

Körpern aus und gibt mathematische Beziehungen an, die zwischen den Beanspruchungen einerseits und den Spannungen und Formänderungen andererseits bestehen. Die einfachste Beziehung ergibt sich aus der Annahme eines linearen

Zusammenhanges zwischen Beanspruchung und der Formänderung (Hookesches Gesetz). Auf dieser Grundlage wurde die klassische Elastizitätstheorie entwickelt und aufgebaut. Sie bildet auch heute noch die Ausgangsbasis der Berechnungsmethoden.

Der Weg zum Erkennen komplizierter Zusammenhänge führt über diese Beziehungen, so dass ihre Darstellung unerlässlich ist. Bei Stabilitätsproblemen und bei Traglastverfahren zieht man zusätzlich Plastizitätstheorien.

Es gibt verschiedene Beanspruchungsarten. Verhältnismäßig einfache Beziehungen ergeben sich bei Zug- und Druckkräften sowie Scherkräften. Etwas komplizierter lassen sich die Spannungen und Verformungen infolge von Biegemomenten, Querkraften und Drillmomenten bestimmen. Zum weiteren sind es die Stabilitätsfälle Knicken, Kippen und Beulen von Beanspruchungsformen, die umfangreichere theoretische Vorbetrachtungen erfordern. Bei gleichzeitigem Auftreten mehrerer Beanspruchungsarten werden Aussagen über die Gesamtwirkung aus der Überlagerung der Einzelwirkungen gewonnen.

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DIGITAL TOOLS IN EDUCATION: FROM DISTANCE LEARNING TO DIGITAL TWINS

Considering the rapid development of information technology, it should be noted that there is a need for more than traditional teaching methods to prepare professionals who can succeed in the digital economy. Internet platforms present students with access to content regardless of location and time. This makes learning more flexible and accessible. This approach promotes the creation of interactive laboratories and digital simulators where students can gain practical skills in a safe environment without proper equipment or risking their safety. As a result, tertiary technical institutions can provide quality training to students even on tight budgets. However, digital transformation also increases the need for curriculum adjustments. Technical support and teacher training are essential elements of digitization in education. Critical components of digitalization in education include the following:

1.Distance Learning Platforms. Moodle and Google Classroom have appeared as essential tools for organizing online education. They are aimed at helping students access educational content, working on assignments, taking quizzes and getting teachers' feedback. For example, Moodle is widely used in distance courses. It provides interactive quizzes, discussion boards, file sharing, and even video conferencing features. Such platforms help teachers effectively track student progress; the system automatically collects student academic performance information and stores it for future analysis. This is especially useful for technical fields where equal access to learning materials is essential.

2.Learning adaptivity based on AI: in the future, AI will be widely used to adapt learning materials to the individual needs of each student, including performance data, frequency of errors, and learning pace. AI can suggest additional resources or adjust the learning pace. For example, if a student encounters an engineering problem. The system can suggest additional exercises or links to supplementary materials. This helps students focus on their weaknesses. This will help develop professional skills.

3.Preparation for real production situations using digital simulation. Interactive laboratories and simulators provide a virtual environment for students to conduct experiments and analyze data digitally. Just as the physical sciences have simulators to study the laws of dynamics, optics, and electromagnetism, digital labs and simulators allow students to experiment with various conditions

and see results immediately. These virtual laboratories can help in conducting chemical and physical experiments remotely and safely without affecting the quality of vision. Such spaces are handy for hands-on organizations where access to equipment is limited or non-existent. In addition, digital modelling can prepare students for specific manufacturing processes or specialized equipment. For example, students in fields such as energy or electronics can learn how a power plant or transformer substation works in a simulated environment, helping them learn in real situations that correspond to real professional work without being at the actual location.

4. Creating digital twins for technical objects. The technology of digital twins allows students to create virtual technical objects that are not inferior in functionality to their real “brothers”. These digital copies are exact dupes of their physical counterparts but are in your virtual environment, allowing you to understand the object better and be able to predict its behaviour based on various characteristics. Students can “play” with this digital pair, experiment with parameters, conduct maintenance simulations, or analyze errors that may occur. This technology can significantly enhance the learning experience in technical fields.

In the end, the virtual transformation of education brings significant benefits, such as improved accessibility and an enriched learning experience. Of course, some may point out that AI makes people lazy, but this is a minor drawback among a large range of advantages. Investments in generating educational infrastructure and teacher training are important to combine the virtual site with the real one.

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ADVANTAGES AND DISADVANTAGES OF DISTANCE LEARNING IN HIGHER EDUCATION

Distance learning has become an integral part of the educational process, especially after the COVID-19 pandemic, when traditional education underwent significant changes. The use of modern information technologies has enabled many educational institutions to transition to a new learning format, which has become both a necessity and an opportunity for development. However, distance learning has both advantages and disadvantages, which should be considered.

Nowadays special attention is given to advantages of distance learning. One of the main advantages of distance learning is its flexibility. Students have the opportunity to study at a convenient time and from any place where there is Internet access. This is especially important for those who combine studies with work or other responsibilities. Such an approach allows more students to participate in the educational process, including those who live in remote areas or have limited possibilities to move to large educational centers. Distance learning helps students save time commuting to and from their educational institution, and it also reduces costs for accommodation in dormitories or rental housing. For universities and educators, this is also an opportunity to reduce costs associated with maintaining infrastructure and organizing offline events. Distance learning allows students to regulate the pace of material assimilation independently. They can return to recorded lectures or course materials if something was unclear, or quickly move on to more complex topics. Such autonomy encourages the development of self-organization and responsibility in students [3, p.45; 4, p.133]. Thanks to distance learning, students gain access to a large number of online resources: e-books, scientific articles, video lessons, interactive simulators, etc. This makes the learning process more diverse and enriched with modern tools [2, p.30]. Distance learning also opens doors to international education. Students from Ukraine can study at institutions in other countries without leaving their homes, gain knowledge from world-renowned lecturers, and participate in global educational programs.

But distance learning has also his disadvantages. One of the most significant disadvantages of distance learning is the absence of direct interaction between students and teachers. Although there