



## Higher education in natural and mathematical sciences at the University of Ostrava

The fundamental organisational form of education at our university is a lecture, which remains irreplaceable and necessary in many directions. Its function is to provide a systematic explanation of the given discipline. It features coherence, clarity, and reflects the state-of-the-art research, development, and findings. A lecture is usually combined with a practical lesson or a seminar. A lecture has three basic parts: introduction, core, and conclusion. The introductory part presents the topic or the problem to be dealt with, shows the presentation structure so that students can get oriented throughout the lecture, and finally, provides the aim of the lecture. The lecturer strives to promote students' curiosity. The core of the lecture is a continuous presentation, often interrupted by lecturer's questions, illustrating examples, guiding examples, or a discussion to bring students' attention back since it degrades fast with a long speech. In the conclusion, the lecturer summarises main ideas, problems, or solutions as well as briefly introduces the topic of the following lecture.

When attending a lecture, students often take notes to understand the topic when they come back to it later on. Sometimes, the students receive a printed or electronic version. Electronic versions of the materials proved more suitable when working with a larger group. Education within the courses of Applied Mathematics prefers standard ways when students interactively cooperate and create their own notes based on detailed explanation.

A lecture is usually followed by a practical lesson. Such a practical form of education trains skills related to theory application (e.g. solving mathematical tasks). The teacher supervises the practical lesson and observes students' performance. It showed that in smaller groups, students tend to discuss lots of findings together with the teacher right during the practical lessons and in front of the board.

The University of Ostrava also offers seminars complementing the lecture. Students present their own findings and the results of their self-study, give presentations, provide solutions to discussed tasks, discuss issues of the solved topic, or formulate and solve problems. Seminars offer students the possibility to think critically, find argumentation, cooperate, use analysis, synthesis, construct theoretical models, and develop their communication skills.

A special type of seminar, which is designed for final-year students, is a diploma seminar. It is based on students' activities, such as processing information and acquiring basic methods of scientific and research work. Students present their diploma projects, procedures used to solve them and overcome obstacles. The teacher and students assess, discuss, oppose, and give advice. A diploma seminar completes the theoretical-practical preparation of a university student within the given field. It is a very a good training for research work of the future graduates.



As a result of the rapid developments in ICT, there are also changes in information retrieval and processing. With the help of modern technologies, we can share and use information and knowledge effectively. Modern information technology makes it possible to use new information resources that were previously only available in printed form for the teaching process. Information and communication technologies are, of course, widely used in distance learning, e-learning, and lifelong learning.

The implementation of information technology does not only mean the possibility to use computers in a traditional school environment, but it can also mean trends in the school's transformation of a very radical nature towards online learning with the support of the Internet. The role of the Internet is constantly increasing. In teaching, it is used as a support for face-to-face instruction, as a source of study information for distance learning, or in guided learning using the Internet as a learning environment. The advantages of working with the Internet in education include the fact that it activates and motivates independent work and allows the use of many information resources.

Real use of ICT at the University of Ostrava includes an interactive board, e-learning platforms, or cloud storage.

The interactive board is already frequent equipment in classrooms at the University of Ostrava. The teacher controls it with their hand or an interactive pen. It is connected to a computer and a data projector. The teacher projects an image from the computer via the data projector onto the board. Writing on the board is easy and intuitive for the teacher and students.

The e-learning environment uses information and communication technology to create courses or study materials. It is also beneficial in communication between teachers and students in the course of the study. The University of Ostrava uses Moodle, which is used to manage and create courses. Students access the system from a browser on their computer. The teacher adds study materials to the course they create, assigns assignments and tests, and tracks the results and the most common mistakes of their students. The teacher uses the created course not only in the current year but also in the following years. Moodle is used primarily at the University of Ostrava for distance learning, but in some cases, it also supports full-time students.

Another form of ICT use is cloud storage. Through the cloud, the teacher shares study materials with students. All data is stored on servers, so there is no risk of data loss. A web browser and the Internet are sufficient to access the data. Students can access the data anytime and anywhere they have an internet connection and a computer or a smart device. Cloud storage is simple to use and easy to upload and share documents and files.

Teaching mathematics differs from other subjects by a higher level of abstraction of the studied concepts. Abstract concepts of each mathematical discipline form a tree that expands as the discipline is studied. The teacher is thus always faced with the task of pointing out the



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coherence and interdependence of the studied concepts. An essential distinction of mathematics is the creation of new concepts, whose level of abstraction is higher than the level of their concrete realisations. The path leading to the given level of abstraction should be recalled at each level.

With the advent of COVID, the situation related to not only university education has changed. Education has witnessed the rise of ICT use. In the future, the University of Ostrava will consider adopting a hybrid form of education where the students will choose the form they prefer to share the educational process with their teacher.