

Peculiarities of English Language Training for Electrical Engineering Students at Ukrainian Universities

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Abstract – The article deals with the issue of English language training for electrical engineering students at Ukrainian universities. Understanding the importance of studying foreign languages has been confirmed by a number of normative documents. The curricula of seven leading universities of Ukraine training electrical engineering students have been analysed. The recommended time for studying foreign languages and the study load at Ukrainian universities differ significantly. The content analysis of existing English language coursebooks and textbooks for engineers, electricians, electrical and power engineers has been conducted to find out the content of foreign language training. Recommendations for the improvement of teaching English for professional purposes at Ukrainian universities have been proposed.

Keywords: *electrical engineering, English language training, English for professional purposes, curricula, university.*

In modern educational space, foreign language training as an integral part of the professional training of specialists is gaining special significance. Employers are willing to have progressive specialists among their employees who are not only competent in their field, with a broad worldview and desire to study throughout their lives, but also with a sufficient or high foreign language level, technical foreign language knowledge, the ability to read and translate technical literature and documentation, communicate with customers, as well as knowledge of the correspondence basics.

Electrical engineering is the basic branch of the economy of any country; nowadays this high-tech branch is rapidly developing, expanding and being complicated due to innovations, the most advanced technologies and new knowledge. Electrical engineering technologies are intensified by integrating processes through the unification of national energy systems into large transnational energy interconnections; the use of non-traditional and renewable sources of energy is changed. Professional communication of electrical engineers under such conditions undergoes significant transformations, which find expression in new forms and means of information transmission, its content changes, its volume complicates and increases, there is the need to increase information accuracy, as well as the level of comprehension for a wide range of people. Certainly, foreign language training of future specialists in any branch should keep pace with the realities of time and take into consideration existing transformations of communication in order to learn languages for the further successful functioning of specialists in their professional activities. This fact is also relevant for training of electrical engineers.

The issues of professional training organization of engineers of various fields are highlighted in the works of Y. Zinkovsky, O. Kaverin, G. Kozlakova, A. Kokareva, V. Marigodova, O. Romanovsky and others. Methodological aspects of the training of power engineers have been studied by Y. Gordiichuk (organization of training of electrical engineers at national and foreign universities), L. Omechenko, A. Kernytsky (formation of professional competence of future power engineers), A. Padalko, N. Padalko (professional training of electrical engineers on the basis of the latest mathematical theories), S. Kvitka, O. Rechyna (practical orientation in the professional training of power engineers), T. Yakymovych (integration of theoretical and industrial training), S. Amrich (step-by-step training of specialists in educational and research and production complexes), D. Kostyuk (creative aspect of technical competence of power engineers), R. Sobko (integrative teaching of computer technologies in the professional training of electricians), O. Fedortsov (formation of cultural competence of future power engineers in the process of studying humanities). Problems of foreign language training of specialists have been presented in papers of O. Khomenko, S. Kostritsky, I. Zuyenok, A. Turchin, N. Mykytenko, V. Sulima, N. Yaremchenko, in particular, the peculiarities of foreign language teaching to engineers have been studied by N. Sayenko, G. Lazaruk, L. Boykiv, I. Grishina, G. Yemelianova, O. Tarnopolsky, I. Secret, the aspects of foreign language learning by electrical engineering students have been explored by R. Horbatiuk, N. Bilan, M. Shevchenko, N. Filippova, M. Nozhka.

Understanding the importance of studying foreign languages has been confirmed by a number of normative documents. In the recommendation letter of the Ministry of Education and Science of Ukraine "On the organization of studying humanities" No 1 / 9-120 dated March 11, 2015, it is stated that "it is necessary to create conditions for the study of English as a language of international academic communication, in order to reach B2 level in accordance with The Common European Framework of Reference for Languages" [11].

The higher education standards of Ukraine for the field of knowledge 14 "Electrical engineering" cover a complication of requirements for obtaining competences, including foreign language competence from the first to the second level of higher education. Thus, for a bachelor's level, the outcome is the ability to use a foreign language in professional activities [4]. For the master's level, the formulation of learning outcomes is significantly deepened and expanded.

Specialists must be able to search for sources for additional training, scientific and innovative activities, present research materials at international scientific conferences and seminars dealing with modern issues in the field of power engineering, electrical engineering and electromechanics, to participate in joint research and development with foreign scientists and specialists in power engineering, electrical engineering and electromechanics, to communicate fluently orally and in writing using state and foreign languages on modern scientific and technical issues of power engineering, electrical engineering and electromechanics.

Researchers R. Horbatiuk and N. Bilan define the foreign language competence of future electrical engineers as an integral feature of the personality, characterized by a complex of foreign-language knowledge, practical skills, the level of achievement of which is determined by the ability to solve educational, domestic, professional, engineering and managerial, production and technological, research, design and development tasks by means of foreign languages [13]. As it can be seen from this definition, electrical engineers should be able to solve rather complicated problems using a foreign language.

The National Curriculum of English for Special Purposes, which is designed to take into account the Common European Framework of Reference for Languages and the purpose of which is the formation of professional communication skills as a language-specific behaviour for the academic and professional environment, states that the minimum acceptable level of foreign language proficiency for undergraduate students is B2 (upper-intermediate level, independent user), for postgraduate students it is C1 (advanced level) [10].

Experts and practitioners believe that in order to prepare a qualified specialist, the practical experience of at least 10,000 hours in the chosen industry is required [18]. Undoubtedly, constant practical activities in all kinds of speech activity are also required for mastering a foreign language and its improvement. According to Cambridge ESOL [16] it takes approximately 200 guided learning hours for a language learner to progress from one level to the next one (to achieve the A2 level students are to learn 180 - 200 hours, B1 – 350-400 hours; B2 – 500-600 hours; C1 – 700-800 hours, and C2 – 1000-1200hours).

We have analyzed the curricula of the speciality 141 “Power engineering, electrical engineering and electromechanics” of the field of knowledge 14 “Electrical engineering” of seven leading higher education institutions of Ukraine regarding the availability and scope of foreign languages. It is quite obvious that the recommended time for learning a foreign language and the study load at higher education institutions of Ukraine differ significantly. Moreover, the ratio of guided learning can be 50% of the total study load, which is a very low figure. The results of the analysis are presented in Table I.

Foreign languages are the part of the humanities cycle, which are taught in the first and second years of study, this fact complicates the teaching of a foreign language for professional purposes, since students lack knowledge in the speciality, and disciplines of the professional cycle are taught in their third or fourth year. In addition, as the results of foreign language entrance tests show, the vast majority of first-year students have a very low level of the foreign language proficiency (A1), and the progress to the higher level of an independent user (B2) becomes almost impossible.

TABLE I. CURRICULA ANALYSIS DATA

De gree	Discipline	Obligatory	Selective	EC TS
Vinnitsia National Technical University				
Bachelor's degree	Foreign language	+		7,5
Master's degree	Business foreign language	+		3
Terнопil Ivan Puluj National Technical University				
Bachelor's degree	Foreign language for professional purposes	+		6
	Foreign language for professional and business purposes		+	10
Master's degree	Foreign language for professional purposes	+		4
National University of Life and Environmental Sciences of Ukraine				
Bachelor's degree	Foreign language		+	4
Master's degree	Business foreign language		+	4
Lviv Polytechnic National University				
Bachelor's degree	Foreign language	+		6
Master's degree	Foreign language	+		2
Yuriy Fedkovych Chernivtsi National University				
Bachelor's degree	Foreign language for professional purposes	+		6
Master's degree	-			
Zaporizhzhia State Engineering Academy				
Bachelor's degree	Foreign language	+		8
Master's degree	Foreign language for professional purposes			4
Dmytro Motornyi Tavria State Agrotechnical University				
Bachelor's degree	Foreign language	+		23
Master's degree	Business foreign language	+		4

To find out the content of foreign language teaching, we have conducted the content analysis of existing English language coursebooks and textbooks for engineers, electricians, electrical and power engineers. Our scientific research was aimed at the following aspects: the presence of tasks and activities for the development of all four language skills; the professional orientation of the content, the presence of job-related situations; the availability of additional materials and resources for self-study.

The coursebook “English for Electrical Engineers” [9] offers the system of authentic texts and a set of exercises for vocabulary acquisition on topics: “Fundamentals of electrical systems”, “Electrical measurements”, “People in electric power industry”. The coursebook is aimed at communication, it contains materials for interactive activities, recommendations for writing tests of different genres and a grammar directory.

The textbook “English for Electrical Engineering and Mechanical Engineering Students” [12] is focused on the peculiarities of terminology used in the scientific and technical fields, in particular, in electrical engineering, and the task performance which contributes to the formation of translation skills from the English and Ukrainian languages,

the perception of writing and oral English language, the ability to write scientific and technical and other texts during a professional activity in English, communication on professional and general issues, etc. The textbook does not take into consideration the latest developments in the fast-growing sector of powerengineering.

The advantages of the Ukrainian coursebooks are their original structure, the use of authentic texts, the basic professional vocabulary, but these books lack tasks for the development of listening skills and activities for communication among students, in particular, there are no examples of dialogues, problem situations, etc.

The Oxford English for Electrical and Mechanical Engineering Student's Book [8] consists of 30 lessons covering a wide range of technical topics in the fields of mechanics and energy. The coursebook develops all four skills through varied activities. The disadvantage of the coursebook is its possible limited application in learning English for professional purposes by electrical engineering students, only some topics are relevant to the field: an electric motor, an engineering student, a portable generator, safety at work, careers, applying for a job. The information content is rather obsolete.

The coursebook "English for the energy industry" [15] can be considered as a short English language course for professional purposes. The coursebook contains only six blocks, the topics of which include introduction to the energy business, markets and customers, protection of the environment, nuclear energy issues, investment plans, and the future of energy. The key features of the course book are the modern contents of texts and listening passages, numerous exercises, job related role plays and a Multi-ROM, which makes it possible to do interactive exercises. The coursebook can be used as a part of the main language course or for self-study.

Among the analysed coursebooks the Express Publishing Career Paths series ("Career Paths") is of great interest. The series is designed for professionals who want to improve their communication skills in English in the work environment. The coursebooks include special vocabulary and texts, step-by-step tutorials for developing four main language skills: reading, listening, speaking and writing. Each book contains three parts in three levels of difficulty (A1, A2 and B1) and offers over 400 lexical terms and phrases. Each lesson includes reading comprehension, vocabulary acquisition activities, and listening tasks.

The Career Paths: Electrical [17] and Career Paths: Electrical engineering textbooks [7] are built on the principles of the whole series, the emphasis of the first coursebooks is on electricity, the second one deals with power engineering. The important structural elements of these coursebooks are specific job-related dialogues related to profession and the set of realistic texts in the field of power engineering for reading. So the books combine specialized vocabulary and professional context in English classes to form the language skills necessary for a career. A distinctive feature of Career Paths: Electrician is the availability of a free mobile application for IOS. For Career Paths: Electrical Engineering, there is the option to use The DigiBooks App, which contains the book's contents, all audio materials, interactive activities, auto-correction and videos. However, despite a well-thought-out structure,

professionally oriented exercises, texts and dialogues, the disadvantage of the coursebooks is the absence of consistency between the topic of the lesson, vocabulary for learning and the skills that are formed during the study of a particular topic. There are also no explanations for the grammatical phenomena inherent in the technical English language.

English for Electrical Engineering in Higher Education [14] is intended for English independent and proficient users. It is aimed at learning listening to electrical engineering lectures and speaking in corresponding seminars. The B2 to C2 coursebook comprises 12 units, which cover a broad range of electrical engineering topics, such as the history of electrical and electronic engineering, electric power generation, transmission and distribution, electric cars, microelectro mechanical systems, lighting engineering. All four language skills can be developed through numerous activities. The online resources for the coursebook provide unit-related links and links to professional organizations servicing electrical engineers.

There are numerous free online courses of top world universities for self-study for students and adults. These courses are self-paced and require two-three hours a week. The courses include watching videos, listening to audio and reading articles, require student involvement by taking tests, doing assignments, communicating with learners and teachers and sharing their opinions and ideas with other participants. The popular FutureLearn portal offers certain courses for electrical engineers. The Electrical Engineering: Sensing, Powering and Controlling online course is aimed at developing skills in analysing and designing digital and analogue circuits and systems, and getting familiar with using English technical vocabulary.

The distinctive feature of these courses is their urgency. The contents are quite modern and comprehensive. Students are able to study the current trends and future developments in the field. The New Energy Technologies: Energy Transition and Sustainable Development course [3] explores alternative energy sources and new energy technologies. The Science of Nuclear Energy [5] and Understanding Nuclear Power [6] courses are intended for students learning English and wishing to broaden their knowledge in the field of nuclear power generation. These courses are very useful for Ukrainian electrical engineering students, because a great percentage of them after graduation from the universities start working at nuclear power stations.

The English for the Workplace [2] course covers main aspects of English for the workplace, such as finding a job, interviews, starting a job, working together. The course helps participants be familiar with using job-related English vocabulary and apply it in real work situations.

The carried out analysis of the curricula and the content analysis of coursebooks, textbooks and online courses for electrical engineering students has allowed us to make certain conclusions and give recommendations for the improvement of teaching English for professional purposes at Ukrainian universities.

The requirements for the foreign language competence of electrical engineers are very high. The levels pointed out in the regulations are difficult to reach because of the limited time intended for learning foreign languages. In many regulations it has been noted that higher education reform

does not imply any unification of the higher education systems in different countries. Each country can keep its national traditions, heritage and culture while organizing the educational process [20] and, correspondingly, each university can organize its educational process autonomously. So, the issue can be settled by increasing the study load of electrical engineering students for learning foreign languages and extending the period of learning languages up to four years.

There is a range of coursebooks and resources aimed at teaching English for electrical engineering students, but there is no universal teaching aid. Some textbooks are out-of-date, most of the coursebooks do not take into consideration national peculiarities and modern technologies developments of the industry. As it has been stated for IT-specialists, technologies are being changed rapidly, so it is advisable to monitor the sources of information systematically in order to identify new industry trends and to determine the appropriateness of making adjustments to educational curricula [19]. The idea is also true for electrical engineers. The contents of English curricula, coursebooks and textbooks are to be modified according to the requirements and needs of students, employers and imperatives.

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