

**Summer School 3E+ 2016**

**Summer School 3E+ = Energy+ Electronics+ Electricity+ Environmental Engineering**

Faculty	Subject	Description/Specification	Coordinator	Lecturer	Duration
<b>Faculty of Civil Engineering</b>	<b>Foundations of renewable energy</b>	The main goal of the course is to provide the students with a basic knowledge on foundations of engineering structures in the sector of renewable energy (dams, wind turbines). Students will be involved in practical training, which will include visiting deep excavations sites where they will focus on the control and monitoring of adjacent buildings and structures. Another trips will be organized to visit water power plants (in the mountains) and wind turbines. Students should acquire practical knowledge on foundation systems in various geological conditions. All the field procedures will be followed by classroom teaching. The syllabus contains basic information on soil mechanics and foundation engineering – mainly practical aspects of geotechnical works in various soil conditions. The host institution will ensure all the safety and quality precautions for the students, as well as basic safety equipment.	dr inż. Beata Nienartowicz	dr inż. Jarosław Rybak	60 h
<b>Faculty of Electrical Engineering</b>	<b>Power Quality</b>	The course contains the basic problems and practical aspects of power quality assessment in power systems. After an introduction and general basis, the following problems are presented: classes of power quality problems, standards, interruptions, voltage sags, transient overvoltages, harmonics, long duration voltage variations, flicker, power quality measurement, disturbances mitigation methods, chosen algorithms for power quality assessment. The course is supplemented by laboratory project based emission and immunity test of selected load.	dr hab. inż. Tomasz Sikorski	dr inż. Grzegorz Kosobudzki	60 h

Faculty of Electrical Engineering	Programmable Logic Controllers	<p>The main aim of the course is to provide programming issues of Programmable Logic Controllers used in information systems working in the industry. The lecture will facilitate future engineer PLC configuration, design and development of computer software and design of distributed systems using programmable controllers. The course is also aimed at explanation of practical problems encountered in Programmable Logic Controllers (PLC) on the basis of the Siemens family SIMATIC S7-200 and S7-1200 the following topics are covered:</p> <ul style="list-style-type: none"> <li>- basic aspects of PLC application in industry,</li> <li>- PLC operation of basic peripherals,</li> <li>- graphical languages (LADDER or FBD),</li> <li>- basic programming tools,</li> <li>- arithmetic and logic operations,</li> <li>- timers and counters,</li> <li>- latches and flip-flops.</li> </ul> <p>Each detailed course topic is an introduction to intensive laboratory exercise.</p>	dr hab. inż. Tomasz Sikorski	<p>dr hab. Inż. Mateusz Dybkowski</p> <p>mgr inż. Kamil Klimkowski</p>	60 h
Faculty of Electrical Engineering	<i>OR</i> Simulation and analysis of AC motor drives with induction motor	<p>The main aim of the course is to provide basics of synthesis of electric motors drives used in industry. The lecture will facilitate projecting scalar and vector control drive with induction motors: Direct Field-Oriented Control (DFOC) and Direct Control of the electromagnetic Torque (DTC). The course includes designing of the AC frequency converter and control via the vector modulation (Space Vector Modulation). Participants will be introduced to the theory of electric drives control, optimal tuning PI regulators, estimation of basic state variables, such as: electromagnetic torque, stator and rotor flux speed/angular velocity. Each detailed course topic is an introduction to intensive laboratory exercise with MATLAB/SimPowerSystem simulation software and experimental laboratory set up with DS1202 card and Controldesk NG software.</p>	dr hab. inż. Tomasz Sikorski	<p>dr hab. Inż. Mateusz Dybkowski</p> <p>mgr inż. Kamil Klimkowski</p>	60 h

<b>Faculty of Electrical Engineering</b>	<b>Power Electronics</b>	<p>The course covers basics of all of the main aspects of the power electronics used in the industrial applications nowadays:</p> <ul style="list-style-type: none"> <li>- AC/DC converters: 2-,3-,6- uncontrolled and controlled rectifiers.</li> <li>- DC/DC converters: buck and boost, transistor and thyristor choppers.</li> <li>- DC/AC converters: 1- and 3-phase controlled inverters, 3-phase Pulse Width Modulation inverter, resonant inverter.</li> <li>- AC/AC converters: 1- and 3- phase converters, cycloconverters.</li> </ul> <p>All of the topics will be preceded by a short introduction. Simulation models created in Matlab/Simulink will be then used to extend the knowledge about the power electronics. Finally, all of the aspects will be tested in detail using the experimental setups, available in the power electronics laboratory.</p>	dr hab. inż. Tomasz Sikorski	dr inż. Grzegorz Tarchała	60 h
<b>Faculty of Environmental Engineering</b>	<b>Thermal comfort and renewable energy systems design in low energy demand buildings</b>	<p>The main goal of the course is to teach the students the holistic approach to the design of the 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 the subject of thermal comfort, heat production (to supply heating and domestic hot water systems) with additional aspect of passive cooling and heat recovery through ventilation for low energy buildings. The subject covers solutions based on sustainable design including among others solar thermal collectors, air-to-water heat pumps, energy recovery heat exchangers in air handling units and ground heat exchangers. Students will participate mostly in active forms like laboratory, calculus and simple project. All practical exercises will be preceded by short lectures.</p>	dr inż. Natalia Fidorów	dr inż. Natalia Fidorów,  dr inż. Marta Laska  dr inż. Maria Kostka	60 h

<b>Faculty of Mechanical and Power Engineering</b>	<b>Efficient and low emission combustion of solid fuels in power engineering</b>	<p>The laboratory course is focused on the analysis and research various types of solid fuels during combustion processes in the energetic boilers. Nowadays the solid fuels are non renewable fuel which should be replaced by renewable ones. But energy demand which are rising, needs to improve the existing combustion process as a main electricity production technology in the market. To increase the efficiency of the combustion process with the low emission of pollutants to the environment, the fuel have to be properly selected and prepared. This laboratory course include analysis of the solid fuels properties, the measurements of flue gas components from combustion of pulverized fuels in the isothermal drop tube reactor, and pelletized fuels in the water boiler equipped with the retort burner. After the course student posses the knowledge about fuel analysis and preparation before combustion processes, the analytical and operating skills on used devices and apparatus, and knowledge about how to control low emission combustion process.</p>	dr inż. Krzysztof Mościcki	dr inż. Krzysztof Mościcki  mgr inż. Michał Ostrycharczyk	60 h
--	--	--	-------------------------------	---	------