Power Electronics (ONLINE)

ECTS Credits	4,0
Teaching hours	50
Workplace learning hours	50
Total hours of student learning	144

Pre-requisites	The course is opened for Russian and foreign Bachelor, Master and PhD students with specialized background in Electronic Engineering or equivalent skills and knowledge.
Alignment to graduate profiles	This course contributes to achievement of the graduate outcomes of the following qualifications: • Bachelor in Electronic Engineering (Electrical / Mechanical) • Graduate Diploma in Electronic Engineering (Electrical / Mechanical) • Diploma in Electronic Engineering (Electrical / Mechanical)
Core transferable skills	This course contributes towards the development of the following core transferable skills categories: Self/Others - Learning to Learn, Specialist skills, Literacy, Numeracy, Digital Literacy. The course examines the basic methods for calculating steady-state and transient processes in electrical circuits, their application to the most common electronic circuits in engineering practice, including amplifiers, rectifiers, stabilizers, triggers and other devices. Much attention is paid to microcontrollers, their architecture and design. Separate chapters are devoted to Code Generation and Project Launch, as well as working with the MATLAB and Simulink programs. The complex of test and individual tasks will allow you to master the practical skills of designing and calculating electronic circuits necessary for the implementation of professional activities.
Course aim	The relevance and novelty of the program is associated with the great demand in the international environment for specialists with knowledge and skills in the field of electronic technical means. Industrial electronics is one of the main training profiles for specialists in the field of modern electronics. It is focused on the development and application of modern electronic devices and devices in industry, transport, in the electric power industry and has two main areas: information electronics (microprocessors, microcontrollers for general and industrial purposes, electronic systems and devices for measuring, monitoring and controlling various objects and technological complexes), as well as energy (power) electronics (powerful converters of electrical energy). The goals of mastering the program are to acquire a set of theoretical knowledge, as well as skills and practical skills necessary to solve basic problems for a wide range of applications: electric power, electric drive, transport.
Indicative content	Content may include but is not limited to: • Introduction. Microcontroller architecture. The inputs and outputs of a microcontroller. Signal types. • Microcontroller programming. Automatic code generation: a modern approach to developing FPGA systems. • Signal processing. • Sensors. Communication with Microcontroller. • Generation of PWM signal using Microcontroller • Design of an automatic control system (Independent work). • Design of an automatic control system (Independent work). • Project Consulting (Feedback mode). • Modification of the automatic control system (Independent work). • Guest Speakers Day • PI&PID controllers. Design of closed-loop control systems. • Stability of control system. Closed-loop control setup • Code Generation and Project Launch (Independent work & Feedback mode). • Introduction to MATLAB/Simulink • MATLAB/Simulink Support Package for Microcontrollers. Project development. • Code generation in MATLAB/Simulink. • External connection of Microcontroller with Simulink. • Project implementation in Simulink (Feedback mode).

LEARNING OUTCOMES

On successful completion of this course students will be able to:	
1	Know the basic concepts, terms, principles, regulations and schemes in the field of industrial electronics
2	Explain the basics of modelling modern electronic technical means
3	Own various software
4	Provide the required modes and specified parameters of the technological process according to the specified methodology of electronics objects
5	Work with scientific and educational literature in your specialty

ASSESSMENTS

Basis of assessment	Achievement based assessment		
Methods of assessment	**Learning Outcomes**	**Pass criteria (Minimum)**	**% Weightings**
Summative review	1, 4	40%	40%
Portfolio – summative of practices	2, 3, 5	40%	60%

REQUIREMENTS FOR SUCCESSFUL COURSE COMPLETION

Requirements	• Mark of 40% or more in every summative assessment • Gain a course result of C (50%) or higher

RESULTS

Assessment results	• Results for assessments are given in percentage marks
Course results	• Individual assessments may cover one or more of the learning outcomes. • Each summative assessment is assigned a percentage weighting. • The overall percentage mark for the course is calculated by adding the weighted results for all summative assessments. • To derive the course result the overall percentage mark is converted into a grade using Course Result Key AC-NMIT-06

LEARNING AND TEACHING

Learning and teaching approaches	Lectures, group discussions, tutorials, learner managed activities, laboratories, presentations, research, projects and case studies.
Learning and teaching resources	Textbooks, journals and Library Learning Centre resources; use of Internet; computer laboratory and specialist software.
Learner managed activities	• Completion of course work, set assignments/projects • Reading of course materials • Study group work • Preparation for classes • Homework • Research - (e.g. exploration, location and selection of relevant information, review/ evaluation/analysis of information, recording information) • Discussions with colleagues/subject matter experts • Review application of information to course work • Practicing relevant practical and technical skills/methods/techniques • Self-evaluation of course work • Gathering relevant contextual information/ issues/ideas to build knowledge of the subject