2010. Выпуск 24, С.213-221

The program was drawn up in accordance with the requirements of the OS of the RUDN.

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