Wrocław University
of Science and Technology

3e+

SUMMER SCHOOL 2021

30 August – 17 September 2021

About 3E+

Our Programme offers interactive small-scale courses (max. 10 students). Our courses are designed to provide an intensive, in-depth look at the selected topic of study. As **3E+ is open to applicants from all over the world,** you will engage in discussions with a unique group of peers!
Apart from lessons, you will get to enjoy our fun and exciting social programme! Almost every afternoon and evening we deliver a wide range of activities - from the City sightseeing tours, sport activities to all day trips outside Wrocław. We organise a variety of social events to help you to get to know your colleagues and Poland better while having fun!

Why Wrocław?

- one of the major academic centers in Poland
- modern, open and dynamic city with rich history and culture
- in the heart of Europe and in southwestern Poland, Wrocław is easily accessible from many other major cities
- approx. 1 million residents in the greater Wrocław area.

About 3E+

Why WUST?

- one of the best technical universities in Poland
- over 25 000 students
- over 2 100 academic staff
- 45 distinguished educational programmes, including courses taught in English and MBA programmes
- Campus located in the city center

Why 3E+ Summer School?

- 60 hours of specialised courses in a friendly atmosphere
- 3 weeks of great experience
- laboratory activities
- 4 ECTS points
- trips, events social activities
- Polish language and culture course
- participants from all over the world

and much more

About 3E+

How much does it cost?

Regular fee **1050 euro in stationary form**
Regular fee **550 euro in remote learning***
10% discount for early bird (application **before 30.05) and students from partner institution**

What is included?

+ tuition + accommodation** + lunches on weekdays* + welcome and farewell dinner** + trips, events and social activities** + welcome pack**

...and not included?**

+ airfare and visa's cost (if required) + insurance + living expenses

When? 30 August - 17 September 2021

*as per default, the programme is to be conducted stationary; remote learning only in case the epidemiological situation does not improve

**only in stationary form

3e+ Offer

CHOOSE ONE OF OUR COURSES AND EARN 4 ECTS POINTS:

- Architecture and Construction - the general issues
- Quality control and technical evaluation of building and civil engineering structures
- Green fuels and environment
- Deep learning methods for biomedical data analysis
- The influence of regulation and economy on the development of the energy sector
- Is the future of Raw Materials and Geodesy Digital?
- Thermal comfort and renewable energy for low energy buildings
- Diffusion of innovations: theoretical and empirical background
- Project Management
- Selected aspects of designing, managing and securing computer networks. Connections redundancy, attack protection and threat detection
- Design Thinking for Innovation and Sustainable Development
- Opportunities and challenges in Nanotechnology
- MEMS and mechatronic systems with LabVIEW
- It's a MEMS, MEMS world ...
- Introduction to Data Science with Python

Architecture and Construction - the general issues

FACULTY OF ARCHITECTURE

The course aims to broaden the knowledge of technical drawing, technological and design solutions. The aim of the course is to introduce students to technical drawing as a universal language of architecture and to broaden the knowledge of building solutions in different regions depending on local conditions. During the course, there will be presentations supporting the design work, introducing selected issues related to the design of single-family houses and small service buildings (e.g. fire protection, green roofs, roof drainage, terrace structure over a heated and unheated room, etc.). Additionally, a trip to Stary Zamek is planned, where you will visit a church from the third quarter of the 13th century with a ruff truss dating back to the 17th / 18th century. There will be a visit to the church and a presentation on the renovation of the roof truss. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Quality control and technical evaluation of building and civil engineering structures

FACULTY OF CIVIL ENGINEERING

GGain the knowledge concerning procedures and advanced testing methods which can be applied for quality control and technical evaluation of different building and civil engineering structures. The course will introduce you to basic principles and practical applications of several modern testing systems. Particular attention is focused on the NDT (Non Destructive Testing) methods that can be applied

for „in-situ" examination. One of the most important aspects of the proposed course is to offer you a possibility for practical training in using modern testing systems in laboratory and „in-situ" conditions. **Stationary or on-line - the form of the course will depend on the epidemiological situation**

Green fuels and environment

FACULTY OF CHEMISTRY

This course aims to provide participants with information on fuel properties, with particular emphasis on biofuels, and the impact of their use in environmental protection. The course will provide knowledge related to fuel economy - types of fuels, standards, the ability to manufacture and store fuels, etc.
The following topics will be covered:
■ the characteristics of liquid and gaseous fuels in relation to the composition of fumes, in terms of their impact on the natural environment ■ technologies for the production of fuels, especially alternative fuels and biofuels along with the use of new separation methods for the purification of waste streams and the recovery of valuable compounds, ■ issues related to the use of supercapacitors and lithium ion batteries that affect the development of motoring.
The projects implemented by the participants of the course will be related to both the characteristics of biofuels and technologies for their acquisition, taking into account the latest trends in this field, as well as the use of membranes and supercapacitors. **Stationary or on-line - the form of the course will depend on the epidemiological situation**

3e+ Offer

Deep learning methods for biomedical data analysis

FACULTY OF ELECTRONICS

We live in the age of data collection and processing. Today, Artificial Intelligence and Machine Learning tools are widely used in all areas of our lives, from business decision marking through image analysis, to games and self-driving cars. During this course we will present various aspects of Machine Learning, including neural networks. With a little bit of theory, a set of intuitive examples (in MATLAB/Octave and Python) and reference to human brain operation and knowledge gaining, you will learn how these powerful models are built, how they work, and how to train them effectively. We will also discuss various aspects of signal and image processing and deep learning to focus on one of the most important and meaningful application areas - medical data analysis. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

The influence of regulation and economy on the development of the energy sector

FACULTY OF ELECTRICAL ENGINEERING

SEnergy is crucial for economic and social development. It affects economic security, lifestyle and the condition of the natural environment. It is also of decisive importance for the balance of power in the global economy. During the course, the relations between economic growth, available energy resources, geopolitical energy security, climate change and the choice of formal and legal regulations (in the global and national system) will be reviewed. All practical exercises will be preceded by lectures.

The main aim of the course is to present the issues of economy and energy. Examples of lectures and classes topics include:
■ Conventional or renewable energy. ■ SWOT and PESTEL analysis of the energy sector. ■ The impact of national and international regulations on the development of the energy sector. ■ DMS - Demand Side Management. ■ Are electric vehicles green? **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Is the future of Raw Materials and Geodesy Digital?

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

TYou will learn modern techniques of acquiring, processing and sharing data related to natural resources, techniques used for modelling geological structures, mine planning, and mining production scheduling for various types of mining companies. You will get to know geodetic methods of acquiring geological data, methods of developing block models of deposits and estimating resources. The non-invasive techniques of exploration and investigation of mineral resources, as well as modern methods of determining the chemical composition (especially radioactive isotopes) in therapeutic and mine underground waters will be presented. You will learn how to interpret radar images used in geophysics. Course plan includes analysis of the implementation of the United Nation's sustainable development goals by mining companies and the impact of mining on the environment in the past, present day and in the future. You will learn how to analyse aerial and satellite images used in mining and geology. Furthermore, selected surveying methods will be presented, with emphasis on laser scanning and photogrammetry. During practical classes, the techniques of processing and geometric modelling of geodata, as well as their visualisation will be exercised. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Thermal comfort and renewable energy for low energy buildings

FACULTY OF ENVIRONMENTAL ENGINEERING

The main goal of the course is to teach the students the holistic approach to the design of low energy demand buildings, with special emphasis on the utilisation of renewable energy in building installations, application of heat recovery systems and maintaining thermal comfort of users. The course focuses on thermal comfort and heat production (to supply heating and domestic hot water systems) for low energy buildings. The subject covers solutions based on sustainable design, including for example solar thermal collectors, air-to-water heat pumps, energy recovery heat exchangers in air handling units, etc. Students will participate mostly in active forms like laboratory, calculus and simple project. All practical exercises will be preceded by short lectures. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Diffusion of innovations: theoretical and empirical background

FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

During this course, students will learn about diffusion in the context of innovation related to management and economics, by identifying the most important parameters in the diffusion process such as the innovation itself, communication channels, time and social network. We will also discuss the typical stages of the diffusion and explore the problem of the "valley of death". In particular, we will discuss the diffusion of innovation in the energy market on some examples of the innovative goods, but also diffusion of opinions and

behaviors. During the practical part of the course, students will learn the basics of agent-based modeling, often used to model and simulate the diffusion of innovations. We will use Netologo - a multi-agent programmable modeling environment platform to explore some existing models as well as to build a new model, run a simulation and analyse the results. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Project Management

FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

The goal of the course is to master the skills to professionally define and plan an innovative social project using dedicated IT tools and available documentation, under the supervision of trainers. The classes will focus on a real social project that will be launched by a non-governmental organization. The emphasis will be placed on: teamwork, skillfully combining IT tools with soft techniques, coping with incomplete information, communication difficulties and with time pressure. The course is also intended to raise awareness of the importance of caring for the social environment and the common good in developing new technologies. This trend has been visible for at least several years in the policies of the world's largest technology companies, which have begun to recognise that technology development should be sustainable and not just focused on economic profit. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Selected aspects of designing, managing and securing computer networks. Connections redundancy, attack protection and threat detection

FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

You will be introduced to the best practices of designing reliable and redundant computer network topologies. The aim will be the creation of networks resistant to various types of failures. Redundancy issues in the second and third layer will be raised. Then, various methods of

computer networks management will be presented. First, the standard methods of configuration and IOS systems management. Secondly, modern methods of programming SDN networks will be practiced. During these classes, students will train the centralised configuration of devices using Python scripts and the API of IOS systems. Second part of the course is devoted to securing networks and network devices against attacks and overload. The final part will be devoted to monitoring and analysing network traffic and detecting threats or attacks. Students, individually or in groups, will have the task of creating a redundant network, protected against various types of attacks for a chosen case study. Classes are conducted in a physical laboratory of computer networks based on Cisco devices. A virtual environment in the form of Packet Tracer simulator, GNS3 emulator and virtual machines of the real networking operating systems will also be used for support. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Design Thinking for Innovation and Sustainable Development

FACULTY OF COMPUTER SCIENCE AND MANAGEMENT

TThe 21st century is driven by professionals who, can discover or foresee problems, understand sustainable development, come up with smart solutions, and be able to implement them. Be it an engineer, a manager, an entrepreneur, a teacher, a researcher or a politician; expectations from them is to do the most with the least amount of resources, even more so, post the COVID-19 pandemic. Design Thinking is a five step process that has proven to be effective in such circumstances. World's top companies, as varied as

Apple, Cisco, GE, IBM, Microsoft, Nike, and Samsung have used design thinking to innovate. This course is a holistic experience into design thinking, based on empathy and driven by creative thinking for innovation and sustainable development. Students would tackle challenges such as the creation of new products, technological innovation, services, business models, experiences, processes and/or systems, while keeping a strong focus on sustainable development. It will empower the students to ideate, launch, run and successfully complete innovation projects that have a substantial impact for organisations, industries or society. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Opportunities and challenges in Modern Nanotechnology and Photonics

FACULTY OF MECHANICAL AND POWER ENGINEERING

Over the last decade, a huge variety of nanomaterials was developed and brought into applications. They became popular due to their unique properties, often much different from 'bulk' analogs. Consequently, nanomaterials of various shapes and sizes can be found in both daily life and laboratory practice. The progress in nanotechnology is possible only through the exploration and optimisation of nanomaterials. This in turn requires the development of new, often sophisticated experimental techniques that provide access to nanomaterial features and allow for observation of new phenomena. Despite the small size of nanomaterial, ranging from single up to hundreds of nanometers, the huge variety of methods allows for detailed characterisation of even individual nanoparticles. In this course, we present a variety of state-of-the-art nanomaterials and the experimental techniques that could be used for studies of this fascinating class of materials. **The course only in the stationary form.**

3e+ Offer

MEMS and mechatronic systems with LabVIEW

FACULTY OF MICROSYSTEM ELECTRONICS AND PHOTONICS

New types of microscopic sensors and actuators are made using technology of micro-electro-mechanical systems (MEMS). MEMS devices are organised into mechatronic systems, which can measure signals and perform mechanical actions, so they are crucial components in automotive, biomedical and electronics applications. But how to build and manage MEMS & mechatronic systems?

Use LabVIEW! It is the world's most popular graphical engineering software for measurements, control, data processing and testing. LabVIEW-based systems are applied in almost every branch of engineering, including: manufacturing, electronics, energetics, transportation, science, and aerospace.

In this course, you will learn how to control an exemplary mechatronic system with the use of own-developed LabVIEW application with a graphical user interface. And you do not need to be a professional programmer – everyone can learn and use LabVIEW! Check this out by taking part in this Summer School course **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

It's a MEMS, MEMS world...

FACULTY OF MICROSYSTEM ELECTRONICS AND PHOTONICS

Have you ever wondered about the sensors on a plane and how small they are? How to print a miniature clock mechanism? Or how to ana-

lyse DNA in a few minutes? This is the field of miniature devices, called micro-electro-mechanical systems (MEMS) or simply microsystems. During this course, you will learn what they are, but also you will be able to touch them and measure some of their properties. Take part in this event to visit a microengineering laboratory, find how microfluidic pumps are working, measure parameters of avionic sensors, discover miniature transducers for energy harvesting, as well as testing of miniaturised devices, such as different lab-on-chips or electron sources, that cover various and selected aspects of human and animal health monitoring. These and many other topics are covered during classes in the Department of Microsystems at the Faculty of Microsystems Electronics and Photonics. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

Introduction to Data Science with Python

FACULTY OF PURE AND APPLIED MATHEMATICS

According to CareerCast, Data Scientist is one of the best professions of recent years. It requires a unique blend of skills from three disciplines: mathematics (especially statistics), computer science (especially data analysis) and domain knowledge (in the field in which it will be applied), which is very attractive to many employers. Strong computer science skills and different approach to data analysis, based on scientific method, is what makes Data Scientists different from statisticians. At the same time, Python is becoming a language of choice for many data scientists, next to languages like Scala and statistical packages like R. It is also the first programming language many people learn, no matter their age. This course gives you a chance to quickly build up your Python skills, learn basics of how a data scientist works and apply all this to a project on a real, large data sets. This course is highly practical. **Stationary or on-line - the form of the course will depend on the epidemiological situation.**

BE A PART OF AN UNFORGETTABLE EXPERIENCE AT ONE OF THE BEST TECHNICAL UNIVERSITIES IN POLAND - WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY! JOIN US FOR A SUMMER OF 3E+!

ENVIRONMENT + ENERGY + ELECTRONICS

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