

## PROFESSIONAL COMMUNICATION IN ENGLISH FOR ENGINEERS: AN ONLINE COURSE

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**Abstract:** The paper presents an overview of a single-semester course on professional communication for engineers taught for master level students in a Power Engineering program at Gdansk University of Technology. The general structure of the course allows adopting it to any engineering level or specialization. The course can be taught in a hybrid manner or fully online.

**Keywords:** professional communication, engineering education, online teaching.

### 1. INTRODUCTION

English has become a *lingua franca* in engineering. International teams of engineers working on products, developing standards, providing services, etc., communicate in English, conduct meetings in English, write manuals in English, and expect all team members to have common understanding of the basic rules of professional communication in general, as well as in their specific discipline. Therefore, it is critically important for graduates of engineering schools to have a professional preparation in the technical use of the language, but also some practice in applying the acquired knowledge in real circumstances.

This is very different from learning English traditionally, which is mostly a colloquial English. Moreover, students of technical disciplines need not only learn technical language, but also get experience in a variety of circumstances where this technical language is practiced. This is not currently offered, even to a minimal extent, by either engineering schools or foreign language departments.

The objective of this paper is to fill this gap and offer an engineering perspective on teaching professional communication in English that would be broad and deep enough to have practical value and involve exercises with actual application of the techniques learned. Since professional communication in engineering tends to be moving away from face-to-face meetings, becoming more distributed, using electronic means, the mode in which a respective course is offered is online or, at least, hybrid. The paper does not cover issues of societal communication skills and psychology of communication, but focuses on technical and organizational aspects of professional communication.

The rest of the paper is structured as follows. Section 2 presents an outline of the curriculum for a course on professional communication in English, Section 3

presents examples of topics covered and practical exercises, and Section 4 ends the paper with conclusions.

### 2. COURSE STRUCTURE AND CONTENTS

#### 2.1. Basic Assumptions

The basic assumption is to structure the course around the every-day activities of a practicing engineer as a team member. Such activities usually include some or all of the following, this being a non-exhaustive list:

- 1) Participation in meetings or seminars, whether face-to-face or online.
- 2) Writing professional documents of various types.
- 3) Making live presentations to technical audiences.
- 4) Translations of professional materials related to the discipline.
- 5) Maintaining contacts via professional forums.
- 6) Making professional trips and reporting on them.
- 7) Preparing product or event press releases.
- 8) Cooperation in the development of marketing or instructional videos.
- 9) Developing product related webpages.
- 10) Last but not least, properly structuring and writing own CV's.

Each of the items listed above has its own specific contents, which goes far beyond a simple meaning of the heading, so all this has to be taught to the students. For example, an activity as simple as "Participation in meetings" (No. 1 in the list above) involves a lot more than just sitting in a meeting and taking part in discussions or simply consuming what happens. Some sample proficiencies includes: the ability to prepare an agenda, skills to write the meeting minutes, the ability to conduct an activity to approve minutes of the previous meeting, etc.

The activity marked as "Professional writing" (No. 2) is one of the most complicated to teach, due to the rich variety of prospective documents the engineers come across in their careers. The nature of the documents may vary from simple product specifications and product descriptions | to technical reports, user manuals, test reports and troubleshooting guides, as opposed to research papers students are most often asked to produce in school.

Due to the nature of a contemporary society, which becomes more and more visually oriented and where most of the information is available online, engineering students

need to acquire corresponding skills as well, which include producing videos, developing websites, putting press releases, etc. All this has to be reflected in the curriculum.

## 2.2. Details of the Course Contents

Following the basic assumptions outlined in the previous section, Table 1 illustrates typical contents of the course. It is structured as a 12-week sequence, with major activities of each week listed in the rightmost column. Each activity is meant to result in a deliverable, based on which student's performance is evaluated.

Table 1. Typical contents of a 12 weeks course

Wk	Topic Description	Hrs	Activity
1	Main Concepts of Professional Communication. Individual Introductions. Messages to Class	3	Student introductions Instructor messages.
2	Observation of a Professional Meeting Online and/or Participation in a Webinar. Agenda, Taking Minutes.	3	Writing minutes. Minutes approval
3	Professional Writing: Research Papers, Technical Reports and Other Technical Documents	3	Writing a Technical Report
4	Preparing Professional Slides in Technical/Engineering Disciplines	3	Producing & presenting slides/poster
5	Professional Terminology in Specific Discipline. Professional Translations	3	Translate a document into English
6	Connecting via professional platforms: LinkedIn, Research Gate, IEEE Societies	3	Connecting w/ LinkedIn
7	Travel to Customers, Seminars – Participating, Presenting and Reporting	3	Writing a Trip Report
8	Writing Professional CV's	3	CV special format
9	Producing Press Release, Observing Professional Ethics (email, social networks, etc.)	3	Writing a Press Release
10	Principles of Developing Professional Websites	3	Skeleton of a website
11	Designing and Producing Visuals: Photos and Videos	3	Produce a project video
12	Summary and Final Remarks	3	Get together

The form and medium of deliverables are varied, but the essential focus is on making the students engage in developing artefacts that would resemble the actual challenges in the real world where students become employed. In addition to typical writing projects, such as developing project documentation (3) or CV's (8), writing skills in different contexts need to be developed, for example, by writing meeting agendas and minutes (2), producing translations (5), developing trip reports (7) and press releases (9). The diversity of written products and different contexts, in which these products are used, give the students a broader perspective on what might be the practical expectations of their future employers.

The acquisition of writing skills in a variety of circumstances is only a half of the skills engineering students need to possess to be prepared for the job. The other half is proficiency in interpersonal skills and multimedia. Traditionally, multimedia skills involve producing and presenting slides and posters (4), but nowadays this

is extended to the development of videos (11) and websites (10). Interpersonal skills are a domain of social sciences, but in this course they are enforced by verbal introductions (1), professional platforms (6), and informal gatherings (12).

## 3. PRACTICAL COURSE OFFERING

### 3.1. General Information

The course was offered during the Spring 2018 semester, for the Power Engineering students at the Faculty of Electrical and Control Engineering of Gdansk University of Technology. There were no formal prerequisites to take it, except senior standing in the Power Engineering program. The initial enrollment was 14, with one student dropped for course unrelated reasons. The students were divided into five 2-3 person teams.

The structure of the course resembled the outline shown in Table 1, with the only difference that it was a 10-week course, so topics for weeks 1 and 12 from the table were incorporated into material for adjacent weeks. Five lectures were presented face to face, in five 3-hour sessions during a single week, and the remaining lectures were offered online. The lecturing language and the language for all assignments was English.

The emphasis in the course was on guiding students how to perform specific tasks for all major topics in professional communication. Subsequent assignments were meant to verify how students perceived the guidance and how well they performed the specific tasks. The assessment of the assignments was done only on a Pass/Fail basis, with no grading scale. If the individual or a team failed on the first submission, they received comments and correction requests to be implemented for the repeated submission. More than one failed submission had a negative impact on the final grade.

### 3.2. Research Project Report

The major part of professional communication in engineering is writing technical documentation, such as product specifications, design documents, test reports, instruction manuals, troubleshooting guides and other types of technical reports. Due to a short time span of this course, the focus was on the development of a research project report, preferably based on a completed master thesis of one of the team members, although a choice of other topics was allowed. Guidance for the report structure, contents, format and length was very strict, and included, for example, a requirement to follow this sequence of sections appropriately titled:

- 0) Separate title page
- 1) Introduction
- 2) Principles of the Technology
- 3) Applications of the Technology
- 4) Conclusions
- 5) References

One additional point to make is that the list of references had to follow the IEEE publishing practices, as opposed to other professional publishers in engineering, such as Springer or Elsevier, or more common guidelines, such as APA (American Psychological Association), which the students usually learn in non-engineering courses.

A dedicated lecture was given on this topic, with detailed discussion explaining the writing guidelines, but in fact all relevant information was made available over the

Instructor's website [1], so this part of the course can be fully conducted over the Internet, as report submission and Instructor's feedback can be communicated via email or by uploading the material to a dedicated server.

### 3.3. Translation of Professional Documents

This activity is rarely conducted in typical engineering courses, despite the fact that it constitutes an essential component of professional practice. In this course, the students were assigned a task to translate into English a fragment of a technical article "How Does a Nuclear Power Station Work?" which is Section 3 from a book [2].

A part of the text was translated jointly, during the class meeting, with the help of Instructor, when every student had a chance to give partial input. The rest of the section was translated off-line, as a task given to student teams. The major assistance was the hint to use professional terminology based on the International Electrotechnical Vocabulary (IEV), endorsed by the International Electrotechnical Commission (IEC) [3].

Sample material from the original publication is shown below, first the Polish original [2] and then the English translation done by the students advised by Instructor.

*Polish Text [2].* **Jak działa elektrownia jądrowa?** Technologia wytwarzania energii elektrycznej została w uproszczeniu przedstawiona poniżej na przykładzie elektrowni jądrowej wyposażonej w reaktor wodno-ciśnieniowy, który jest najczęściej spotykanym typem energetycznego reaktora jądrowego. W reaktorze tym jako paliwa używa się głównie nisko-wzbogaconego uranu, zaś moderatorem neutronów i chłodziwem jest zwykła (lekka) woda będąca pod ciśnieniem na tyle wysokim, że nie wrze. W nomenklaturze angielskiej ten typ reaktora znany jest pod skrótem PWR (Pressurized Water Reactor), a w rosyjskiej WWER (Wodo-Wodianoj Energietyczeskij Reaktor).

*English Text.* **How Does a Nuclear Power Station Work?** The technology of generating electricity is presented in simplification in Figure 1.17. It shows an example of a nuclear power station equipped with Pressurized Water Reactor. This is the most common type of a nuclear power reactor. In such reactor, mainly a low-enriched uranium is used as a fuel. The neutron moderator and coolant is an ordinary (light) water under the pressure high enough that it does not boil. In English terminology, this type of reactor has been known under the acronym of PWR (Pressurized Water Reactor), and in Russian – WWER (Wodo-Wodianoj Energietyczeskij Reaktor).

#### Meeting Agenda of the Professional Communication in English Course. March 5, 2018; 17:15-19:45

1. Introductions (ALL)
2. Preparation for the Observation of a Professional Meeting over the Internet (Dr. Zalewski)
3. Passive Participation in the IEEE WG P1876 Mtg (ALL)
4. Discussion of the Course Contents (Dr. Zalewski)
5. Writing Minutes of the Observed Online Meeting (ALL)
6. Any Other Business

### 3.4. Documenting Professional Meetings

Conducting and attending professional meetings is one of everyday activities of engineering professionals. To the knowledge of this author, these meetings are not always properly structured and documented, so it is essential to teach engineering students how this should be done in a professional manner.

Two types of meetings were considered in this course. First, a typical face-to-face or online meeting (which makes

no difference from the documentation perspective), which was documented by developing the agenda and minutes.

The draft minutes were also approved in a subsequent meeting, as a necessary follow-up. The sample agenda and a skeleton of minutes are provided in the respective text boxes.

#### Minutes of the Professional Communication in English Gdańsk Univ. of Technology, March 5, 2018; 17:15-19:45 Minutes Taker: Name of the Student

##### 1. Introductions

Upon request of Dr. Zalewski, students introduced themselves and presented their reasons why they picked this course.

##### 2. Preparation for the Observation of a Professional Meeting

Dr. Zalewski explained elements of the professional meeting over the Internet, including explanation of the Agenda, how meeting progresses throughout its Agenda, who is WG chair. Additionally, Dr. Zalewski asked students to take notes of the online meeting, which was about to start.

##### 3. Passive Participation in the IEEE WG P1876 Online Mtg

Students, while listening to the online meeting, were taking notes. In the meantime Dr. Zalewski took active participation in the meeting and also due to the poor quality of sound was explaining what was discussed in each item of the agenda.

##### 4. Discussion of the Course Contents

Dr. Zalewski discussed the course syllabus, explaining each item, which will be covered during this course, as well as the grading system.

##### 5. Writing Minutes of the Observed Online Meeting

Due to the lack of time this point was skipped and moved to the next class meeting.

##### 6. Any Other Business

Dr. Zalewski showed the students the official sites of IEEE Societies and the Power and Energy Society, in particular: <https://www.ieee-pes.org/>. He explained why participation in these activities will be beneficial to students in the future and also showed examples of standards that IEEE developed.

Another important activity in the category of professional meetings are trips to attend conferences and other types of gatherings. A common way to inform the team members, company associates, etc., about such events are trip reports. A skeleton of the Trip Report for this course, documenting a trip to the National Center of Nuclear Research in Świerk, is shown in a textbox below. What is important is to follow the template of this report, which has been developed by the author during many years of professional travels. The report should fit into a single page.

#### Student Group on Power Engineering, WEIA, PG April 4, 2018; Trip Report #03/2018

**Event Name:** Education Trip to a Nuclear Reactor  
**Location:** Nat'l Center of Nuclear Research, Świerk, Poland  
**Date:** March 28, 2018

**Background.** This trip was a part of a mandatory requirement of a laboratory "Nuclear Power Safety" and was arranged [...]

**Summary.** The group arrived in Świerk by bus at 10:00am. We were met by a person responsible for visitors [...]

**Conclusion.** The trip was important from the perspective of gaining professional experience, since none of us had seen a real nuclear reactor before. The trip could have been more valuable, if there were a scientist or an engineer present and competent to answer questions about the principles and operation of the reactors.

**Materials.** The Instructor received a book on the structure and operation of the Center.

**Cost.** The cost of the trip was covered in half by the students, and half by the University.

### 3.5. Other Professional Documents: Press Release

There are several other types of documents students need to learn how to write, and this includes a C.V., which is usually structured according to what the students learn in English language courses. However, professional C.V.'s in engineering disciplines have a significantly different focus than the typical ones written for job applications. So this has to be reflected in an appropriate assignment in the course and can be easily adjusted by Instructor after submission.

What is more important, though, is to learn how to write some uncommon documents, which may become a part of a professional assignment given to an engineer. One such document is a Press Release. Normally, the medium size company will have a professional marketing person who will take care of the task, but an engineer must always supply technical information for the document.

A typical Press Release will have the following contents, which must be submitted and verified by an engineer:

- for *whom* a Press Release is written (the audience)
- communicate the *what* (problem is being solved by the product) and *why*
- show the solution developed
- include a quote (testimonial) from the customer
- have a headline and possibly include a separate FAQ (Frequently Asked Questions).

Well written press releases from the major power companies have been presented to the class and discussed [4] and [5].

### 3.6. Multimedia Communication

At least three items fall into this category: preparation of slides, poster, and project video. First, making a traditional slide presentation on the accomplishments in the class project seems to be a relatively easy task, since students are familiar with it from previously taken courses. In engineering, however, a slide presentation, which is normally about some sort of product design or development, has to have a specific structure, which is normally composed of the following slides, as an example:

Slide 1. Title page (project title, author's name, instructors, school, date, copyright notice)

Slide 2. Introduction (general information on the project's topic, project objective)

Slides 3-4. Details of the Problem (Requirements Specification)

Slides 5-6. Design Description (Architecture of the Solution and Detailed Design)

Slides 7-8. Overview of the Implementation

Slide 9. Results of Experiments or Tests (for example, screenshots of runs, etc.)

Slide 10. Conclusion (how successful was the project, major problems occurred, what else to improve, etc.)

There are also some other rules regarding the slides:

- all slides must include illustrations (diagrams, images, screenshots, code snippets, team members' photos, etc.)
- a single slide should have no more than 12-15 words (iron rule)
- presentation of a single slide should take 1-2 minutes, and should fit into the entire time allocated for the presentation (including the demo, if applicable)
- as a rule, there is only one presenter, who should be the student that has the best command of English.

A direct consequence of developing the slides is very often producing a poster. A very practical way of designing a poster is to follow the slides and arrange them in the following order, three slides in the upper half and three slides in the bottom half of the poster:

- Top lines across the poster should state: project title, student authors, Instructor's name, institution.
- Slide 1 (top middle) – Abstract
- Slide 2 (top left) – Introduction
- Slide 3 (top right) - Problem Description (or Objective, or Sample of Requirements Specs)
- Slide 4 (bottom left) - Design Description (or methodology, if it's a research poster)
- Slide 5 (bottom middle) - Implementation/Test Results (or Results of Experiments, if research)
- Slide 6 (bottom right) - Conclusion (best with a photo of team members)

The students are additionally instructed that a key element of every slide (and poster as a whole) is illustration(s), not text. This could be a photo, screenshot, table, drawing, etc. Although there was no sufficient time in this class to develop posters, a sample poster following these rules from the author's institution is shown in Figure 1.

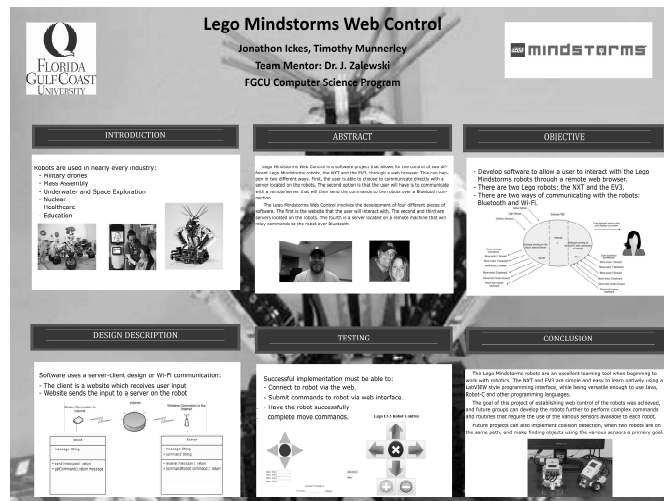


Fig. 1. Sample poster on Lego Mindstorms Web Control project from a senior project course at FGCU, following the design rules

The third multimedia item the students need to be familiar with is creating a project video. There are free tools available on the Internet, which are easy to learn how to produce short videos. The one selected for use in this course was Jing [6], for which instructional materials exist on YouTube [7]. While no videos made in this particular course were preserved, multiple videos have been produced for this author's courses at his home institution. Samples can be viewed from links at his labs homepage [8].

Simple rules for making project videos can be also formulated, as follows:

- having sound is mandatory; the narrative should relate to what is showing on the screen
- the video should start with showing a few slides indicating the Project Objective and the adopted Solution, as well as any Problems encountered
- after slides, demonstrate exactly how your project works live and how it meets the Objectives
- the duration of the entire video should be no less than 3 (three) minutes.

### 3.7. Interpersonal Skills

Although the development of interpersonal skills is mostly the domain of psychology, and this course is technical in nature, some limited guidelines can be also given how to improve this ability in the student population.

The essential interpersonal skill engineering students need to have is the ability to work on a team. There have been multiple publications spread over the last two decades investigating various aspects of pursuing teamwork in engineering education [9]-[11], so this paper can only touch the subject on a surface. One particular criterion, 3(d), from the ABET General Criteria for Baccalaureate Level Programs, states that the graduates should have “an ability to function on multidisciplinary teams” [12]. While true teamwork skills are being developed in a project course, where a multidisciplinary team of engineering students need to design a product, this course facilitated acquisition and application of such skills, in several ways, by:

- enforcing groupwork on the preparation of research reports, writing trip reports, meeting minutes and press releases
- encouraging collaboration in translating a professional document into English, and
- requiring cooperation in the development of projects slides and posters.

Such activities, although not graded separately, were embedded in the group projects and are believed to have a lasting impact on successful completion of the course and acquisition or consolidation of respective skills.

While the ability to work on teams is an interactive skill, which involves two-way communication, there are equally important one-way situations, in which students express themselves individually facing live audience, with limited interaction. Two instances of such communication skills were practiced in this course:

- student introductions in the first class meeting, when individuals, upon request of Instructor, were presenting themselves to the rest of the class, in particular, outlining their professional goals and plans after graduation;
- slide presentations, which were rather typical and familiar to the students, but required proper articulation and argumentation, in front of the class, regarding the accomplishments and meeting the original project objectives.

This sort of activities may seem to have minor value and insignificant impact on professional careers, but cannot be neglected, since they allow the students to acquire confidence in their work and meeting the personal goals.

Finally, last but not least, one has to mention an activity that is apparently outside the scope of a professional life of an engineer, but nowadays becomes more widespread than one would think. It's an official but informal get together of a group of co-workers, including management, often called a retreat, that appears to be a common practice in companies of all sizes. Discussing work unrelated subjects and learning mutually about each other personalities definitely contributes to improving an atmosphere in the workplace. Along these lines, after the last class meeting, students in this course were invited by Instructor to a known coffee place for a chat and sharing their experiences on various non-academic subjects. An impact of such even cannot be overstated, but it definitely contributes to mutual understanding and recognition among the participants.

### 3.8. Electronic and Online Components

As opposed to the types of professional communication that can take place either face-to-face or electronically, such as those discussed thus far, in previous sections, there are types of communication that can be only done electronically. One such known to everyone is electronic mail. Emailing the students about various sorts of tasks was a primary means of communication in this course. A sample email about current tasks is shown in the textbox below. It is self-explanatory and there is not much to add to it, except one important thing that the messages should be uniformly organized during entire semester, for example the Subject line should include the consecutive Message Number.

From: Janusz Zalewski <ikswelaz@gmail.com>  
Date: Wed, Apr 11, 2018 at 3:28 PM  
Subj: Professional Communication in English - Message #6  
To: Undisclosed recipients

Dear Students,

Please see attached the result of our joint work today on the translation of a couple of paragraphs from the section titled "Jądrowe reaktory energetyczne" of the book "Podstawy energetyki jądrowej" edited by Władysław Kielbasa (Wejherowo, 2012).

Since all students were present today and everybody participated one way or another on a team doing the translation, then I confirm that all students have passed this task. I will send separate emails shortly, explaining what needs to be done by students who missed the previous tasks.

For the next week meeting, I am planning to use the Jing tool to produce a simple video, based on the Powerpoint presentation slides you have developed in December when I was visiting PG. We will do this again in teams of up to 3 students per team. A separate email will be sent shortly how to prepare for this meeting and do the video production.

With Kind Regards,  
Janusz Zalewski, Instructor

Another means of electronic communication that are worth mentioning are professional forums. One of the most important ones is LinkedIn [13]. Its importance for the student population, as well as for seasoned professionals of all groups, is that employers often look through this service for CV's of potential hires. Students in this course were requested to create accounts on LinkedIn (if they have not had any, yet), and make links with the Instructor.

One other electronic forum for connecting with professionals is worth mentioning in this context: Research Gate [14]. Those who can benefit from this forum are students who plan their careers as researchers or academics, since the principal objective of this forum is the exchange of research and other publications. Students in this course were given pointers on using the Research Gate, but no specific tasks were assigned.

While electronic forums are a valuable means of professional communication for all engineering professions, they all lack one important feature: trustworthiness. Even though they all connect groups of individuals interested in a common subject, and unprofessional behavior or statements are easily scrutinized, their value is much less than that of belonging to professional societies, such as those under the umbrella of IEEE. In this view, students in this class were informed about the advantages of and encouraged to join the IEEE Power and Energy Society [15].

In recent decades, one important aspect of electronic communication has gained an enormous popularity in the society, in general, and in professional communities,

in particular. This is the world wide web, which translates into everyday use for the purposes of professional interactions. One specific application of this technology is to set up professional websites for both storing and retrieving technical data and other information. For example, all technical documentation described in sections 3.2 through 3.6 of this paper, as well as interactions mentioned in Section 3.7, can be channeled via the web. In this regard, it is important to make the engineering students aware of the means to create and maintain websites for their own use.

Although in professional practice, a company or institution, where the students will get employed, will have a technical expert responsible for web design, the knowledge of specific elementary web design techniques can be offered in college, to facilitate future communication with the web developers. In this view, one lecture in this course was spent on covering the development of a project-related personal website per each team. The high-level free tool used for this task was Wix [16], although there exist multiple others.

Finally, to complete this subsection it must be noted that the use of social networks such as Facebook and blogs was not prohibited by not promoted either, since their professional value is next to none. For the same reason, the use of Wikipedia was severely restricted and not allowed in the list of References in technical reports.

#### 4. CONCLUSION

It is obvious to everyone in the engineering professions that to be effective in a contemporary world, engineers need to acquire fluency in multiple communication techniques, building on those that were traditionally required, related to preparing respective engineering documents. Adding a number of new ones, brought up by the electronic revolution in the media that include professional discussion forums, web seminars, distributed meetings over the Internet, video technologies, website development, etc., creates a new challenging communication environment that has to be mastered by practicing engineers.

In this view, given additionally that English has become the preferred language in multiple engineering forums, "Professional Communication in English for Engineers" is the topic very much desired as a part of every future engineer's preparation in college. Consequently, it can be argued that it should be offered as a separate required course. This article is proposing a general curriculum responding to these new trends and needs in professional communication for engineers. Experiences from offering a course in a hybrid mode for students of Power Engineering at Gdansk University of Technology have been presented.

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## KOMUNIKACJA PROFESJONALNA W JĘZYKU ANGIELSKIM DLA INŻYNIERÓW: KURS ONLINE

Artykuł omawia jednosemestralny kurs z przedmiotu „Komunikacja profesjonalna w języku angielskim” przeznaczony dla studentów kierunków inżynierskich. Ogólna organizacja wykładu umożliwi oferowanie go na różnych specjalizacjach i poziomach studiów kształcących inżynierów. Przedmiot może być oferowany całkowicie online lub w trybie hybrydowym, w jakim był wykładany dla studentów studiów magisterskich kierunku Energetyka na Wydziale Elektrotechniki i Automatyki Politechniki Gdańskiej.

**Słowa kluczowe:** komunikacja profesjonalna, kształcenie inżynierów, nauczanie online.