Приложение № 1

к распоряжению Финуниверситета

от «\_\_\_» \_\_\_\_\_\_\_\_2019 № \_\_\_\_\_\_\_

**Шаблон структуры и содержания рабочей программы дисциплины**

**Syllabus**

**1. Name of a subject – Computer Workshop**

The main learning outcome of this discipline is acquiring by a student the basic computer science knowledge and skills (forming competences) for solving standard economical tasks.

**2. Mapping of learning outcomes (list of competences), with the relevant indicators described and subject learning outcomes indicated**

 The discipline provides necessary tools to form competences listed below.

The section lists the graduates’ coded competencies that are to be developed during the learning process, indicators that show their development (generalized descriptions of specific actions performed by the graduate that clarify and reveal the competence content), learning outcomes (knowledge, skills) with indicators of competence development (in the form of a table):

 Table 1

|  |  |  |  |
| --- | --- | --- | --- |
| Competence code | Competence  | Competence development indicators[[1]](#footnote-1) | Learning outcomes (skills and knowledge) and indicators that show competence development[[2]](#footnote-2)  |
| IK-2 | Ability to work on a computer usingmodern general and professional application software to solveprofessional tasks |  | Know the computational techniques of basic mathematical problems used in economics and finance;Be able to use computer technologies in the implementation of mathematical methods and models for the description and analysis of applied problems.Possess computational skills in Excel and R. |
| IK-5 | The ability to apply calculation techniques and basic research methods. |  | Know the computational methods for calculating the basic mathematical problems used in economics and finance;Be able to use computer technologies in the implementation of computational methods of mathematical methods and models for describing and analyzing problems of economics and finance.Possess computational skills in Excel and R.  |
| PKN-3 | Ability to apply mathematical methods to solve standard professional financial and economic problems, to interpret the obtained mathematical results. |  | Know the computational techniques of basic mathematical problems used in economics and finance;Be able to use computer technologies in the implementation of mathematical methods and models for the description and analysis of applied problems.Possess computational skills in Excel and R. |

**3. Place of the discipline subject in the curriculum**

The discipline *"Computer workshop"* is a discipline of the Module of Mathematics and Computer Science of the direction of training 38.03.01 *"Economics"*.

The study of the discipline *"Computer workshop"* is based on the knowledge gained in the framework of the school course of informatics and mathematics or the corresponding disciplines of secondary vocational education. The discipline *"Computer workshop"* is the basis for all disciplines of the module of Mathematics and Computer Science, and IT concepts and methods are used in the future in the study of general professional disciplines and disciplines of the profile.

The section describes what place is occupied by the subject in the program curriculum.

**4. Workload in credits and academic hours, with class work (lectures and seminars) and self-study indicated**

The data are presented in the form of a table.

Table 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Type of work**  | **Total** **(in credits and hours)**  | **Semester 1 (in hours)** | **Semester 2 (in hours)** |
| **Overall workload**  | ***4/144*** | ***72*** | ***72*** |
| ***Class work***  | ***72*** | ***36*** | ***36*** |
| *Lectures*  | ***0*** | ***0*** | ***0*** |
| *Seminars*  | ***72*** | ***36*** | ***36*** |
| ***Self-study***  | ***72*** | ***36*** | ***36*** |
| Formative assessment  |  | ***Test*** | ***Test*** |
| Summative assessment  |  | ***Exam*** | ***Exam*** |

**5. Subject content (with the thematic components indicated).**

**5.1. Thematic components content**

**Thematic component 1. Introduction to MS Excel.**

Workbook, worksheet, cell in MS Excel; cell addressing and formatting; manipulation of cell ranges; data types, entering data and formulas into cells; built-in MS Excel functions; Goal Seek instrument.

**Thematic component 2. Dealing with mathematical objects in MS Excel.**

Approximate solution of algebraic equations, finding the zeros of a function; modeling sequences and limits of functions; plotting functions of one variable; finding slant (oblique) asymptotes; approximate calculation of the derivative of a function; finding critical points; finding local extrema and inflection points, intervals of monotonicity and concavity of a function.

**Thematic component 3. Introduction to R and RStudio.**

Installing R and RStudio; description of the console interface; loading and activating R libraries; R data types and variable programming; basic math functions in R; creating custom functions in R and connecting custom libraries; logical constructs and conditional operators in R; ways to read / write data in R in various formats.

**Thematic component 4. Operating with mathematical objects in R.**

Numerical determination of definite and improper integrals. Display of graphs of one-dimensional and two-dimensional functions; drawing lines level and general surfaces. Symbolic differentiation: finding exact partial derivatives of arbitrary order, constructing the gradient and Hessian for functions of several variables; approximate solution of difference equations. Computational problems of linear algebra: vector algebra, matrix algebra, solving systems of linear equations, transforming the matrix of a linear operator and finding its eigenvalues ​​and vectors. Elements of analytical geometry: construction of straight lines on a plane and curves of the second order.

**Thematic component 5. Applied computational problems of economics and finance.**

Finding elasticity and other limiting values in microeconomics. Calculation of accruals on deposits and payments on loans. Nonlinear programming problems in economics: cost minimization, profit maximization, etc. Simplex method: production problem, transport problem, assignment problem.

This subsection lists the academic subject itemized thematic contentin the form of a text. The text volume should not exceed 3 pages.

 **6. List of teaching and methodological materials needed for the students self-study**

**6.1. List of questions for student self-study and types of out-of-class activities**

The section lists types of out-of-class activities that correspond to items in the subject content description.

There is a list of questions the students should answer while working independently.

Table 3

|  |  |  |
| --- | --- | --- |
| **Itemized subject content**  | **Questions the students should answer within the self-study process**  | **Types of out-of-class activities**  |
| **1. Introduction to MS Excel.** | Solution of tasks in MS Excel | Work with educational literature.Solving typical tasks. Analysis of questions on the topic of the lesson. Doing homework assignments for each lesson. |
| **2. Dealing with mathematical objects in MS Excel.** | Solution of tasks in MS Excel | Work with educational literature.Solving typical tasks. Analysis of questions on the topic of the lesson. Doing homework assignments for each lesson. |
| **3. Introduction to R and RStudio.** | Solution of tasks in RStudio | Work with educational literature.Solving typical tasks. Analysis of questions on the topic of the lesson. Doing homework assignments for each lesson. |
| **4. Operating with mathematical objects in R.** | Solution of tasks in RStudio | Work with educational literature.Solving typical tasks. Analysis of questions on the topic of the lesson. Doing homework assignments for each lesson. |
| **5. Applied computational problems of economics and finance.** | Solution of tasks in RStudio and MS Excel | Work with educational literature.Solving typical tasks. Analysis of questions on the topic of the lesson. Doing homework assignments for each lesson. |

**6.2. List of questions/assignments/topics for students’ preparation to formative assessment**

**Templates of questions for the exam preparation**

1. Find the approximate value of the limit of the numerical sequence in MS Excel:

2. Decompose according the Maclaren's formula . Using MS Excel you can approximate this formula by particular sums of order of Maclaren – using polynomials of 1,2,3,4,5 grades. Look though intervals [-1;1] and [-3;3] with steps 0,1 and 0,03.

3. Decompose according the Maclaren's formula . Using MS Excel you can approximate this formula by particular sums of order of Maclaren – using polynomials of 1,2,3,4,5 grades. Look though intervals [-0,5;0,5] with steps 0,05 and 0,01.

4. A client put on a deposit 900 thousand dollars for the term of 14 January until 14 April of the year 2020 under 2.7% per annum. Calculate the saved-up amount in MS Excel.

5. A loan is $48000; interest is 5.3% per annum compounded monthly; monthly payments are $2200. Calculate in MS Excel the period for paying off the loan.

6. Find in MS Excel the asymptotes to the graphs of the following functions:



7. Compute in R the exact expressions for derivatives up to third order inclusive of the following functions and evaluate the derivatives in:

1. ,
2. .

The section may include the following:

Templates of questions the students need to answer when preparing for a test; templates of assignments that might be found in tests;

Templates of questions the students need to answer when preparing for performing an analysis or making a calculation;

Templates of topics for essays, summaries, creative home assignments;

Templates of questions the students need to answer when preparing for business games, roundtable discussion sessions, debates (based on a certain topic and relevant recommendations) conducted during a seminar; a list of assignments that should be done by a team of students when preparing for a co-authored work presentation.

Other types of assessment.

**7. Mandatory and optional reading list**

Legal regulations. The list of legal regulations adopted at the international and federal levels, including international treaties ratified by the Russian Federation, Constitution of the Russian Federation, codes, laws of the Russian Federation, federal laws, decrees of the President of Russia, resolutions of the Government of Russia, etc. The list should not exceed 10 entries.

**7.1. Mandatory**

Alexander M., Kusleika D., Walkenbach J. *Microsoft Excel 2019 Bible.* / Wiley, 2018

Dayal V. *Quantitative Economics with R* / Springer, 2020

**7.2. Optional**

Campbell M.*Learn RStudio IDE /* Apress, 2019

**8. List of IT resources, incl. the list of software, information and reference systems (as appropriate).**

**8. 1. Software:**

1. Windows OS;

2. Microsoft Office software.

3. RStudio

**8.2. Databases and information and reference systems**

1. Information and education portal of the Financial University http://portal.ufrf.ru/.

2. Library of digital resources of the Financial University: http://elib.fa.ru/

**8.3. Certified software/hardware used for information protection**

ESET Endpoint Security antivirus software.

**Title page template**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(full name of education institution/branch)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(name of department/teaching department)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(full name of author/authors)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(subject name)

**SYLLABUS**

***Level of Study:*** *Bachelor’s Degree / ~~Master’s Degree / Postgraduate Degree~~ \*to be chosen\**

***Field of Study:*** *\*to be defined\**

***Study Program:*** *\*to be defined\**

1. To be filled in when the updated Financial University educational standards and federal state educational standards of higher education “3++” are implemented. [↑](#footnote-ref-1)
2. Skills are described when the Financial University educational standards of the 1st generation and federal state educational standards of higher education “3+” are implemented. [↑](#footnote-ref-2)