Journal of Vasyl Stefanyk Precarpathian National University
*http://journals.pnu.edu.ua*
Vol. 12, No. 1 (2025), 105-118

UDC 378.091.214:001.53(430+477)
doi: 10.15330/jpnu.12.1.105-118

ISSN 2311-0155 (Print)
ISSN 2413-2349 (Online)

# COMPARATIVE CHARACTERISTICS OF FUTURE TECHNICAL SPECIALISTS TRAINING EDUCATIONAL PROGRAMS IN GERMANY AND UKRAINE

*ANNA DYNOVYCH**

*Corresponding author: anyash26@gmail.com

**Abstract**. Educational programs are an integral part of the higher education institutions functioning. An educational program is a system of relevant educational components determined at the highest level for the optimal possession of a certain qualification. The educational program specifies the requirements, disciplines, credit numbers, diploma projects, and practical classes necessary for completion. The scope of educational programs differs for each higher education level and corresponding focus. The article examines various technical specialties and educational programs of higher education institutions in Germany and Ukraine. The key disciplines are analyzed, and the corresponding credits number students must complete to successfully obtain a diploma are indicated. Certain differences in the forms of control and the number of tasks required for learning are indicated. The existing competencies list of an education seeker with the normative content of the education seeker's training is highlighted, where deadlines and study results are displayed. The research includes the current trends analysis of the technical education development in Germany and Ukraine. A brief introduction to the latest technologies and teaching methods is presented. An important aspect is the comparison of the requirements for students' practical training and the possibility of internships at enterprises. The issue of students' academic mobility and the exchange studies possibility is shown. The article examines some educational programs of the Technical University of Munich and Zhytomyr Polytechnic State University. The programs "Management and Technologies", "Electrical Engineering and Information Technologies", "Computer Science", and "Software Engineering" are analyzed. The necessary documents for a higher technical specialty admission are indicated. The importance of interdisciplinary connections for the students' better development is emphasized.

**Keywords***:* educational program, technical specialty, higher technical educational institution, credits number, educational components.

## 1. INTRODUCTION

The relevance of the study on the comparative characteristics of educational programs for training future technical specialists in Germany and Ukraine is driven by the contemporary challenges facing the higher education systems of both countries. Changes in technology, the digitalization of production (Tsependa & Budnyk, 2021), and Ukraine's integration into the European educational space necessitate the modernization and improvement of educational programs by international standards. Germany has a well-developed dual education system that combines theoretical training with practical experience, serving as an important benchmark for enhancing Ukraine's educational model. The analysis and comparison of approaches to technical specialist training will help identify the strengths of both systems

and propose ways to improve Ukrainian engineering and technical education in line with European quality standards.

An educational (educational-professional, educational-scientific, educational-creative) program is a system of relevant educational components determined at the highest level of education within a separate specialty. The educational program shows clearly defined requirements for the applicant's level, a list of educational disciplines, its logical outline, the specified credits number of the European credit transfer system, overcoming which is a prerequisite for successful graduation, and the result obtained by the student at the corresponding higher level (*Educational programs, n.d.*).

The scopes of educational programs differ for each higher education level and their focus. Let's look at the table in more detail (*Educational Programs, n.d.*).

*Tab. 1*

*Volumes of educational programs by higher education level (Ukraine)*

| **Higher Education Level** | **Educational Program Scope** | **The Educational Program Scope with a Research Component** |
|---|---|---|
| Bachelor Degree | 180-240 ECTS | |
| Master's Degree | 90-120 ECTS | 120 ECTS (research work at least 30%) |
| Master's Degree in Medicine, Pharmacy or Veterinary field | 300-360 ECTS | |
| Doctor of Philosophy | 30-60 ECTS | |

*Source: Own elaboration*

Each educational program for each specialty and corresponding level of higher education is approved by the higher education institution Academic Council, but some general requirements are necessary for the implementation and the educational program execution. The standard of higher education defines the following requirements (*Educational programs, n.d.*):

1) the appropriate credit volume for obtaining each degree of higher education;
2) available list of students' competencies;
3) the normative content of the higher education applicants' training, where the deadlines and results of training are shown;
4) control forms;
5) internal certificates availability illustrating the ability to ensure the proper quality of education;
6) professional standards requirements (if any).

## 2. LITERATURE REVIEW

The issue of studying educational programs has always been a relevant field for various scientists. S. Vitvytska (2009, pp. 133-153) has investigated the theoretical and methodological foundations of future specialists' professional training. N. Sydorchuk (2009, pp. 103-114) has studied the issues of higher school didactics and ways of its modernization. O. Dubasenyuk (2009, pp. 14-48) and O. Antonova (2009, pp. 330-355) have investigated the competency-based approach in higher education. Ye. Lodatko (2016) has dealt with quality management education problems. S. Sysoeva (2014, pp. 36-47) and T. Krystopchuk (2014) have investigated the pedagogical research methodology. These and lots of other scientists have tried to find out and improve some issues that show problems or weak points in Ukrainian higher education.

Different scientists have contributed to the educational programs development in Germany. Their work is an important source of information. Jürgen Baumert (2001) is a well-known German educator who deals with the problems of educational quality and its comparison to other countries. Metz-Göckel

(2012, pp. 213-232) specializes in issues of higher education didactics and curriculum development. Katja Ludwig (2018) is a higher education researcher who deals with issues of educational quality management and accreditation of educational programs. Ulrich Teichler (2017) studies issues of internationalization of higher education and the development of international educational programs. Kirstin Bromberg (2015, pp. 551-567) highlights the historical roots of contemporary teaching-learning research.

## 3. RESEARCH OBJECTIVE AND METHODOLOGY

The objective of the article is to analyze and compare modern educational programs of technical universities in Germany and Ukraine, identifying their strengths, weaknesses, and development trends. We want to assess the compliance of educational programs with the labor market requirements and modern technologies. The aim is to contribute to the specialists' quality training improvement in the field of technology and engineering.

In conducting our research, we have used system analysis and considered the educational program as a system consisting of interconnected elements. Comparative analysis has allowed us to identify common and distinctive features of different educational programs. The modern case study method has allowed us to study individual educational programs in more depth to identify the features of their implementation. We have analyzed the content of the educational programs using content analysis.

## 4. RESULTS AND DISCUSSION

### 4.1. Technical University of Munich (Germany)

We will consider the educational programs organization and planning in Germany in more detail using the example of the Technical University of Munich. The first specialty will be "Management and Technologies", and the educational and qualification degree will be Bachelor. Let's consider the key characteristics of this specialty *(Management and Technology, n.d.)*.

*Tab. 2*

*Key admission characteristics to the specialty "Management and Technology" at the Technical University of Munich*

| | | |
|---|---|---|
| **Training Type**<br>Full day | **Standard Study Length**<br>6 Semesters | **Credits Number**<br>180 ECTS |
| **Main Locations**<br>Munich, Harching | **Submitting Documents Deadlines**<br>15.05-15.07 | **Admission Category**<br>Abilities Assessment after Graduation |
| **Training Start**<br>Winter Semester (October) | **Tuition**<br>Student Fee: 85 Euros and a separate fee for foreigners | **Language of Learning**<br>German or English |

*Source: Own elaboration*

It is seen from Tab. 2, there is an opportunity to choose the language of learning, which makes the specialty more accessible to international students. Studies begin in October, but there is the possibility of starting studies in the spring too, and the need to pay student fees.

Nowadays, many Ukrainian and international companies are looking for managers with an engineering education who can successfully combine entrepreneurial skills and have detailed knowledge of a business running with a deep understanding of innovation and technology.

The educational program "Management and Technologies" combines courses in management (70%

of the entire study) with options in the field of engineering: natural sciences or life sciences (30%). The program training is based on the latest research and modern industrial practice. In addition to attending lectures, students have the opportunity to attend practical classes and seminars and work in small groups. Practical experience is gained through the project work. The university helps its graduates to start a professional career, as it actively cooperates with the leading companies BMW, BCG, Commerzbank, Siemens, and Telefónica O2.

The program includes additional electives for specialization in management:

- Innovation and Entrepreneurship;
- Marketing, Strategies and Leadership;
- Operations and Chain Management Supply;
- Finance and Accounting;
- Economy, Law, and Politics.

Additional electives depend on the chosen specialization in the field of technology too:

- Medicine;
- Chemistry;
- Electrical Engineering and Information Technologies;
- Informatics;
- Mechanical Engineering;
- Computer Engineering.

Students acquire basic knowledge in mathematics, management, law, and economics during the first four semesters of this program. Starting from the second semester, there is a clear idea about the chosen specialization in the field of technology (chemistry, mechanical engineering, computer science, medicine, computer engineering, electrical engineering, and information technology). The last sixth semester is dedicated to the thesis.

The specialization in computer engineering is taught entirely in English. There is a special selection procedure for specialization in medicine, as it has limited opportunities.

Let's take a closer look at the "Management and Technologies" educational program, where the actual structure of the program and its components depend on the choice of technical subject and the semester when the studies begin *(Bachelor in Management and Technology, n.d.)*.

*Tab. 3*

*Structure of the educational program "Management and Technologies"*

| **Management and Technologies (Bachelor)** | | | | | | |
|---|---|---|---|---|---|---|
| **Key disciplines** | I Semester | II Semester | III Semester | IV Semester | V Semester | VI Semester |
| Mathematics/Methodology | Methodological foundations of mathematics (6 credits) | Methodological foundations of mathematics (6 credits) | Methodological foundations of mathematics (6 credits) | | | |
| Economy | Fundamentals of Economics (6 credits) | Fundamentals of Economics (6 credits) | | | | |
| Management | Fundamentals of Manageme | Fundamentals of Manageme | Fundamentals of Manageme | Fundamentals of Managem | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | nt (18 credits) | nt (18 credits) | nt (18 credits) | ent (18 credits) | | |
| Law | | | Fundamentals of Law (6 credits) | Fundamentals of Law (6 credits) | | |
| Specialization in Technologies | | Technologies (6 credits) | Technologies (12 credits) | Technologies (12 credits) | Technologies (6 credits) | Technologies (6 credits) |
| Interdisciplinary Qualification | | | Communication skills (3 credits) | | | |
| Electives | | | | | Management and Technologies (12 credits) | Management and Technologies (12 credits) |
| Project Studies/Thesis | | | | | Project Research (12 credits) | Project Research (12 credits) |
| **Credits** | 30 | 30 | 30 | 30 | 30 | 30 |
| **Total Number of Credits** | 180 | | | | | |

*Source: Own elaboration*

As we see from Table 3, the total volume of the educational program is 180 credits, which are evenly distributed between each semester. A separate time is given for conducting project research and writing a thesis, so students are not involved in practical and seminar classes that are convenient for planning and fulfilling requirements. While studying "Communication Skills", students acquire important communication skills, expand their knowledge of languages, and have the opportunity to gain experience abroad. Students can complete their studies abroad at one of the partner universities through the mobility window.

Let's consider another educational program "Electrical Engineering and Information Technologies". This program is popular among applicants, as it includes many innovative developments of today: electric cars, solar systems, computer tomography, and household robots. Today, they are the governing components of our economic life. Numerous German companies and institutions research, manufacture, and sell electrical and information technology systems. Current research topics include electromobility, intelligent networks, computer chips, and environmentally safe energy supply. The achievements and developments of German scientists have an excellent reputation throughout the world. Graduates of this specialty find opportunities to realize themselves in various spheres: in industry, at government bodies, at railways and post offices, radio and television, in institutes, universities, and colleges, at home or abroad.

The bachelor's program consists of compulsory subjects in the first four semesters (120 credits). From the fifth semester onwards, students study optional modules from different areas of electrical engineering and information technology research (30 credits) as well as a wide module range to develop and improve communication skills (6 credits) from the field of interdisciplinary engineering qualifications. Students complete a nine-week engineering internship (12 credits) and complete their studies with an undergraduate thesis (12 credits), which they must write over nine weeks *(Elektrotechnik und Informationstechnik, n.d.)*.

The educational program "Electrical Engineering and Information Technologies" consists of such fundamental disciplines as methodological foundations of mathematics (32 credits), physics (24 credits), electrical engineering (21 credits), information technologies (17 credits), and signals and systems (26 credits). Thus, the first four semesters are the basis not only for the fifth and sixth semesters but also for the subsequent master's degree and professional practice *(Elektrotechnik und Informationstechnik, n.d.)*.

The compulsory part of the first four semesters includes a basic and orientation exam in the first two semesters. Since the bachelor's program is open for admission, the baseline and orientation exam provide a complete indication of whether studying electrical engineering and information technology is the right course of study for applicants. Mathematical and physical principles play an important role. The basic and preventive exam consists of 10 modules and 9 modules can be repeated only once. Let's consider the modules that are presented in the specialty "Electrical Engineering and Information Technologies" *(Elektrotechnik und Informationstechnik, n.d.)*.

*Tab. 4*

*The Training course structure in the specialty "Electrical Engineering and Information Technologies"*

| | **The Training Course Structure** | | |
|---|---|---|---|
| **Semesters** | **Modules** | | **Credits Number** |
| 1-2 | Chain Theory | Computer Technologies and Programming | 60 |
| | Digital Technologies | Linear Algebra | |
| | System Theory | Electricity and Magnetism | |
| | Physics for Electrical Engineers | Algorithms and Data Structures | |
| | Analysis 1 | Analysis 2 | |
| 3-4 | Theory of Signals | Stochastic Signals | 60 |
| | Physics of Solids, Semiconductors and Devices | Theory of the Electromagnetic Field | |
| | Electricity Technologies | Management Systems | |
| | Modern Technologies | Electronic Circuits | |
| | Measuring System and Sensor Technology | Compulsory Elective Module in Mathematics | |
| | Analysis 3 | | |
| 5-6 | Technical Optional Modules (30) | Communication skills (6) | 60 |
| | Engineering practice (12) | Bachelor thesis (12) | |
| Mathematics | | | 32 |
| Signals and Systems | | | 26 |
| Physics | | | 24 |
| Electrical Engineering | | | 21 |
| Information Technologies | | | 17 |

*Source: Own elaboration*

Tab. 4 shows the disciplines of the curriculum for the specialty "Electrical Engineering and Information Technologies" which are divided into various modules that are mandatory for students to

listen to. If a student does not pass the exam from a separate module, he has the right to retake it only once. In cases where a student cannot pass a separate module, a commission is convened and the right to retake or to be withdrawn from the educational process is considered.

Graduates of this technical specialty have the opportunity to continue their academic studies or start a career. You can work independently or in a team on complex technical and professional tasks. Acquired skills allow you to design, model, simulate, test, and integrate digital, electrical, and electronic circuits, systems, and products using various methods. An absolute advantage is that students develop and work on products that meet the requirements of the global market.

We consider the specialty "Informatics" which has been stable for many years. Informatics is the science of systematic, automated information processing, that deals with the information presentation and processing in original and highly technical computer systems and is constantly developing. This specialty provides an opportunity to acquire strong theoretical, practical, and technical skills in this field.

Computer science is the only science that has radically changed and continues to change the life of people over the past 30 years. Computers, tablets, mobile phones, and digital cameras quickly became objects of everyday use, and the Internet became widespread in all areas of our lives. Informatics makes possible radical progress in medicine, automotive, and space technologies.

While entering this specialty, the applicant receives a certain number of points that allow him to start studying: 84 or more points show that the student has passed and can start training; 73-83 points indicate that the applicant needs to retake some subjects or assignments; 72 points or less indicates that the student cannot be admitted to the university *(Bachelor Information Engineering, n.d.)*.

A graduate of the specialty "Informatics" receives in-depth knowledge of mathematics and computer systems, as well as the basics of professional specialization, and possesses basic concepts and laws *(Bachelor Information Engineering, n.d.)*:

- programming languages;
- computer architecture;
- algorithms and data structures;
- software development;
- databases;
- computer networks and operating systems.

In addition, students expand their knowledge in linear algebra, mathematical analysis, and discrete structures, learn to understand the principles of theoretical computer science, probability theory, and statistics, and gain additional knowledge in the areas of greatest interest. Among them, we highlight:

- software development;
- databases;
- artificial intelligence;
- computer graphics;
- IT security;
- computer architecture;
- algorithms and scientific calculations.

The student receives mandatory working experience in interdisciplinary teams, and upon graduation, he/she presents own results to a scientific audience.

"Informatics" graduates work in different spheres of industry and economy, in mechanical engineering and electronics, mathematics, or medicine. You can design complex information systems for businesses, program robots, build data networks between banks and companies, and develop traffic control systems.

Let's take a closer look at the structure of the Informatics course and its key modules *(Studiengangsdokumentation, n.d.)*.

*Tab. 5*

*Modules and credits number of the specialty "Informatics"*

| Training Course Structure | | |
|---|---|---|
| **Semester** | **Module** | **Credits Number** |
| 1 | Introduction to Computer Science (6) | 30 |
| | Basics of Programming (6) | |
| | Introduction to Computer Architecture (8) | |
| | Discrete Structures (8) | |
| | Intercultural Communication (2) | |
| 2 | Introduction to Software Engineering (6) | 30 |
| | Basics of Algorithms and Data Structures (6) | |
| | Functional Programming and Verification (5) | |
| | Basics of Computer Structure (5) | |
| | Linear algebra (8) | |
| 3 | Basics of Databases (6) | 30 |
| | Basics of Operating Systems and System Software (5) | |
| | IT security (5) | |
| | Informative Analysis (8) | |
| | Microeconomics (6) | |
| 4 | Basics of Computer Networks and Distribution Systems (6) | 30 |
| | Introduction to Theoretical Computer Science (8) | |
| | Discrete Probability Theory (6) | |
| | Business Administration (3) | |
| | Sociology of Labor and Industry (3) | |
| | Introduction to a Startup (4) | |
| 5 (possible mobility window) | Project work (10) | 30 |
| | Numerical Programming (6) | |
| | Business Administration (3) | |
| | Financial Accounting (6) | |
| 6 | Bachelor thesis (12) | 30 |
| | Bachelor colloquium (presentation) (3) | |
| | Algorithmic Game Theory (5) | |
| | Parallel Programming (5) | |
| | Software Security (5) | |
| Compulsory Computer Science Modules | | |
| Compulsory Mathematics Modules | | |
| Elective Informatics Modules | | |
| Thesis and Colloquium | | |
| Interdisciplinary Foundations | | |
| Elective Discipline | | |

*Source: Own elaboration*

A mandatory condition for completing "Informatics" is writing and defending a bachelor's diploma thesis. This type of work takes four months. If a student is confident in his abilities, he can propose his own topic, that he can be interested in, or the topic can be assigned by the relevant academic supervisor.

After receiving a bachelor's degree, you can start a professional activity or enroll in a master's degree.

### 4.2. Zhytomyr Polytechnic State University (Ukraine)

Let's have a closer look at the educational programs of a technical university in Ukraine. Let's consider the educational program "Software Engineering" based on Zhytomyr Polytechnic State University, the Faculty of Information and Computer Technologies. The volume of the educational program is 240 credits with a study period of four years.

You can enter this specialty only if you have a complete general secondary education, a junior specialist degree, or a junior bachelor's degree. The language of learning is only Ukrainian. The educational program's purpose is to ensure that highly qualified specialists training in the field of information technologies, capable of solving complex tasks and practical problems of designing, developing, and testing software systems, possessing modern methods of creating and maintaining software for various purposes.

This specialty graduate can work as a leading specialist in the following fields (according to DK 003:2010) *(Software Engineering, n.d.)*:

- 3121 – Technician-programmer;
- 3121 – Information technologies specialist;
- 3121 – Software development and testing specialist;
- 3121 – Computer program development specialist;
- 2132.2 – Software engineer;
- 2132.2 – Programmer (database);
- 2132.2 – Application programmer;
- 2131.2 – Computer systems engineer;
- 2131.2 – Computer software engineer.

Let's take a closer look at the structure of the educational program "Software Engineering" *(Software Engineering, n.d.)*.

*Tab. 6*

*The educational program "Software Engineering"*

| The Educational Program Components | Credits Number | Total Volume | Final Control Form |
|---|---|---|---|
| **First year, 1st semester** | | | |
| Foreign language | 3 | 90 | Credit |
| History and culture of Ukraine | 3 | 90 | Exam |
| Linear algebra and analytic geometry | 3 | 90 | Credit |
| Mathematical analysis | 4 | 120 | Credit |
| Computer architecture | 4 | 120 | Exam |
| Fundamentals of programming | 8 | 240 | Exam |
| Application programs packages | 3 | 90 | Exam |
| **First year, 2nd semester** | | | |
| Foreign language | 4 | 120 | Credit |
| Ukrainian language (by professional direction) | 3 | 90 | Credit |
| Physics | 4 | 120 | Exam |
| Mathematical analysis | 4 | 120 | Exam |
| Algorithms and data structures | 5 | 150 | Exam |
| Object-oriented programming | 8 | 240 | Exam |
| Group dynamics and communications | 3 | 90 | Credit |
| Educational practice | 3 | 90 | Credit |

| | | | |
|---|---|---|---|
| **Second year, 3d semester** | | | |
| Foreign language | 3 | 90 | Credit |
| Probability theory and mathematical statistics | 3 | 90 | Exam |
| Computer discrete mathematics | 5 | 150 | Exam |
| Fundamentals of software engineering | 5 | 150 | Exam |
| Web design | 7 | 210 | Exam |
| Computer graphics | 4 | 120 | Credit |
| Functional programming | 4 | 120 | Credit |
| **Second year, 4th semester** | | | |
| Foreign language | 4 | 120 | Exam |
| Discrete structures | 4 | 120 | Exam |
| Databases | 5 | 150 | Credit |
| Operating systems | 4 | 120 | Exam |
| Internet programming | 9 | 270 | Exam |
| System Programming | 4 | 120 | Credit |
| Programming in the Python language | 4 | 120 | Credit |
| Technological practice | 3 | 90 | Credit |
| **Third year, 5th semester** | | | |
| Databases | 5 | 150 | Exam |
| Human-machine interaction | 3 | 90 | Exam |
| Computer networks | 5 | 150 | Exam |
| Internet Programming (ASP.NET) | 5 | 150 | Exam |
| Internet Programming (PHP) | 5 | 150 | Exam |
| Foreign language (by professional direction) | 3 | 90 | Credit |
| English language (by professional direction) | 3 | 90 | Credit |
| A student's choice component from sample block 1 | 3 | 90 | Credit |
| A student's choice component from sample block 2 | 3 | 90 | Credit |
| A student's choice component from sample block 3 | 3 | 90 | Credit |
| **Third year, 6th semester** | | | |
| Analysis of software requirements | 4 | 120 | Credit |
| Software architecture and design | 4 | 120 | Exam |
| Application and data security | 3 | 90 | Exam |
| Empirical methods of software engineering | 3 | 90 | Exam |
| Design of software interfaces | 5 | 150 | Credit |
| Application development using Node.JS | 5 | 150 | Credit |
| Linear and discrete programming | 5 | 150 | Exam |
| Mathematical methods of operations research | 5 | 150 | Exam |
| Foreign language (by professional direction) | 2 | 90 | Credit |

| | | | |
|---|---|---|---|
| English language (by professional direction) | 2 | 90 | Credit |
| Production practice | 6 | 180 | Credit |
| **Fourth year, 7th semester** | | | |
| Philosophy | 3 | 90 | Exam |
| Economics and software management | 5 | 150 | Credit |
| Software modeling and analysis | 3 | 90 | Exam |
| Software quality and testing | 4 | 120 | Exam |
| Linear and discrete programming | 11 | 330 | Exam |
| Mathematical methods of operations research | 11 | 330 | Exam |
| Foreign language (by professional direction) | 3 | 90 | Credit |
| English language (by professional direction) | 3 | 90 | Credit |
| **Fourth year, 8th semester** | | | |
| Ecology and life safety | 3 | 90 | Credit |
| Political science | 3 | 90 | Credit |
| Professional IP practice and project practicum | 3 | 90 | Exam |
| Artificial intelligence systems | 6 | 180 | Exam |
| Intelligent systems | 6 | 180 | Exam |
| Computational complexity theory | 3 | 90 | Exam |
| The complexity of extreme problems theory | 3 | 90 | Exam |
| Pre-diploma practice | 3 | 90 | Credit |
| Diploma project | 6 | 180 | State exam |
| **General Scope of the Educational Program** | 240 | 7200 | |

*Source: Own elaboration*

We may see from Table 6 that the Ukrainian educational program is larger in terms of the educational material volume (7,200 hours) and the credits number (240 as opposed to the German program, where 180). Some academic subjects overlap with those offered at German universities: linear algebra, discrete structures, databases, computer networks operating systems, etc.

You can get a bachelor's degree only after writing a thesis and successfully defending it. After completing studies, you can enroll in a master's degree or start a professional career. Most Ukrainian students begin their work by combining it with further studies to complete a full cycle of higher education in Ukraine.

## 5. CONCLUSIONS

We can see that educational programs differ in the credits number and the volume that students must master to successfully get into a certain profession. Students have to pass 240 credits in Ukraine and at the same time, German students must take 180 credits in Germany. There are also identical elements in the educational process: forms of control, the educational process organization forms (lectures, practical, seminar classes), and the possibility of practical training. In Ukrainian universities, it is possible to retake several subjects and one subject several times, while in German universities, it is possible to retake one subject only once. All higher education institutions are characterized by a high

rating and a good level of specialist training.

Obtaining a bachelor's degree is possible only after defending the thesis and passing separate state exams. Their number may vary according to the specialty. In Ukraine, students combine writing a bachelor's thesis with attending classes and completing other tasks. In Germany, students are given separate time to write their bachelor's thesis and prepare for the defense, which is a significant advantage.

## REFERENCES


[1] Antonova, O. (2009). Methodology of teaching pedagogically gifted students in the studying disciplines process of the pedagogical cycle. *Professional pedagogical education: innovative technologies and methods*: Monograph, ed. O. Dubasenyuk. Zhytomyr: Publishing house of Zhytomyr Ivan Franko State University, pp. 330-355. http://eprints.zu.edu.ua/4977/1/Колективна_Монография_2009.pdf (in Ukr.)

[2] *Aufbau des Studiengangs*. Technical University of Munich. https://www.cit.tum.de/fileadmin/w00byx/cit/Studium/Studiengaenge/Bachelor_Elektrotechnik_Informationstechnik/Studienfuehrer_BSEI_WS2023-24.pdf (in Germ.)

[3] *Bachelor of Information Engineering*. Technical University of Munich. https://www.cit.tum.de/en/cit/studies/degree-programs/bachelor-information-engineering/#c940 (in Germ.)

[4] *Bachelor in Management and Technology.* Technical University of Munich. www.tum.de/fileadmin/user_upload_87/gi32rab/Management_and_Technology_BA_Program_Structures_ab WS23_24.pdf (in Germ.)

[5] Baumert, Jürgen; Klieme, Eckhard; Neubrand, Michael; Prenzel, Manfred; Schiefele, Ulrich; Schneider, Wolfgang; Stanat, Petra; Tillmann, Klaus-Jürgen; Weiss, Manfred (2001). *Basiskompetenzen von Schülerinnen und Schülern im internationalen Vergleich*. Opladen: Leske u. Budrich. https://www.fachportal-paedagogik.de/literatur/vollanzeige.html?FId=2707693 (in Germ.)

[6] Bromberg, K. (2015). *Akademische Lehr-Lern-Forschung im Vergleich: Wissenschaftliche Selbstthematisierungen aus transnationaler Perspektive*, 18, 551–567. https://doi.org/10.1007/s11618-015-0621-y (in Germ.)

[7] B.Sc. *Information Engineering (at TUM Campus Heilbronn): Curriculum*. www.cit.tum.de/fileadmin/w00byx/cit/Studium/Studiengaenge/Bachelor_Information_Engineering_Heilbronn/20210422_BSC_IE_Curriculum.pdf (in Germ.)

[8] Dubasenyuk, O. (2009). Innovative educational technologies and methods in the system of professional-pedagogical training. In: *Professional pedagogical education: innovative technologies and methods:* Monograph, ed. O. Dubasenyuk. Zhytomyr: Publishing house of Zhytomyr Ivan Franko State University, 14-48. http://eprints.zu.edu.ua/4977/1/Колективна_Монография_2009.pdf (in Ukr.)

[9] *Educational programs.* Nizhyn Mykola Gogol State University. https://sites.google.com/ndu.edu.ua/osvitni-prohramy/ (in Ukr.)

[10] Elektrotechnik und Informationstechnik. Bachelor of Science. Technical University of Munich. https://www.cit.tum.de/en/cit/studium/studiengaenge/bachelor-elektrotechnik-informationstechnik/ (in Germ.)

[11] Katja Ludwig, Cathleen, Grunert, Nora, Friederike Hoffmann (2018). *Herausforderungen rekonstruktiver Forschung an Hochschulen am Beispiel der Studiengangsentwicklung in der Erziehungswissenschaft.* https://elibrary.utb.de/doi/abs/10.3224/zqf.v18i2.08 (in Germ.)

[12] Krystopchuk, T (2014). Trends in the pedagogical education development of the European Union countries. *Abstract of the dissertation for the Doctor of Pedagogical Sciences degree*. Kyiv. https://kubg.edu.ua/images/stories/Departaments/apirantam/Avtoreferat/Д.26.133.06/TY_Krystopchuk_avtoreferat.pdf (in Ukr.)

[13] Lodatko, Ye. (2016). V. I. Bader. In: *Encyclopedia of Modern Ukraine* [Electronic resource], ed. I. Dzyuba, A. Zhukovsky, M. Zheleznyak [and others]; NAS of Ukraine, National Scientific Research Center. Kyiv: Institute of NAS Encyclopedic Research of Ukraine. https://esu.com.ua/article-56170 (in Ukr.)

[14] Management and Technology (am Campus München). Bachelor of Science. Technical University of Munich. https://www.tum.de/en/studies/degree-programs/detail/management-and-technology-bachelor-of-science-bsc (in Germ.)

[15] Metz-Göckel, S., Kamphans, M. & Scholkmann, A. (2012). *Hochschuldidaktische Forschung zur Lehrqualität und Lernwirksamkeit*, 15, 213–232. https://doi.org/10.1007/s11618-012-0274-z (in Germ.)
[16] *Software Engineering. Zhytomyr Polytechnic State University*. https://vstup.ztu.edu.ua/bakalavr/121-inzheneriya-prohramnoho-zabezpechennya/ (in Ukr.)
[17] *Studiengangsdokumentation. Bachelorstudiengang Informatik*. Teil A. Fakultät für Informatik. Technische Universität München. www.tum.de/fileadmin/user_upload_87/gi32rab/Informatik_BA_Studiengangsdokumentation_02062021.pdf (in Germ.)
[18] Sydorchuk, N. (2009). Innovative principles of domestic higher education modernization in the context of European integration processes. *Professional pedagogical education: innovative technologies and methods:* monograph, ed. O. Dubasenyuk. Zhytomyr: Publishing house of Zhytomyr Ivan Franko State University, 103-114. http://eprints.zu.edu.ua/4977/1/Колективна_Монография_2009.pdf (in Ukr.)
[19] Sysoeva, S. (2014). European requirements for the effectiveness criteria of specialists' professional training. In: *Acmeology – the science of the 21st century: materials of the IV International Scientific and Practical Conference,* May 30. Kyiv, 36-47. (in Ukr.)
[20] Teichler, U. (2017). Higher Education System Differentiation, Horizontal and Vertical. In: Shin, J., Teixeira, P. (eds) *Encyclopedia of International Higher Education Systems and Institutions.* Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9553-1_36-1 (in Germ.)
[21] Tsependa, I., & Budnyk, O. (2021). Editorial. Mission and strategy of a modern university development in the conditions of digitalization. *Amazonia Investiga*, 10(41), 6-9. https://doi.org/10.34069/AI/2021.41.05.0
[22] Vitvytska, S. (2009). Technology of masters pedagogical training in the graduate education conditions. In: *Professional pedagogical education: innovative technologies and methods:* monograph, ed. O. Dubasenyuk. Zhytomyr: Publishing house of Zhytomyr Ivan Franko State University, 133-153. http://eprints.zu.edu.ua/4977/1/Колективна_Монография_2009.pdf (in Ukr.)

**Anna Dynovych**, Graduate Student of the General Pedagogy and Preschool Education Department, Drohobych Ivan Franko State Pedagogical University, Ukraine;
**ORCID ID:** 0000-0002-8678-3311
**Address:** Anna Dynovych, Drohobych Ivan Franko State Pedagogical University, Ivana Franka Str., 24, Drohobych, 82100 Ukraine.
**E-mail:** anyash26@gmail.com
**Received**: October 31, 2024; **revised**: January 29, 2025; **accepted**: March 17, 2025; **published**: March 28, 2025.

---

*Динович Анна.* Порівняльна характеристика освітніх програм підготовки майбутніх фахівців технічного профілю в Німеччині й Україні. *Журнал Прикарпатського університету імені Василя Стефаника*, **12** (1) (2025), 105-118.

Освітні програми є невід'ємною частиною функціонування вищого закладу освіти. Освітня програма — система відповідних освітніх компонентів, визначених на найвищому рівні для оптимального володіння певною кваліфікацією. Цей документ визначає вимоги, дисципліни, кількість кредитів, дипломні проекти та практичні заняття, необхідні для виконання. Обсяг освітніх програм відрізняється для кожного рівня вищої освіти та відповідної спрямованості. У статті розглядаються різноманітні освітні програми технічних спеціальностей вищих навчальних закладів Німеччини та України. Проаналізовано ключові дисципліни, вказано відповідну кількість кредитів, які здобувачі освіти повинні виконати для успішного отримання диплома. Зазначено певні відмінності у формах контролю та кількості завдань, необхідних для засвоєння. Висвітлюється наявний перелік компетентностей здобувача освіти з нормативним змістом підготовки, де відображаються терміни та результати навчання. Дослідження включає аналіз сучасних тенденцій розвитку технічної освіти в Німеччині та Україні, а також представлено деякі новітні технології та методи навчання. Важливим аспектом є порівняння вимог до практичної підготовки студентів та можливості проходження

стажування на підприємствах. Висвітлено питання академічної мобільності студентів. У статті розглядаються деякі освітні програми Мюнхенського технічного університету та Державного університету "Житомирська політехніка". Проаналізовано програми "Менеджмент і технології", "Електротехніка та інформаційні технології", "Інформатика", "Інженерія програмного забезпечення". Вказано необхідні документи для вступу на вищу технічну спеціальність. Наголошено на важливості міжпредметних зв'язків для успішного розвитку здобувачів освіти.

**Ключові слова:** освітня програма, технічна спеціальність, технічний заклад вищої освіти, кількість кредитів, освітні компоненти.