

**International Economic Institute s.r.o. (Jesenice, Czech Republic)**  
**Central European Education Institute (Bratislava, Slovakia)**  
**National Institute for Economic Research (Batumi, Georgia)**  
**Al-Farabi Kazakh National University (Kazakhstan)**  
**Institute of Philosophy and Sociology of Azerbaijan National Academy of  
Sciences (Baku, Azerbaijan)**  
**Batumi Navigation Teaching University (Batumi, Georgia)**  
**Regional Academy of Management (Kazakhstan)**  
**Ukrainian Assembly of Doctors of Sciences in Public Administration  
(Kyiv, Ukraine)**  
**University of New Technologies (Kyiv, Ukraine)**  
**Interstate Consultants Engineers Guild (Kyiv, Ukraine)**  
**Institute of Education of the Republic of Azerbaijan (Baku, Azerbaijan)**  
**European Lyceum "Scientific Perspectives" (Kyiv, Ukraine)**  
**International Consulting company "Sidcon" (Kyiv, Ukraine)**

*within the Publishing Group “Scientific Perspectives”*

## **MODERN ASPECTS OF MODERNIZATION OF SCIENCE: STATUS, PROBLEMS, DEVELOPMENT TRENDS**

***Materials of the 63th International Scientific and Practical Conference  
December 7, 2025, Olomouc (Czech Republic)***

### СЕКЦІЯ 13. ТУРИЗМ

- Науменко О.В.** 251  
*Організаційно-правові особливості державного регулювання охорони культурної спадщини в Україні*

### СЕКЦІЯ 14. МАТЕМАТИКА ТА СТАТИСТИКА

- Misiura Ie.** 255  
*Integration of gnu octave into the educational process in the “higher mathematics” course for the specialties “management” and “marketing”*

### СЕКЦІЯ 15. БУХГАЛТЕРСЬКИЙ ОБЛІК, АНАЛІЗ І АУДИТ

- Іваночко Б.Р.** 259  
*Становлення економічного контролю як соціального інституту: теоретичні основи*

### СЕКЦІЯ 16. СОЦІОЛОГІЯ

- Ящук О.О., Сорокіна Л.М., Гуржий Т.О.** 263  
*Соціологічні та фінансові виміри досліджень енергоефективних систем керування асинхронними генераторами вітроелектростанцій*

### СЕКЦІЯ 17. ПІДПРИЄМНИЦТВО ТА ТОРГІВЛЯ

- Герасимов Ю.О.** 265  
*Fleetiq system: інтелектуальне управління автопарком та логістичною архітектурою компанії*

- Скрипка В.І.** 269  
*Від інтуїтивного хаосу до інтелектуального управління: інтегровані методики аналітичного консалтингу в будівництві*



## **СЕКЦІЯ 14. МАТЕМАТИКА ТА СТАТИСТИКА**

**Misiura Ie.**

Candidate of Technical Sciences,  
Associate Professor of Department of  
Economic and Mathematical Methods,  
*Simon Kuznets Kharkiv National  
University of Economics,  
Kharkiv, Ukraine*

### **INTEGRATION OF GNU OCTAVE INTO THE EDUCATIONAL PROCESS IN THE “HIGHER MATHEMATICS” COURSE FOR THE SPECIALTIES “MANAGEMENT” AND “MARKETING”**

The development of every independent state directly depends on its ability to remain competitive in today's economic environment. In Ukraine, one of the most important factors in this process is the quality of economic education, which serves as the foundation for developing the nation's intellectual potential and for training highly qualified professionals capable of operating effectively in a market economy.

In particular, the training of higher education applicants of the specialties 073 Management and 075 Marketing plays a significant role in providing in-depth knowledge and preparing professionals capable of solving practical problems and complex specialized tasks in the management and marketing of organizations and their divisions. This process involves applying modern management theories and methods, fostering applicants' critical thinking, creativity, and entrepreneurial initiative, and developing their ability to use new technologies in their future professional activities. Higher education institutions train specialists who can effectively manage business processes, solve professional challenges in organizational administration, select optimal business models, and make sound managerial decisions [1].

The training of future specialists in the above-mentioned specialties is impossible without a solid command of mathematical methods, which provide applicants with a comprehensive education and a clear understanding of the practical application of mathematical tools and techniques to solve various professional tasks. Therefore, mathematical training begins with the “Higher Mathematics” course, which is included in the list of compulsory educational components and forms part of the professional training cycle for applicants of the specialties 073 Management and 075 Marketing [1].



Modern mathematical education for specialists in these fields requires not only knowledge of mathematical courses such as “Higher Mathematics” and related courses but also the ability to solve applied problems using computer and information technologies. Considering this, it has become a common practice in teaching mathematically oriented courses to employ computer mathematics systems such as MATLAB, MAPLE, MATHCAD, DERIVE, MATHEMATICA, MuPAD, GNU Octave, Python, and others, which are gaining increasing popularity in both teaching and scientific research. These systems serve as essential tools for applicants, university lecturers and researchers alike [2, 3].

In particular, GNU Octave is used by university lecturers during practical and laboratory studies in the “Higher Mathematics” course at Simon Kuznets Kharkiv National University of Economics (KhNEU). Among the available computer mathematics systems, GNU Octave was selected because it is open-source, freely accessible, and increasingly competitive with the well-known MATLAB platform. This software environment meets key educational requirements: it ensures a systematic, consistent, accessible, and clear presentation of theoretical concepts in the “Higher Mathematics” course, as well as the implementation of methods for solving practical problems. The non-commercial online interface of GNU Octave (i.e. *Octave Online*) is optimized for Google Chrome and can be accessed from any computer with a modern web browser [4, 5].

GNU Octave enables the solution of numerous applied problems from various sections in the “Higher Mathematics” course, both in numerical and symbolic (analytical) form. It also supports exact computations involving rational fractions and arbitrary-precision arithmetic. Integrating GNU Octave into the educational process allows applicants to acquire versatile competencies and practical skills in using these tools, and to readily apply the knowledge gained to solving typical or similar problems in their future professional activities. The Octave Online web service further enhances learning by visualizing mathematical terminology, demonstrating the essence of mathematical methods and techniques, and showing their practical implementation [6, 7].

The aim of the “Higher Mathematics” course is to familiarize applicants with the fundamental concepts, theoretical principles, and modern mathematical models and methods used to solve applied problems in management and marketing. The course also aims to develop applicants’ logical and analytical thinking skills. Its objective is to provide theoretical and practical training focused on mastering contemporary mathematical methods that will enable future professionals to address applied economic problems. The content of the “Higher Mathematics” course covers the key methods and models of linear and vector algebra, analytical geometry, mathematical analysis, differential and integral calculus, functions of several variables, the theory of ordinary differential equations, and series. Alongside the study of mathematical





concepts, attention is given to their practical applications in economics, finance, management, and administration. Knowledge and skills requirements include understanding the basic concepts of all sections of the “Higher Mathematics” course; the ability to choose appropriate mathematical methods and models, and apply analytical techniques to investigate applied problems; the ability to use modern mathematical methods to solve practical economic tasks; and the development of skills for independent study and use of mathematical literature.

With the rapid development of information technologies, it has become necessary to develop teaching materials for integrating the Octave Online web service into the teaching of the “Higher Mathematics” course. The focus is on training specialists capable of solving challenging tasks in the context of the information society. This teaching and practical guide [4] serves as a methodological resource for both university lecturers and applicants, useful for preparing laboratory and practical studies, as well as for conducting mathematical research and self-directed learning.

At the beginning, applicants study the basic numerical formats and the principles of working with built-in functions. Then, using the fundamental mathematical functions and operations of GNU Octave, they begin to study methods of linear algebra, explore the graphical capabilities of GNU Octave for working with vectors, and use its special functions to solve problems in analytical geometry. Applicants also apply elements of limit analysis to calculate function limits at a point and at infinity, and solve problems related to differential calculus for functions of one or several variables, employing graphical tools to visualize function graphs. They further use methods of integral calculus for functions of one variable, including computing indefinite and definite integrals, determining the areas of figures bounded by lines, and calculating the volumes of solids formed by rotating figures around a given axis. Applicants conduct studies of improper integrals, solve first- and second-order differential equations, investigate numerical series for convergence, determine the regions of convergence of power series, and expand functions into Maclaurin series [4].

GNU Octave provides a convenient command-line interface for the numerical solution of linear and nonlinear problems, as well as for conducting other numerical experiments using its programming language. It offers a wide range of built-in tools and is easily extensible and customizable through user-defined functions written in Octave’s own language. The system is distributed under the terms of the GNU General Public License (GPL) published by the Free Software Foundation [8].

GNU Octave significantly expands the range of problems that can be solved efficiently and effectively, both at the level of symbolic computation and numerically. This enables university lecturers to design tasks and exercises that leverage the capabilities of modern mathematical software systems. Applicants can concentrate on key concepts rather than on tedious algebraic calculations and transformations [6, 7].



The use of GNU Octave in the educational process enables a wide range of educational tasks to be addressed in accordance with the educational programs and the syllabus of the specialties 073 Management and 075 Marketing [1]. These tasks include developing analytical thinking skills and proficiency in using the GNU Octave software tools for solving practical problems in future professional activities, conducting scientific research, and expanding applicants' competencies in applying various software tools to achieve their objectives. GNU Octave can also be used as a tool for self-study and distance learning of mathematics [2].

Therefore, mastering GNU Octave tools enables applicants of the specialties Management and Marketing to meet modern requirements for training specialists capable of effectively analyzing market processes, making informed management decisions, and forecasting enterprise development. The use of GNU Octave fosters the development of practical skills in applying mathematical methods, models, and analytical tools to solve real-world management and marketing problems. Proficiency in this software environment allows applicants to gain a deeper understanding of economic processes, optimize business decisions, and enhance management effectiveness.

### **References:**

1. Освітні програми ХНЕУ ім. С. Кузнеця 2025 року вступу URL: <https://hneu.edu.ua/osvitni-programy-hneu-im-s-kuznetsya>
2. Гриб'юк О.О., Юнчик В.Л. Використання систем комп'ютерної математики у контексті моделі змішаного навчання // Математика. Інформаційні технології. Освіта (СНУ імені Лесі Українки). – Луцьк – Світязь, 2015. – С. 52 – 71.
3. Аналіз найпоширеніших пакетів прикладних програм для економістів / Д.А. Озерчук, О.Н. Романюк, О.М. Ціхановська // Збірник матеріалів Міжнародної науково-практичної Інтернет-конференції «Електронні інформаційні ресурси: створення, використання, доступ», 9-10 листопада 2020 р. – С. 200 – 202.
4. Железнякова Е. Ю., Норік Л. О. Вища математика в GNU Octave [Електронний ресурс]: навчально-практичний посібник. – Харків : ХНЕУ ім. С. Кузнеця, 2024. – 275 с.
5. GNU Octave. URL: <https://www.gnu.org/>
6. Introduction to GNU Octave. URL: <http://math.jacobs-university.de/oliver/teaching/iub/resources/octave/octave-intro/>
7. GNU Octave. Scientific Programming Language. URL: <http://www.gnu.org/software/octave/>
8. General Public License. URL: <https://www.gnu.org/licenses/>

