COURSE CATALOG – ELECTRICAL ENGINEERING

Type of Study: Undergraduate professional study
Semesters: 6
ECTS: 180

	Code	Course	Student workload (L + S + T)	ECTS credits
1st semester (Winter)	**285394**	**Physics ***	**30 0 45**	**6.0**
	285395	Mathematics I	45 0 45	6.0
	285396	Fundamentals of Electrical Engineering I	30 0 30	5.0
	285397	**Programming and Algorithms***	**30 0 30**	**5.0**
	285399	Work Safety and Protection	15 0 15	2.0
	285400	Social and communication skills	15 15 0	2.0
	285398	Technical Documentation	15 10 20	4.0
2nd semester (Summer)	285403	Databases	30 10 20	5.0
	285405	**Engineering methods and statistics ***	**30 0 30**	**5.0**
	285401	Mathematics II	45 0 45	6.0
	285406	Electrical Measurements	15 10 20	4.0
	285402	Fundamentals of Electrical Engineering II	30 0 30	5.0
	285404	**Computer communications and networks***	**30 10 20**	**5.0**
3rd semester (Winter)	129710	Databases and SQL	30 0 30	5.0
	129711	Electronic Elements	30 0 30	5.0
	129712	Electrical Measurements	30 0 30	5.0
	129713	Modelling and Simulation	30 0 30	5.0
	129714	Computer Structure	30 0 30	5.0
	129716	*Mobile Applications ***	*30 0 15*	*3.0*
	129717	*Switching Devices*	*30 0 15*	*3.0*
	129719	***Choice from other HEI – 3rd semester ****	***30 0 15***	***3.0***
4th semester (Summer)	129722	Digital Electronics	30 0 30	5.0
	129724	Electronic Circuits	30 0 30	5.0
	129727	Signals and Systems	30 0 30	5.0
	129729	Fundamentals of Entrepreneurship	15 15 0	2.0
	129731	Statistics	30 0 30	4.0
	163373	Professional Training	0 0 0	5.0
	129734	*Fundamentals of Machines and Devices*	*30 0 15*	*3.0*
	149938	*Basics of web programming*	*30 0 15*	*3.0*
	129740	***Choice from other HEI 1 – 4th semester ****	***30 0 15***	***3.0***
	129741	***Choice from other HEI 2 – 4th semester ****	***30 0 15***	***3.0***
	129743	**Automation of Machines and Devices***	**30 0 15**	**3.0**
	129744	Automatic Control	30 0 30	5.0

5th semester (Winter)	**129745**	**Electric Power System Analysis***	**30 0 30**	**4.0**
	129747	Electrical Machines	30 0 30	5.0
	129748	**Power Electronics***	**30 0 30**	**5.0**
	130098	Process Instrumentation	30 0 15	4.0
	166407	*Quality Assurance*	*30 0 15*	*3.0*
	166407	*Basics of robotics*	*30 10 5*	*3.0*
6th semester (Summer)	129762	Electromotive Drives	30 0 30	4.0
	129763	Supervision and Visualization of Technological Processes	15 0 30	4.0
	129764	**PLC Control Systems***	**15 0 30**	**3.0**
	129765	**Computer Networks***	**30 0 30**	**4.0**
	129767	Final Year Project	0 0 0	7.0
	129769	*Power System Protection**	*30 0 15*	*3.0*
	129771	*Power Electronic Devices**	*30 0 15*	*3.0*

L - LECTURES, S - SEMINARS, T – TUTORIALS

Elective courses in italic

**Courses available in English*

UNIVERSITY NORTH, UNIVERSITY CENTRE VARAŽDIN, DEPARTMENT OF ELECTRICAL ENGINEERING

Undergraduate professional study in electrical engineering (Bachelor program)

List of courses that can be delivered in English, including learning outcomes and course coordinators qualified to teach them in English:

Physics (course coordinator: Jurica Hižak)

- Apply kinematic equations and Newton's laws to horizontal and oblique shots for one or more connected bodies, (Level 5, 1 ECTS)
- Explain the laws of conservation of energy and momentum using examples of elastic and inelastic collisions, and examples of sliding with friction and energy dissipation, (Level 6, 1 ECTS)
- Calculate the center of mass of a given form, the moment of force and the moment of inertia with respect to the principal axis of rotation, (Level 5, 1 ECTS)
- Distinguish between forces and pseudoforces, or between inertial and accelerated systems, (Level 6, 1 ECTS)
- Formulate equations relevant to fluids at rest and fluids in motion, (Level 5, 1 ECTS)
- Apply the equation of an ideal harmonic oscillator for the oscillator is in equilibrium and in maximum elongation, (Level 5, 1 ECTS)

Programming and Algorithms (course coordinator: Robert Logožar)

- Formulate basic concepts in programming — algorithm and its presentations and three basic program structures: sequence, selection, iteration, (Level 5, 1 ECTS)
- Discuss the basic types of syntactic determinants and expressions of the selected programming language (C/C++) in procedural programming: directives, statements, functions, (Level 6, 1 ECTS)
- Classify the existing data types, operators, and statement types for managing program execution for organizing a statement block and for implementing program loops, (Level 5, 1 ECTS)
- Analyze given program tasks and algorithms necessary for their solution, in selected programming language, (Level 6, 1 ECTS)
- Create program solutions for solving problems of filtering (input) data, for statistical analysis, and for problems of searching and sorting dana, (Level 6, 1 ECTS)

Engineering methods and statistics (course coordinators: Srđan Skok, Jurica Hižak)

- Organize basic technical data in order to draw conclusions in an engineering context, (Level 5, 1 ECTS)
- Recommend basic methods of numerical calculation, modeling and visualization of data in the context of electrical engineering problems, (Level 6, 1 ECTS)
- Sort the data using a frequency table, clustering and dispersion of data around the mean, linking empirical and theoretical data distributions, i.e. theoretical distributions and "a priori probability". (Level 5, 1 ECTS)
- Compare the use of Bernoulli's formula in product control, Poisson formula in the case of a large number of data, as well as Binomial and Gaussian distributions, (Level 6, 1ECTS)
- Relate correlation and causality, for measured values of the dependent variable (y) and selected set of values of the controlled variable (x), (Level 6, 1ECTS)

Computer communications and networks (course coordinator: Matija Mikac)

- Analyze the basic principles of functioning of computer communication systems and computer networks, according to the layers of reference network models and specific communication protocols contained in the TCP/IP stack - ARP, ICMP, IP, TCP, UDP, (Level 5, 1 ECTS)
- Evaluate the role and application of the studied communication protocols in the common use of local networks and the Internet - from access devices and networks, topology and structure of the core network, specialized network devices to the application of specialized software, (Level 6, 1 ECTS)
- Design computer networks, using available network equipment or the specialized emulator system Imunes, (Level 6, 1 ECTS)
- Determine the functional principles of the used network protocols by using auxiliary programs such as ping, traceroute, netcat, nslookup, (Level 6, 1 ECTS)
- Review the possibilities of applying the acquired knowledge in practice and on specialized upper-year courses - IoT, web programming, (Level 5, 1 ECTS)

Mobile Applications (course coordinator: Matija Mikac)

- Create a simple native Android application with the necessary functionalities, using common user interface elements (Level 6, 1 ECTS)
- Apply the appropriate development tools (for example, Android Studio) and utilities (scrcpy) to develop, test and deploy mobile applications to devices (Level 5, 1 ECTS)
- Evaluate the possibilities to use alternative principles of creating applications for mobile devices (hybrid mobile applications and progressive web applications) (Level 6, 1 ECTS)

Elective course - Choice from other HEI – 3rd semester

Elective course - Choice from other HEI 1 – 4th semester

Elective course - Choice from other HEI 2 – 4th semester

Automation of Machines and Devices (course coordinators: Dunja Srpak, Josip Srpak)

- Evaluate the requirements for the creation of electrical diagrams and the selection of equipment for different versions of automation according to the problem description, (Level 6, 1 ECTS)
- Design a technical description, a control system flowchart and electrical diagrams for power supply and control of simpler machines and devices, (Level 5, 1 ECTS).
- Implement a programmable logic controller (PLC), HMI panel or programmable relay for the control of simpler machines and devices, (Level 6, 1 ECTS)

Electric Power System Analysis (course coordinator: Srđan Skok)

- Evaluate the theoretical calculations of individual parts of electrical installations, (Level 6, 1 ECTS)
- Valorize the shematics of electrical installations and associated equipment of medium, high and very high voltage, (Level 6, 1 ECTS)
- Verify of installations for the production and distribution of electricity and the functionality of their operation, (Level 6, 1 ECTS)
- Analyze of modern electrical installations in the energy transition, (Level 5, 1 ECTS)

Power Electronics (course coordinator: Dunja Srpak)

- Evaluate the essential properties of basic power electronics components and their combinations, (Level 6, 1 ECTS)
- Demonstrate the operation of different types of converters (rectifiers and converters, DC/DC and AC/AC converters), (Level 5, 1 ECTS)
- Examine the behavior of different types of converters depending on the type and characteristics of the load, (Level 6, 1 ECTS)
- Select appropriate converter topology designs for different applications, (Level 5, 1 ECTS)
- Evaluate relevant criteria for selecting different types of converters for controlling DC and AC electric motor drives, (Level 6, 1 ECTS)

PLC Control Systems (course coordinators: Dunja Srpak, Josip Srpak)

- Determine the requirements for creating a PLC program from a technological description of the problem (interrupts, high-speed counters), (Level 6, 1 ECTS)
- Design a program flow chart and an application program based on a technological description of the process, (Level 6, 1 ECTS)
- Compare the possibilities of applying various special functions in control systems with PLC and HMI, (Level 5, 1 ECTS)

Computer Networks (course coordinator: Matija Mikac)

- Analyze basic concepts from the field of computer networks, according to the OSI and TCP/IP reference models (Level 5, 1 ECTS)
- Evaluate communication equipment for establishing wired and wireless local networks, (Level 6, 1 ECTS)
- Develop solutions to specific problems related to communication security, (Level 6, 1 ECTS)
- Apply equipment and software for analyzing network traffic and solving related specific problems, (Level 5, 1 ECTS)

Power System Protection (course coordinator: Srđan Skok)

- Combine the operating techniques of switchgear and protection devices in the operation of electrical installations, (Level 5, 1 ECTS)
- Confirm of technical and technological design, and application of switchgear and protection devices in the power system, (Level 6, 1 ECTS)
- Evaluate the selection of the scope of protection for a particular facility in the power industry and industry, (Level 6, 1 ECTS)

Power Electronic Devices (course coordinator: Dunja Srpak)

- Evaluate the methods of control the power electronics converters, (Level 6, 1 ECTS)
- Compare the characteristics of available power electronics devices from different manufacturers to select the appropriate device, (Level 5, 1 ECTS)
- Elaborate the methods of functioning of power electronics devices in power plants using renewable energy sources, (Level 6, 1 ECTS)