

## Uvodne riječi · *Introduction*

### Riječ dekana Tehničkog veleučilišta u Zagrebu



Tehničko veleučilište u Zagrebu, kao javno veleučilište, kroz svojih šest preddiplomskih stručnih studija: Elektrotehnika, Graditeljstvo, Informatika, Mehatronika, Računarstvo i Strojarsvo te šest specijalističkih diplomskih stručnih studija: Strojarsvo, Elektrotehnika, Graditeljstvo, Informatika, Digitalna ekonomija te Informacijska sigurnost i digitalna forenzika provodi izobrazbu budućih inženjera u sustavu visokoškolskog obrazovanja Republike Hrvatske.

Objavljivanje znanstvenih i stručnih radova je na jedan način potvrda našega rada, dokaz da idemo u korak sa razvojem struke i znanstvenim napretkom. Časopis Polytechnic&Design je izdanje Tehničkog veleučilišta u Zagrebu u kojem se mogu objaviti znanstveni i stručni radovi prvenstveno iz područja u kojima izvodimo naše studije. Posebno je vrijedno spomenuti da se u časopisu objavljuju i radovi naših studenata koji pod mentorstvom svojih nastavnika u redovnom školovanju uspiju vlastitim zalaganjem i radom napisati rad. I u ovom izdanju časopisa može se pronaći više takvih članaka.

Kako bi održali korak s nadolazećim trendovima u područjima inženjerstva struke nužan je rad na osumreventavanju postojećih i izradi novih studijskih programa te uvođenju novih metodologija nastavnog rada. To nam je kao javnom veleučilištu temeljna djelatnost i na taj način našim studentima osiguravamo širok spektar stručnih i specijalističkih znanja te visoku kvalitetu izobrazbe.

Poziv za objavljivanje radova otvoren je za sve koji rade u području znanstvene i stručne djelatnosti jer misija časopisa je upravo promocija znanstvenih i stručnih postignuća.

Smatram da možemo s ponosom ustvrditi sljedeće: *Tehničko veleučilište u Zagrebu je mjesto na kojem ćete sresti ljude s idejama te spoznati snagu kreativnog inženjerstva.*

*Dekan Tehničkog veleučilišta u Zagrebu*

*mr. sc. Goran Malčić, v. pred.*

## A Word from the Dean of the Zagreb University of Applied Science



As a public higher education institution, the University of Applied Sciences in Zagreb (Tehničko veleučilište u Zagrebu) provides education for future engineers within the higher education system of the Republic of Croatia through six undergraduate professional study programmes in: Electrical Engineering, Civil Engineering, Information Technologies, Mechatronics, Computing and Mechanical Engineering as well as six specialist graduate professional study programmes in Mechanical Engineering, Electrical Engineering, Civil Engineering, Information Technologies, Digital Economy, Information

Publishing scientific and professional papers is a recognition of our work and a proof that we keep up-to-date with professional development and scientific progress in engineering. The Polytechnic&Design journal is issued by Zagreb University of Applied Sciences in which scientific and professional papers can be published dealing primarily with the fields of our study programmes. It is particularly worth mentioning that the journal publishes the articles of our students who, given the mentor support by their teachers while concurrently meeting the requirements of full-time students, manage to write the article due to their own effort and work. This journal's issue also includes a number of such articles.

In order to keep up with emerging trends in the fields of engineering, it is necessary to update the existing and develop new study programmes along with the introduction of new teaching methodologies. Being a public university, it is our core activity and a way to provide our students with wide spectrum of professional and specialist knowledge and a high quality education.

We invite all professionals in the field of science and technologies to submit their papers for publishing in Polytechnic&Design, since the mission of the journal is to promote scientific and professional achievements.

In conclusion, I believe that we can proudly say: *The University of Applied Sciences in Zagreb is a place where you can meet people with ideas and learn the power of creative engineering.*

*Dean of the Zagreb University of Applied Sciences*

**Goran Malčić, MScEEng**

## Uvodne riječi · *Introduction*

### Riječ glavnog urednika časopisa *Polytechnic and Design*



Prvi broj, ove osme godine izlaženja, donosi radove kolega iz Visokih učilišta, privrede, iz Hrvatske, Slovenije i Grčke. Imamo radove nastavnika koji se prvi puta javljaju s Istarskog veleučilišta i Atenskog „Hellenic Union of Graphic Arts and Media Technology Engineers“ (Grčka) .

U nekoliko članaka su naši studenti (Vukašin i Ložnjak) sa svojim profesorima pokazali rezultate istraživanja o primjeni računarske tehnologije u edukaciji s aktualnim primjenama virtualnih postupaka. Nastavnici (Kraljević, Staničić) s Tehničkog veleučilišta iznose klasifikaciju, primjenu dubinske analize podataka i strojnog učenja. U današnjem broju *Polytechnic&Design* imamo prikaz inovacije X-Bin kao nov način rješavanja multifunkcionalnog kontejnera za transport voća i povrća, na primjer. Novost je u postupku složivosti kontejnera u transportu same ambalaže. Zajednički je to rad kolega iz poduzeća eLog, Heavy Duty i nastavnika s Grafičkog fakulteta.

Nova aktualna tema u našem časopisu dolazi pod naslovom „Metoda proračuna potresne otpornosti“. To je rad grupe istraživača iz InnoRenew CoE, (Slovenija) i kolega nastavnika s Građevinskog fakulteta u Zagrebu. U ovom broju časopisa, demonstrira se povezanost znanosti i umjetnosti. Fizikalne metode spektroskopije razvrstavanju pigmente prema svojim svojstvima u vizualnom i bliskom infracrvenom dijelu sunčanog spektra. Demonstriraju se rezultati i nove interpretacije učenja o bojama profesora sa Studija inženjerstva i tehnologije grafičkih medija (iz Atene, Grčka) i Tehničkog veleučilišta u Zagrebu.

*Glavni urednik časopisa *Polytechnic and Design**

*prof. emeritus dr. sc. Vilko Žiljak*

## Word of Chief editor of journal Polytechnic and Design



The first issue in the eighth year of our journal's publication presents the papers of the colleagues from higher education institutions and business industries from Croatia, Slovenia and Greece. For the first time, the teachers from the Istrian University of Applied Sciences - Università Istriana di scienze applicate and Hellenic Union of Graphic Arts and Media Technology Engineer from Athens (Greece) send us their works.

In a few articles, our students, Vukašin and Ložnjak along with their teachers, show us the research results of computer technology application in education with current virtual instruction models. The teachers from Zagreb University of Applied Sciences, Kraljević and Staničić present a classification and application of data mining and machine learning.

The current issue of the Polytechnic&Design journal brings a description of the innovative X-Bin design for creative packaging solution, which is a new way of shipping, for example, fruit and vegetables in multifunctional containers (storage bins). The novelty is that containers alone are foldable (collapsible) while being transported. It is a teamwork of the colleagues from the eLog, Heavy Duty Company and the teachers from the Faculty of Graphic Arts.

A new, current topic in our journal comes under the title Seismic Design Methods. The paper is a teamwork of researchers from InnoRenew CoE, (Slovenia) and our colleagues from the Faculty of Civil Engineering, Zagreb. This issue of the journal includes a paper linking science and art as shown by spectroscopy methods in pigment identification in visible and near infrared spectrum. Presented are new results and interpretations of studies about colours conducted by the teachers from Hellenic Union of Graphic Arts and Media Technology Engineer from Athens and the University of Applied Sciences in Zagreb.

*Editor-in-chief of journal Polytechnic and Design*

***Prof. Emer. Vilko Žiljak, PhD***