Specification for the book of courses

Study program	Electron Devices and Microsystems Electronics and Embedded Systems		
Type and level of studies	Master Academic Studies		
The name of the course	Open Source Operating Systems		
Lecturer (for lectures)	Dimitrijević A. Marko		
Lecturer/associate (for exercises)	Dimitrijević A. Marko		
Lecturer/associate (for OFE)	Dimitrijević A. Marko		
Number of ECTS 5	**Course status (obligatory/elective)**	Obligatory / Elective	
Prerequisites	None		
Course objectives	Acquiring the necessary knowledge for advanced using open source operating systems: Linux/Unix.		
Course outcomes	Mastering the knowledge and skills of using and administering open source operating systems (OOS), application installation on OOS and OOS networking. Learning user interface (shell) and script programming.		
Course outline			
Theoretical teaching	The history of open source system (OOS) development. OOS architectures. Kernel. Working with files and file systems. Shell and shell script programming (regular expressions, variables). Processes and jobs. Working with users and security models. Working with hardware and hardware diagnostics. Working with text files, standard I/O, pipes. Installing and maintaining software on OOS. Computer networks and network services. Graphical user interface.		
Practical teaching (exercises, OFE, study and research work)	The login procedure. General purpose commands (passwd, cal, clear, date, man, find, grep,...). Working with files and directories (commands: cat, chmod, umask, chown, chgrp, cmp, diff, cp, more, mv, rm, ln, ...). Working environment and corresponding commands (env, set). Archiving (tar, gzip, bzip,...). Process control (jobs, ps, top, kill, killall,...). Text editors (VI editor). Shell (bash, tcsh, zsh) and script programming. Regular expressions. Working with a file system (commands df, du, dd, fdisk, gdisk). Graphical user interface. System administration basics. Applications installation and maintenance (rpm, make,...). Basic network services and commands for working in the computer network environment (ping, traceroute, arp, netstat, nslookup,...).		
Textbooks/references			
1	Evi Nemeth, Garth Snyder, Trent Hein, Ben Whaley, Dan Mackin, UNIX and Linux System Administration Handbook 5th Edition, Addison-Wesley Professional, 2017, ISBN: 978-0-134-27755-4.		
2	William Shotts, The Linux Command Line: A Complete Introduction, 2nd Edition, No Starch Press, 2019, ISBN: 978-1-59327-389-7.		
3	Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts 10th Edition, John Wiley & Sons, Inc., 2018, ISBN 978-1-118-06333-0.		
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Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	2	0	0

Teaching methods	lectures, excercises, laboratory work, consultations

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures		Written exam	70
Exercises	30	Oral exam	
Colloquia			
Projects			

Specification for the book of courses

Study program	Control Systems / Automatic Control Electrical Power Engineering Electron Devices and Microsystems Electronics and Embedded Systems		
Type and level of studies	Master Academic Studies		
The name of the course	Methods of mathematical optimization		
Lecturer (for lectures)	Marinković D. Slađana, Rančić Z. Lidija		
Lecturer/associate (for exercises)	Rajković P. Jovan		
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Obligatory / Elective

Prerequisites	None
Course objectives	Mastering basic mathematical knowledge from optimization theory and getting acquainted with various optimization methods. Training for forming mathematical models of problems from practice and solving them.
Course outcomes	Students' capability to apply acquired knowledge in the profession. Ability to recognize optimization problems from practice, define them, form mathematical models, select appropriate methods for their solution and apply methods using software tools.
Course outline	
Theoretical teaching	Defining a general optimization problem. Theoretical foundations of optimization. Elements of convex analysis. Linear programming. Geometric interpretation of linear programming problems. Duality principle. Simplex method. One-dimensional optimizations. Unconstrained multidimensional optimizations. Search methods. Gradient methods. Constrained multidimensional optimizations. Kuhn-Tucker conditions. Method of Lagrange multipliers. Penalty function methods. Fundamentals of multiobjective optimization.
Practical teaching (exercises, OFE, study and research work)	Solving tasks that follow the content presented in the theoretical classes. Implementation of optimization algorithms through software packages for symbolic computation. Through the preparation of homework assignments and the analysis of their solutions, the application of mathematical and software tools in the context of optimization is gradually mastered.
Textbooks/references	
1	E.K.P. Chong, S.H. Zak, An Introduction to Optimization, John Wiley & Sons, 2001.
2	X.S. Yang, Introduction to Mathematical Optimization, Cambridge International Science Publishing, 2008.
3	M.J. Kochenderfer, T.A. Wheeler, Algorithms for Optimization, second edition, The MIT Press, 2025.
4	
5	

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	0	0	0

Teaching methods	Lectures, computational exercises, computer exercises, project.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures		Written exam	40
Exercises	10	Oral exam	10
Colloquia			
Projects	40		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Microelectromechanical Systems (MEMS)		
Lecturer (for lectures)	Pantić S. Dragan, Paunović V. Vesna		
Lecturer/associate (for exercises)	Paunović V. Vesna, Marjanović B. Miloš		
Lecturer/associate (for OFE)	Marjanović B. Miloš		
Number of ECTS 5	**Course status (obligatory/elective)**	Elective	

Prerequisites	None
Course objectives	Familiarizing students with the principles of operation, design, modeling, fabrication, and application of microelectromechanical systems (MEMS) and their components. Understanding the processes of microfabrication and the integration of MEMS with electronic systems.
Course outcomes	Essential knowledge about the functioning, implementation, and application of MEMS systems. Working with specific types of pressure, acceleration, and temperature sensors. Calculation and design of simple electronic systems. Implementation of wireless communication systems for information transmission.
Course outline	
Theoretical teaching	Introduction to MEMS: definition, applications, and history. Basic elements of MEMS systems: sensors, actuators, passive structures, and electronic circuits. Fundamental physical principles: mechanical, thermal, electrical, optical. Materials for MEMS: silicon (Si), silicon dioxide (SiO_2), polymers, piezoelectrics, metals. Microfabrication: photolithography, deposition, chemical etching. Micromachining techniques: bulk micromachining, surface micromachining, LIGA process. Modeling MEMS components: beams, springs, membranes. Electrostatic and piezoelectric actuators. Thermal and magnetic MEMS components. Sensors: pressure, acceleration, temperature, chemical, and biosensors. Integration of MEMS with CMOS systems. Reliability, testing, and packaging of MEMS systems. Current trends: IoT, biomedical MEMS, optoMEMS.
Practical teaching (exercises, OFE, study and research work)	Overview of MEMS devices: microsensors and microactuators. Analysis and practical work with specific types of pressure sensors, accelerometers, and temperature sensors. Computer simulations of MEMS structures. Design of simple sensors.
Textbooks/references	
1	Chang Liu, Foundations of MEMS, Person, 2nd ed., 2011
2	Ahmed M.Elshurafa et all., Microelectromechanical Systems, Design and Fabrication, Springer, 2023
3	Jitendra Kumar et all., Microelectromechanical Systems: Design, Fabrication, and Applications, CRC Press, 2021
4	Eun Sok Kim, Fundamentals of Microelectromechanical Systems (MEMS), McGraw Hill, 2021
5	Internal scripts and lectures by the instructors are available on the course website.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0

Teaching methods	The theoretical part of the instruction is delivered using PowerPoint presentations, while the practical part involves the use of computers for running simulations and laboratory instruments for measurements. Team projects focus on the application of available MEMS systems.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	5	**Written exam**	25
Exercises	30	**Oral exam**	25
Colloquia	15		
Projects			

Specification for the book of courses

Study program		Electron Devices and Microsystems		
Type and level of studies		Master Academic Studies		
The name of the course		Laser Electronics		
Lecturer (for lectures)		Paunović V. Vesna, Aleksić M. Sanja		
Lecturer/associate (for exercises)		Vračar Zlatković M. Jana		
Lecturer/associate (for OFE)		Vračar Zlatković M. Jana		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective	
Prerequisites	None			
Course objectives	Introduction to the laser light sources, their excitation and structures, and applications in various fields of technology, medicine and consumer products			
Course outcomes	Detailed knowledge of laser devices and systems. Knowing the working principle of certain types of lasers. Use of lasers and their control in various systems.			
Course outline				
Theoretical teaching	Laser techniques as part of optoelectronics and its role in electronics.Emission and absorption of light. Spontaneous and stimulated emission. Normal and inverse population. Laser light sources, modulators, optical transmitters and detectors. Laser diodes. Gas, liquid and solid lasers. Semiconductor lasers. Laser spectroscopy. Holography. The characteristics and limitations of the laser. Quantum optoelectronics. Sources and transmissions of light. Complex optical and electro-optical structure of telecommunications systems.			
Practical teaching (exercises, OFE, study and research work)	Exercises on computer and microcontroller development environments, for design and simulation of laser and communication systems. Use of lasers and their control in various alarm systems, introduction and operation with RF communication protocols, introduction and operation with Bluetooth protocols, operation with ultrasonic modules.			
Textbooks/references				
1	Mauro Nisoli, Semiconductor Laser Photonics, Cambridge University Press, 2022			
2	Anil K. Maini, Lasers and Optoelectronics, John Wiley and Sons Ltd 2013			
3	David J. Klotzkin, Introduction to Semiconductor Lasers for Optical Communications, Springer, 2020			
4	L. Chin, H. Xu,S. Yuan ,Fundamentals of Laser Optoelectronics, World Scientific, 2022			
5	E. K.Asibu, Jr., Principles of laser materials processing, Wiley, 2009			
Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	1	1	0	0
Teaching methods	Lectures, consultations, laboratory exercises (exercises on computers and microcontroller development environments)			
Grade (maximum number of points 100)				
Pre-exam duties	**Points**	**Final exam**	**Points**	
Activity during lectures	10	**Written exam**	25	
Exercises	25	**Oral exam**	25	
Colloquia				
Projects	15			

Specification for the book of courses

Study program		Electron Devices and Microsystems Electronics and Embedded Systems	
Type and level of studies		Master Academic Studies	
The name of the course		Nanoelectronics	
Lecturer (for lectures)		Davidović S. Vojkan	
Lecturer/associate (for exercises)		Davidović S. Vojkan	
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Obligatory / Elective

Prerequisites	None
Course objectives	The aim of the course is for the student to acquire the necessary level of knowledge about trends in the field of development of state-of-the-art nanoelectronic components and systems, about new operating principles of components, new materials used for the production of nano-components, technological processes used to realize nano-components and models used to describe their functioning. The knowledge acquired in this subject should enable the student to easily fit into the modern semiconductor industry and understand new developments in the field of information technology.
Course outcomes	The student knows the scaling rules and trends in the development of nanocomponents. He knows the specifics of technological processes for the realization of very thin and well-controlled layers of materials, material removal techniques and adequate measurement methods. He understands the application of High-k dielectric materials, strained silicon, metal gate, understands the structure and functioning of FD and SOI transistors, FinFET model. He understands ferroelectric FET, RTD and Single electron transistor principles. He understands superconductivity and its applications in electronics, the potential of carbon nanotubes for component realization, components based on organic molecules, memory components for RAM or HDD and sensor components. In general, his way of thinking has shifted from the macro level to the level of very thin layers, the interaction of a small number of molecules, the importance of interfaces, and new materials.
Course outline	
Theoretical teaching	Scaling theory, Moore's law. Materials in nanoelectronics (semiconductors, dielectrics, superconductors, ferroelectrics, organic molecules). Quantum effects. Methods of deposition of thin layers of materials. Lithography. Etching and chemical mechanical polishing. Measurement techniques in nanotechnology. Si MOSFET - new materials and alternative concepts (High-k dielectrics, strained Si). FinFETs, structure and modeling. Ferroelectric FET transistors. RTD components. Single-electron transistors. Superconducting electronics and quantum computers. Graphene, carbon nanotubes and components. Nanocomponents based on organic molecules. Nanoelectronic RAM memories. Ferroelectric RAM components. Concept of high-density memory disks - AFM. Sensor nanocomponents.
Practical teaching (exercises, OFE, study and research work)	Defining and solving a certain number of tasks related to the physical phenomena and functioning of nanoelectronic components, modeling and computer simulations. Organization of seminars with current issues and with an emphasis on teamwork. In the form of consultations, analyzing of a certain number of scientific papers (of the student's choice and affinity) in the field of nanoelectronic components.
Textbooks/references	
1	Vijay Kumar Arora, NANOELECTRONICS: Quantum Engineering of Low-Dimensional Nanoensembes, CRC Press, 2020, ISBN: 978-0367575922
2	Brajesh Kumar Kaushik, NANOELECTRONICS, Devices, Circuits and Systems, Elsevier, 2018, ISBN 9780128133538
3	K. Goel, NANOELECTRONICS AND NANOSYSTEMS, From Transistors to Molecular Quantum Devices, Springer 2004, ISBN 978-3-662-05421-5
4	IEEE Electron Device / Solid State Circuits - selection of the latests publications from the journals and conferences.
5	Rainer Waser (Ed.), NANOELECTRONICS AND INFORMATION TECHNOLOGY, Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2012 (Third Edition), ISBN: 978- 3-527-409273
Number of classes of active education per week during semester/trimester/year	

<table>
<tr><td>Lectures</td><td>Exercises</td><td>OFE</td><td>Study and research work</td><td>Other classes</td></tr>
<tr><td>2</td><td>2</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Teaching methods</td><td colspan="4">Lectures using PowerPoint presentations, problem solving, seminars with papers on current topics, homework, and consultative teaching.</td></tr>
<tr><td colspan="5">Grade (maximum number of points 100)</td></tr>
<tr><td colspan="2">Pre-exam duties</td><td>Points</td><td>Final exam</td><td>Points</td></tr>
<tr><td colspan="2">Activity during lectures</td><td>20</td><td>Written exam</td><td>20</td></tr>
<tr><td colspan="2">Exercises</td><td>0</td><td>Oral exam</td><td>30</td></tr>
<tr><td colspan="2">Colloquia</td><td>10</td><td></td><td></td></tr>
<tr><td colspan="2">Projects</td><td>20</td><td></td><td></td></tr>
<tr><td colspan="5"></td></tr>
</table>

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	RF Microelectronics		
Lecturer (for lectures)	Danković M. Danijel, Prijić D. Zoran		
Lecturer/associate (for exercises)	Danković M. Danijel		
Lecturer/associate (for OFE)	Mitrović I. Nikola		
Number of ECTS 5	**Course status (obligatory/elective)**	Elective	

Prerequisites	None
Course objectives	Acquiring the knowledge needed for understanding the principles of operations and applications of RF microelectronics circuits
Course outcomes	Student training for capacity to sucesfully design the functional blocks of RF microelectronic circuits using the dedicated state-of-art software packages.
Course outline	
Theoretical teaching	Introduction to RF and wireless technology. Basic concepts of RF design: effects of non-linearity, noise, sensitivity and dynamic range, transformation of passive impedance, scattering parameters. Communication concepts: analog and digital modulations, mobile RF communications, standards of wireless transmittion. Architectures of transmitters and receisivers , Low-noise amplifiers (LNAs). Frequency mixers. Integrated passive components. Oscillators. Phase detectors. Phase-Lock-Looped oscillators (PLL). Frequency oscillators. RF power amplifiers.
Practical teaching (exercises, OFE, study and research work)	Laboratory exercises include the use of dedicated software package for designing RF integrated circuits. Each student obtains a final project assignment that aims to verify that the student can design and check the functionality of some practical RF circuit block .
Textbooks/references	
1	Behzad Razavi, "RF Microelectronics", 2nd Edition, Prinmtence Hall PTR, 2011, ISBN: 978-0-13-713473-1.
2	Sorin Voinigescu, "High-Frequency Integrated Circuits", Cambridge University Press, 2013, ISBN: 978-0-521-87302-4.
3	Ken Kuang, Franklin Kim, Sean S. Cahill, Rick Sturdivant, "RF and Microwave Microelectronics Packaging I & II", Springer, 2017, ISBN: 978-3-319-51696-7.
4	Behzad Razavi, "Fundamentals of Microelectronics", 2nd Edition, Wiley, 2014, ISBN: 978-1118156322.
5	"RF Basic Technology Guide", Rigol Technologies, 2016.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0

Teaching methods	Auditorial teaching. Laboratory exercise. Consultations.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures		Written exam	
Exercises	20	Oral exam	50
Colloquia			
Projects	30		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Microsensors and Microsystems		
Lecturer (for lectures)	Vračar M. Ljubomir, Pejović M. Milić		
Lecturer/associate (for exercises)	Vračar M. Ljubomir		
Lecturer/associate (for OFE)	Vračar M. Ljubomir		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	Acquiring the knowledge needed to understand the application of modern sensors in measuring and controlling systems.
Course outcomes	Students became capable of understanding the microsytem principals and independently be able to connect sensors with microcontrollers forming a basic microsystem.
Course outline	
Theoretical teaching	This course provides an in-depth introduction to microsensor technologies and their integration within modern microsystems. Students will explore the fundamental principles behind the design, fabrication, and operation of microsensors, with emphasis on thermal, optical, magnetic, inertial, chemical, and biological sensing mechanisms. The course covers the role of microcontrollers in sensor-based systems, including programming for real-time data acquisition, signal processing in the time domain, and digital communication. Attention will be given to interface circuit design and the process of analog-to-digital conversion, which is essential for accurate signal interpretation. Students will also gain familiarity with current standards and communication protocols that ensure interoperability and reliability of sensor systems. Through practical examples and laboratory exercises, the course aims to bridge theoretical concepts with real-world applications in fields such as environmental monitoring, biomedical diagnostics, industrial automation, and smart devices. By the end of the course, students will understand how microsensors function as part of larger integrated systems, and will be able to design and implement basic sensor-based solutions using microcontrollers and supporting hardware. The course prepares students for advanced work in embedded systems, IoT development, and sensor-driven innovation across multiple engineering domains.
Practical teaching (exercises, OFE, study and research work)	The laboratory exercises include courses on sensors operation and electrical characterisitcs found in practice. Especially, the introductory cource is aimed to educate students with programing micorcontrolers for data processing from different snensor devices.
Textbooks/references	
1	IEEE Electronics Packaging Society, “MEMS and Sensor Integration,” in Heterogeneous Integration Roadmap, ch. 11, IEEE, 2021. [Online]. Available: https://eps.ieee.org/wp-content/uploads/2025/11/ch11_MEMS.pdf
2	Design and Fabrication of Micro/Nano Sensors and Actuators, MDPI Books, Basel, Switzerland, 2024. [Online]. Available: https://www.mdpi.com/books/reprint/9567-design-and-fabrication-of-micro-nano-sensors-and-actuators
3	MEMS Inertial Device, MDPI Books, Basel, Switzerland, 2024. [Online]. Available: https://www.mdpi.com/books/reprint/8872-mems-inertial-device
4	Minin, Oleg, ed. 2011. ‘Microsensors’. InTech. doi:10.5772/688. Available: https://mts.intechopen.com/storage/books/162/authors_book/authors_book.pdf
5	Rasras, Mahmoud, Ibrahim M. Elfadel, and Ha Duong Ngo, eds. 2019. MEMS Accelerometers. Basel: MDPI. https://doi.org/10.3390/books978-3-03897-415-4

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0

Teaching methods	Lectures; Computer simulations; Practical laboratory work; Consultation.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	10	Written exam	

Exercises	20	**Oral exam**	50
Colloquia			
Projects	20		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Integrated Microsystems		
Lecturer (for lectures)	Prijić P. Aneta		
Lecturer/associate (for exercises)	Prijić P. Aneta, Vračar Zlatković M. Jana		
Lecturer/associate (for OFE)	Vračar Zlatković M. Jana		
Number of ECTS 5	**Course status (obligatory/elective)**	Elective	

Prerequisites	None
Course objectives	The objectives of the course are focused on: - Introduction to the structure of integrated (embedded) microsystems - basic subsystems; - Acquaintance with the concept of reconfigurability of integrated microsystems based on Programmable System on Chip (PSoC); - Understanding the specific characteristics of individual families of PSoC chips (PSoC3, PSoC4, PSoC5LP); - Presenting capabilities for the realization of various applications with PSoC microcontrollers; - Mastering the PSoC Creator integrated development environment; - Acquiring the ability to work with different development kits with PSoC chips.
Course outcomes	Learning outcomes allow a student to: - Describe the architecture of integrated microsystems based on a Programmable System on Chip (PSoC); - Explain the reconfiguration property of PSoC chips; - Distinguish the specificity of the individual family of PSoC chips (PSoC3, PSoC4, PSoC5LP); - Demonstrate the principle of creating projects within the PSoC Creator integrated development environment; - Design a variety of applications using different PSoC development kits.
Course outline	
Theoretical teaching	Introduction. Characteristics of the reconfigurability of the PSoC architecture. Block diagram of the PSoC. Central subsystem. Analog subsystem. Digital Subsystem. System-wide resources. Subsystem for communication with the environment. Communication between the subsystems. Specific PSoC modules (SC/CT, LCD driver, CapSense driver). Built-in components. Integrated development environment of the PSoC (PSoC Creator). Development kits with PSoC. Rules from practice for work with PSoC. Implementation of basic projects with the PSoC5LP chip (control of peripherals, interrupts, LCD, ADC, DAC, PWM, CapSense, operation in low-power mode).
Practical teaching (exercises, OFE, study and research work)	Laboratory exercises using PSoC development kits: implementation of the accelerometer and capacitive, temperature and proximity sensors; state indication and management of the peripherals; communication with PC; working with capacitive sliders and buttons; digital logic; generation of precise analog signals.
Textbooks/references	
1	W. Weidinger, "System Investigation of Programmable Systems on Chip (PSoC)", VDM Verlag Dr. Mueller e.K., 2008.
2	A. R. Kansal, "A Study on Programmable System on Chip", IOSR Journal of VLSI and Signal Processing, Vol. 4, No. 5, 2014.
3	"CY8CKIT-050 PSoC 5LP Development Kit Guide", Cypress Semiconductor Corporation, 2018, Online Available: http://www.cypress.com/file/45276/download
4	R. Ashby, "My First Five PSoC3 Designs", Cypress Semiconductor Corporation, 2010-2012, Online Available: https://www.cypress.com/documentation/other-resources/my-first-five-psoc-3-designs.
5	

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0

Teaching methods	Theoretical lectures - using slides; Practical demonstration of typical projects; Laboratory exercises with development kits and PC; Project tasks presentation.		
Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	20	**Written exam**	40
Exercises	40	**Oral exam**	
Colloquia			
Projects			

Specification for the book of courses

Study program			Electron Devices and Microsystems	
Type and level of studies			Master Academic Studies	
The name of the course			Basics of Photovoltaic conversion	
Lecturer (for lectures)			Aleksić M. Sanja	
Lecturer/associate (for exercises)			Branković Lj. Neda	
Lecturer/associate (for OFE)			Branković Lj. Neda	
Number of ECTS		5	**Course status (obligatory/elective)**	Elective
Prerequisites	None			
Course objectives	Enabling students to understand the physical principles of photovoltaic conversion, the behavior of materials under illumination, the structure and function of PN junctions, as well as the characteristics of solar cells. The course lays the foundation for further work in PV technologies, systems, and materials.			
Course outcomes	Upon successful completion of the course, the student will be able to: explain the physics of radiation interaction with semiconductors, describe the operation of a PN junction under illumination, derive current equations for ideal and real PV cells, analyze I–V and P–V characteristics and their parameters, distinguish types of PV cells and compare their physical characteristics, and perform basic calculations of efficiency and losses in PV devices.			
Course outline				
Theoretical teaching	Introduction to photovoltaic conversion; history and significance. Properties of light and photons; photon energy. Semiconductor materials and bandgap. Statistical physics – Fermi level, density of states. PN junction – electric field, diffusion, recombination. Illuminated PN junction – photocarrier generation. Diode equation and operation of a PV cell under load. Operating point, Voc, Isc, FF, η. Influence of temperature and radiation on cell performance. PV cell models – single-diode and two-diode. Materials for PV cells: Si, GaAs, CdTe, CIGS. Absorption, reflection, and transmission of light in the cell. Behavior of series- and parallel-connected cells. Optical and electronic losses in PV cells. Course summary / student presentations.			
Practical teaching (exercises, OFE, study and research work)	Solar radiation spectrum: Calculation of the number of photons in spectral ranges. Photon energy and bandgap width: Spectral selectivity of absorption. Carrier concentration and Fermi level: Variation with temperature and doping. Simulation of the PN junction in equilibrium and illuminated states. Derivation and simulation of the PV diode equation. I–V characteristics under different illumination conditions. Comparison of Si and GaAs cells – losses and fill factor (FF). Calculation of overall efficiency including optical losses. Modeling of a real PV cell based on technical datasheet data.			
Textbooks/references				
1	Würfel, P. Physics of Solar Cells: From Principles to New Concepts (2nd ed.). (2005). Wiley-VCH. https://doi.org/10.1002/3527606677			
2	Green, M. A. Solar Cells: Operating Principles, Technology, and System Applications. (1982) Prentice-Hall.			
3	PV Education. (n.d.). An Open Educational Resource on Photovoltaics. Retrieved June 2, 2025.			
4	Solar Components: Solved Problems and Exercises, S. Aleksić, A. Pantić, N. Stanojević, A. Petković, D. Pantić, Faculty of Electronic Engineering, 2023. ISBN: 978-86-6125-263-1			
5	Internal scripts and lectures by the instructors are available on the course website.			
Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	1	0	0
Teaching methods	Research-oriented lectures with a focus on critical thinking, analysis of scientific literature, and solving specific engineering problems. Advanced laboratory exercises using appropriate software tools. Development of seminar and final projects under mentorship. Collaboration with industry through master's thesis projects or internships in companies and institutes. Public presentation of work, presenting in front of faculty and other students, accompanied by the preparation of technical documentation.			
Grade (maximum number of points 100)				
Pre-exam duties		**Points**	**Final exam**	**Points**
Activity during lectures		5	**Written exam**	20

Exercises	20	**Oral exam**	30
Colloquia			
Projects	25		

Specification for the book of courses

Study program		Electron Devices and Microsystems	
Type and level of studies		Master Academic Studies	
The name of the course		Photovoltaic technologies and devices	
Lecturer (for lectures)		Pantić S. Dragan, Aleksić M. Sanja	
Lecturer/associate (for exercises)		Branković Lj. Neda	
Lecturer/associate (for OFE)		Branković Lj. Neda, Stojanović D. Milan	
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	The aim of the course is to familiarize students with advanced technologies of photovoltaic (PV) components, modern manufacturing processes and materials, as well as PV system architectures. Special attention is given to the characterization and modeling of components, as well as the analysis of their application in various configurations and environments.
Course outcomes	Upon completion of the course, the student will be able to: understand advanced manufacturing technologies of PV cells (PERC, HIT, bifacial, tandem, etc.), perform characterization and analysis of PV modules and inverters, design a PV system with optimal component selection according to site conditions, apply software tools (MATLAB, PVsyst) for simulation and techno-economic analysis of the system, and analyze the impact of degradation, soiling, temperature, and irradiance on system performance.
Course outline	
Theoretical teaching	Introduction to advanced PV technologies. Physics of photovoltaic devices – advanced models. Manufacturing technologies: PERC, HIT, TOPCon, Tandem. Thin-film and organic PV cells. Bifacial modules and solar tracking technology. Materials: silicon, perovskites, CdTe, CIGS. Characterization of PV components: STC, NOCT, LID, PID. Electronic components: inverters, converters, MPPT. Energy storage systems and integration with PV. Photometric and spectral device analysis. Standards and certification of PV components. Building integration (BIPV) and smart grids. Component degradation and system durability. Energy and economic analysis (LCOE, ROI). Student project presentations.
Practical teaching (exercises, OFE, study and research work)	Modeling of PV modules in MATLAB (explicit and exponential models), analysis of the operation of different PV cell technologies (PERC, HIT, CdTe), simulation of bifacial PV systems in PVsyst, design and optimization of PV systems for a real location (with irradiance data), calculation of MPPT algorithms in Simulink, and computation of LCOE and economic analysis of PV systems.
Textbooks/references	
1	Green, M. A. Solar Cells: Operating Principles, Technology, and System Applications. Englewood Cliffs, (1982) NJ: Prentice-Hall.
2	Markvart, T., & Castañer, L. (Eds.). Practical Handbook of Photovoltaics: Fundamentals and Applications. (2003) Oxford: Elsevier.
3	IEC 61215:2021. Terrestrial photovoltaic (PV) modules – Design qualification and type approval. Geneva: IEC. IEC 61730:2023. Photovoltaic (PV) module safety qualification – Part 1 & 2. Geneva: IEC. IEC 62109-1:2010 & IEC 62109-2:2011. Safety of power converters for use in photovoltaic power systems. Geneva: IEC.
4	Solar Components: Solved Problems and Exercises, S. Aleksić, A. Pantić, N. Stanojević, A. Petković, D. Pantić, Faculty of Electronic Engineering, 2023. ISBN: 978-86-6125-263-1
5	Internal scripts and lectures by the instructors are available on the course website.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	2	0	0

Teaching methods	Research-oriented lectures with an emphasis on critical thinking, analysis of scientific literature, and solving specific engineering problems. Advanced laboratory exercises using appropriate software tools. Preparation of seminar and final projects under mentorship. Collaboration with industry through master's theses or internships at companies and research institutes. Public presentation of work, including presentations before faculty and fellow students, accompanied by the preparation of technical documentation.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points

Activity during lectures	5	**Written exam**	20
Exercises	20	**Oral exam**	30
Colloquia			
Projects	25		

Specification for the book of courses

Study program		Electron Devices and Microsystems Control Systems / Computer Control Systems and Measurement Techniques		
Type and level of studies		Master Academic Studies		
The name of the course		Medical Physics		
Lecturer (for lectures)		Ristić S. Goran		
Lecturer/associate (for exercises)		Živanović N. Emilija		
Lecturer/associate (for OFE)				
Number of ECTS	5	**Course status (obligatory/elective)**	Elective	
Prerequisites	None			
Course objectives	Introduction to application of the ionizing and non-ionizing radiation in medicine, as well as the principle of basic methods of medical diagnostics.			
Course outcomes	Knowledge of diagnostic and therapeutic methods in medicine that are based on the ionizing and non-ionizing radiation, and the equipment is used in that purpose.			
Course outline				
Theoretical teaching	Medical diagnostics. X-rays and X-ray characteristics and their application in medicine. Radiography and fluoroscopy, mammography, X-ray, computer tomography. Digital Flat Panel X-ray Appliances. The production and the characteristics of ultrasound and its application in medicine. Principle of magnetic resonance, and its application in medical diagnostics. Use of radioisotopes in medical diagnostics and radiotherapy. PET diagnostics. Electrocardiography, Laser application in medicine. Application of radiofrequency and optical radiation in medical diagnostics and therapy. Radiotherapy devices.			
Practical teaching (exercises, OFE, study and research work)	Practical classes take place through computational exercises. Concrete problems are solved during computational tutorials in order to make students more easily and successfully master certain areas that are covered in theoretical classes.			
Textbooks/references				
1	E. Samei, D.J. Peck, Hendee's Physics of Medical Imaging, Wiley-Blackwell, ISBN: 978-1-118-67096-5, 2019			
2	S.A. Kane, B.A. Gelman, Introduction to Physics in Modern Medicine (3rd Edition), CRC Press (Taylor & Francis Group), ISBN: 978-1138036031, 2020			
3	J. Enderle, J. Bronzino, S. Blanchard, Introduction to Biomedical Engineering (4th Edition), Academic Press (Elsevier), ISBN: 978-0128224380, 2021			
4	S.Keevil, R. Padovani, S. Tabakov, T. Greener, C. Lewis, Introduction to Medical Physics, CRC Press (Taylor & Francis Group), ISBN: 978-1138742833, 2022			
5	G. Ristić, Medical Physics, Lecture Notes, Faculty of Electronic Engineering, Niš, 2021			
Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	0	0	0
Teaching methods	Lectures, computational exercises and consultations.			
Grade (maximum number of points 100)				
Pre-exam duties	**Points**	**Final exam**	**Points**	
Activity during lectures		**Written exam**	30	
Exercises		**Oral exam**	30	
Colloquia	20			
Projects	20			

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Measurement Systems in Industry 5.0		
Lecturer (for lectures)	Dinčić R. Milan, Jovanović R. Jelena		
Lecturer/associate (for exercises)	Pešić T. Miroljub, Ranđelović S. Ivana		
Lecturer/associate (for OFE)	Pešić T. Miroljub, Ranđelović S. Ivana		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	Empowering students to apply modern industrial measurement systems by integrating advanced technologies such as artificial intelligence, IoT/IIoT, and predictive maintenance — with a strong emphasis on improving the reliability, accuracy, and energy efficiency of these systems.
Course outcomes	Students will gain comprehensive theoretical and practical knowledge essential for the implementation of modern measurement systems in industrial settings. They will be equipped to integrate artificial intelligence, IoT/IIoT technologies, and predictive maintenance into advanced measurement solutions. Additionally, they will learn to apply smart sensors, digital twins, and sensor fusion techniques. Students will also master methods for enhancing the accuracy, reliability, and energy efficiency of measurement systems, thereby preparing them to work effectively in cutting-edge industrial environments.
Course outline	
Theoretical teaching	The course explores modern measurement systems with applications in industry, including the fundamental principles of Industry 4.0 and 5.0, measurement systems based on artificial intelligence, as well as the basic concepts of the Internet of Things (IoT) and the Industrial Internet of Things (IIoT). Students will also become familiar with smart sensors, digital twins, predictive maintenance techniques, sensor fusion, and energy harvesting techniques for powering autonomous sensor modules. Through this approach, students gain the knowledge necessary to apply the latest technologies in modern industrial environments.
Practical teaching (exercises, OFE, study and research work)	Problem-solving exercises, laboratory sessions, project assignments, and seminar papers designed to equip students with practical skills and knowledge for the application of modern measurement systems in industrial environments.
Textbooks/references	
1	Dan Zhang (editor), Xuechao Duan (editor), "Smart Sensors and Devices in Artificial Intelligence", Mdpi AG, 2021.
2	Halit Eren, "Artificial Intelligence in Wireless Sensors and Instruments: Networks and Applications", CRC Press, 2024.
3	Bhagirathi Nayak, Monika Mangla, Sachi Nandan Mohanty, Suneeta Satpathy, "Integration of Cloud Computing with Internet of Things: Foundations, Analytics and Applications", Wiley, 2021.
4	Guangrui Wen, Zihao Lei, Xuefeng Chen, Xin Huang, "New Generation Artificial Intelligence-Driven Diagnosis and Maintenance Techniques: Advanced Machine Learning Models, Methods and Applications", Springer, 2024.
5	Alice James, Avishkar Seth, Subhas Chandra Mukhopadhyay, "Smart Sensors, Measurement and Instrumentation: Iot System Design: Project Based Approach", Springer, 2022.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	2	0	0

Teaching methods	Lectures, problem-solving and laboratory exercises, consultations, project work, real-world industrial case studies, teamwork, educational games and simulations — all delivered through personalized learning approaches tailored to students' individual needs and interests.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	5	Written exam	25
Exercises	25	Oral exam	25

Colloquia	20		
Projects			

Specification for the book of courses

Study program		Electron Devices and Microsystems	
Type and level of studies		Master Academic Studies	
The name of the course		Hardware for Artificial Intelligence	
Lecturer (for lectures)		Marjanović B. Miloš	
Lecturer/associate (for exercises)		Marjanović B. Miloš	
Lecturer/associate (for OFE)		Mitrović I. Nikola	
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	The course objectives are such that the student will: become familiar with the concepts of artificial intelligence, machine learning, and neural networks; hardware components for artificial intelligence: digital multipliers and adders; types and architectures of microprocessors, graphic processors, and neural processors; understand the hardware requirements imposed by artificial intelligence; become familiar with neuromorphic hardware architectures and the concept of in-memory computing.
Course outcomes	The learning outcomes specific to the course are defined so that the student will: understand the fundamentals of artificial intelligence; be familiar with the role and operating principles of basic hardware components such as digital multipliers, adders, and MAC arrays; distinguish between types and architectures of microprocessors, graphic processors, and neural processors; apply knowledge of in-memory computing techniques using memristors.
Course outline	
Theoretical teaching	Fundamentals of artificial intelligence (machine learning, neural networks). Basic hardware components for artificial intelligence: digital multipliers and adders, MAC arrays. Types and architectures of microprocessors, graphic processors, and neural processors. Examples of hardware architectures: CISC, RISC, RISC-V. FPGA-based accelerators. Neuromorphic architectures (TrueNorth, Loihi, Spinnaker), asynchronous design. Techniques for reducing power consumption of AI hardware. In-memory computing using memristors (RRAM).
Practical teaching (exercises, OFE, study and research work)	During practical classes, students will have the opportunity to apply the acquired theoretical knowledge by working in real development environments. The emphasis will be on implementing a simplified AI accelerator on an FPGA platform and using a development board with a RISC-V microcontroller. As part of the research component of the course, students will work on a seminar paper covering advanced topics in the field of hardware for artificial intelligence.
Textbooks/references	
1	John L. Hennessy, David A. Patterson, Computer Architecture: A Quantitative Approach, 4th Edition, Morgan Kaufmann, 2006."
2	Shiho Kim, Ganesh Deka, Advances in Computer Hardware Accelerator Systems for Artificial Intelligence and Machine Learning, Academic Press is an imprint of Elsevier, 2021.
3	Donghyeon Han, Hoi-Jun Yoo, On-Chip Training NPU - Algorithm, Architecture and SoC Design, Springer, 2023.
4	Manan Suri, Advances in Neuromorphic Hardware Exploiting Emerging Nanoscale Devices, Springer, 2017.
5	Sarah Harris, David Harris, Digital Design and Computer Architecture: RISC-V Edition, Morgan Kaufmann, 2021.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0

Teaching methods	Theoretical lectures. Practical computer-based exercises. Independent student work through homework assignments. Consultations.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	10	**Written exam**	40
Exercises	10	**Oral exam**	10
Colloquia	20		
Projects	10		

Specification for the book of courses

Study program		Control Systems / Automatic Control Electron Devices and Microsystems	
Type and level of studies		Master Academic Studies	
The name of the course		Energy storage systems in modern propulsion units	
Lecturer (for lectures)		Aleksić M. Sanja	
Lecturer/associate (for exercises)		Spasić D. Miodrag	
Lecturer/associate (for OFE)		Branković Lj. Neda	
Number of ECTS	5	**Course status (obligatory/elective)**	Obligatory / Elective

Prerequisites	None
Course objectives	The aim of this course is to introduce students to the working principles and fundamental characteristics of electric and hybrid electric vehicles (EVs and HEVs). It familiarizes them with the electrochemical foundations of battery systems and supercapacitors, battery management systems, as well as charging and discharging methods for returning electrical energy to the system. The course equips students to test and simulate battery module characteristics using the MATLAB/Simulink software environment, and to understand, analyze, and optimize battery performance.
Course outcomes	Students are trained to recognize different types of power supply devices, as well as the possibilities of combining them to optimize energy consumption in EVs and HEVs. They are able to define the conditions for establishing feedback for charging EVs and HEVs during phases of their operating cycles when this is possible, test, simulate, and optimize battery module characteristics in MATLAB, design battery systems for specific types of vehicles, analyze real battery performance, and optimize power supply systems within the MATLAB/Simulink environment.
Course outline	
Theoretical teaching	Hybrid and electric vehicles and their environmental impacts. Energy storage systems and hybrid energy storage systems. Operating principles of lithium-ion and other types of batteries, as well as hydrogen fuel cells. Performance parameters: capacity, energy density, lifespan. Advantages and disadvantages of various battery types. Battery monitoring and protection. Thermal management and safety aspects. Cell charging and balancing models. Supercapacitors (operating principle, types, chemical and electrical characteristics, comparison with batteries). Hydrogen. Characteristics of hydrogen combustion (reactivity issues). Hydrogen storage. Performance, efficiency, economic and environmental benefits of using hydrogen fuel cells. Transistors for converters (conventional and WBG as the future). Converter control.
Practical teaching (exercises, OFE, study and research work)	Introduction to energy storage systems. Overview of technologies – batteries, supercapacitors, flywheels, hydrogen. Simulation of lithium-ion battery models in Simulink. Creation and parameterization of cell and battery pack models. Charging and discharging of batteries – real-time analysis. Supercapacitors: modeling and analysis. Hybrid storage systems (Battery + SC). Energy management in electric vehicles. Thermal battery model, heating simulation. Battery diagnostics and degradation. Status and simulation of chargers (AC/DC, DC/DC). Simulation of Level 1/2 chargers, conversion and control. Integration with Smart Grid concepts (V2G, BMS, EMS).
Textbooks/references	
1	Electrochemical Energy Storage for Renewable Sources and Grid Balancing, Jürgen Garche et al. Springer, 2015.
2	Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, Chris Mi, M. Abul Masrur, David Wenzhong Gao, Wiley, 2011.
3	Batteries for Electric Vehicles: Materials and Electrochemistry, D. A. J. Rand, R. Woods, R. M. Dell, Royal Society of Chemistry, 2001.
4	Advanced Electric Drive Vehicles, A. Emadi, CRC Press, 2014.
5	Internal scripts and lectures by the instructors are available on the course website.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0

Teaching methods	Research-oriented lectures with an emphasis on critical thinking, analysis of scientific literature, and solving real engineering problems. Advanced laboratory exercises using appropriate software tools. Development of seminar and final projects with mentoring support. Collaboration with industry through master's thesis work or internships in companies and institutes. Public presentation of projects, presentations in front of faculty and other students, along with the preparation of technical documentation.		
Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	5	**Written exam**	20
Exercises	15	**Oral exam**	30
Colloquia			
Projects	30		

Specification for the book of courses

Study program		Electron Devices and Microsystems	
Type and level of studies		Master Academic Studies	
The name of the course		Energy, Environment and Sustainable Development	
Lecturer (for lectures)		Pantić S. Dragan, Aleksić M. Sanja	
Lecturer/associate (for exercises)		Pantić S. Dragan, Aleksić M. Sanja	
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Elective
Prerequisites	None		
Course objectives	Enabling students to understand and critically analyze the interconnection between energy systems, environmental protection, and the concept of sustainable development. Acquiring interdisciplinary knowledge for planning and implementing technologies that minimize environmental impacts and promote a sustainable energy transition.		
Course outcomes	Upon completion of the course, the student will be able to: Analyze energy systems from the perspective of environmental impact; Use sustainability indicators in the assessment of energy technologies; Develop low-carbon development and energy transition scenarios; Apply the concept of circular economy within the energy sector; Understand global and local sustainable development and climate policies (e.g., EU Green Deal, Agenda 2030)		
Course outline			
Theoretical teaching	Introduction to sustainable development and 21st-century energy challenges. Overview of energy sources and their environmental impacts. Greenhouse gas emissions and climate change. Life Cycle Assessment (LCA) in the energy sector. Energy efficiency and sustainability indicators. Concepts of energy transition: decarbonization and decentralization. Renewable energy sources and their integration into the energy mix. Circular economy in the energy sector. Waste management and Waste-to-Energy (WtE) systems. Urban sustainability: energy-efficient cities and buildings. Energy policy and international agreements (UNFCCC, IPCC, EU Green Deal). Low-carbon development strategies: national and regional examples. Energy justice and access to energy. Case study analysis: successful models of sustainable communities. Seminar paper presentations and discussion.		
Practical teaching (exercises, OFE, study and research work)	Practical activities / learning outcomes: Calculation of the carbon footprint of various energy sources; Conducting a Life Cycle Assessment (LCA) for a selected technology (e.g., solar power plant); Simulation of energy scenarios using software tools (HOMER, LEAP, SimaPro – as selected); Project work: designing a sustainable energy solution for a local community; Group analysis of a national sustainable development strategy; Comparative review of energy transition policies in different countries.		
Textbooks/references			
1	Goldemberg, J. Energy for a Sustainable World: From the Oil Age to a Sun-Powered Future. (2012) Wiley.		
2	Tester, J. W., Drake, E. M., Driscoll, M. J., Golay, M. W., & Peters, W. A. Sustainable Energy: Choosing Among Options. (2005) MIT Press.		
3	IPCC Reports (изабрана поглавља) Selected chapters from Assessment Reports [e.g., AR5, AR6].		
4	European Commission. (n.d.). EU Energy Strategy and European Green Deal Documents. Retrieved from https://energy.ec.europa.eu and https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en		
5	Internal scripts and lectures by the instructors are available on the course website.		

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	0	0	0

Teaching methods	Research-oriented lectures with an emphasis on critical thinking, analysis of scientific literature, and solving specific engineering problems. Advanced laboratory exercises using appropriate software tools. Preparation of seminar and final projects under mentorship. Collaboration with industry through the development of master's theses or internships at companies and research institutes. Public presentation of work, including presentations before faculty and fellow students, along with preparation of technical documentation.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	5	Written exam	20
Exercises	20	Oral exam	30
Colloquia			
Projects	25		

Specification for the book of courses

Study program			Communications and Information Technologies / System Engineering and Radio-Communications Electron Devices and Microsystems		
Type and level of studies			Master Academic Studies		
The name of the course			Techno-economic and ecological aspects of communication systems		
Lecturer (for lectures)			Joković J. Jugoslav, Aleksić M. Sanja		
Lecturer/associate (for exercises)			Dimitrijević Ž. Tijana		
Lecturer/associate (for OFE)			Mladenović M. Ksenija		
Number of ECTS		5	**Course status (obligatory/elective)**	Obligatory / Elective	
Prerequisites	None				
Course objectives	Introduction to techno-economic aspects of the sustainability of communication systems and their impact on health and the environment. Understanding of mechanisms for managing energy consumption, frequency spectrum resources and the risks of RF and microwave radiation to human health. Introduction to relevant legislation and standards.				
Course outcomes	Understanding the techno-economic aspects of the operation of communication systems and their impact on health; Knowledge of regulations in the field of spectrum management and protection from electromagnetic (EM) radiation; Knowledge of the physics of the interaction between EM fields and tissue and the effects that arise - the ability to identify types and sources of RF and microwave radiation that have a harmful effect and to perform a risk assessment and take appropriate safety measures. Training in the design, analysis, optimization and integration of photovoltaic (PV) systems into communication systems.				
Course outline					
Theoretical teaching	Overview of communication systems, techno-economic aspects and environmental impact issues (spectrum, energy consumption, health). Factors in the analysis of electronic communications, convergence of technologies. Frequency spectrum - limitations, allocation, spectrum management in the RF, microwave and millimeter wave bands. EM field radiation and public safety - regulatory aspects. Interaction of EM fields and the human body. Exposure and dosimetry of RF and microwave radiation – parameters, measurements and protection. Energy needs and sustainability aspects in the infrastructure of modern communication systems. Design, implementation and optimization of photovoltaic (PV) systems for powering elements of communication systems. PV integration into communication systems. Smart energy management.				
Practical teaching (exercises, OFE, study and research work)	Calculations related to the of electromagnetic fields exposure to living organisms and the absorption of electromagnetic energy. Introduction to devices and methods for experimental determination of RF and microwave radiation levels. Introduction to methods for designing, analyzing and optimizing photovoltaic (PV) systems that used in powering elements and devices in telecommunications, as well as their integration into communication systems.				
Textbooks/references					
1	Handbook of Telecommunications Economics, Vol.1 & Vol.2; S. Majumdar, M. Cave, I. Vogelsang; North Holland; 2002; ISBN: 978-0444514233				
2	Essentials of Modern Spectrum Management; Martin Cave, Chris Doyle, William Webb; Cambridge University Press; 2007; ISBN: 978-0521876698.				
3	Biological Effects and Health Implications of Radiofrequency Radiation; James C. Lin, Sol M. Michaelson; Springer Science & Business Media; 2013; ISBN: 9781475746143,				
4	Energy-Efficient Computing and Communication, Sangheon Pack. MDPI, 2020, ISBN 978-3-03936-149-6				
5					
Number of classes of active education per week during semester/trimester/year					
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**	
2	1	1	0	0	
Teaching methods	Lectures, classroom exercises, seminar, practical work				
Grade (maximum number of points 100)					
Pre-exam duties		**Points**	**Final exam**	**Points**	
Activity during lectures		10	**Written exam**	30	

Exercises	10	**Oral exam**	30
Colloquia			
Projects	20		

Specification for the book of courses

Study program	Electron Devices and Microsystems Electronics and Embedded Systems		
Type and level of studies	Master Academic Studies		
The name of the course	Real Time Operating Systems		
Lecturer (for lectures)	Nikolić S. Goran		
Lecturer/associate (for exercises)	Nedeljković N. Jelena		
Lecturer/associate (for OFE)	Nedeljković N. Jelena		
Number of ECTS 5	**Course status (obligatory/elective)**	Obligatory / Elective	

Prerequisites	None
Course objectives	Acquiring knowledge of the fundamental concepts and principles of modern operating systems, with a particular focus on their structure, functions, and components. Special attention is given to real-time operating systems, including an understanding of their specific requirements, as well as the importance of timing constraints and guarantees during program execution in such systems.
Course outcomes	Students will acquire theoretical and practical knowledge about the concepts, internal design, and implementation of modern operating systems, with a focus on systems intended for embedded applications. They will gain proficiency in the practical use of the Real-Time Linux operating system API functions, as well as a detailed understanding of the structure and functions of the Linux kernel, including the possibilities for its modification and extension in real-time operating environments.
Course outline	
Theoretical teaching	Covers the history and development of embedded Linux systems, as well as an overview of popular distributions and architectures. It examines the structure of the Linux operating system, including the kernel, user space, startup sequences, and the boot loader interface. Special emphasis is placed on system resource management—memory, interrupts, timers, interfaces, and power consumption. Embedded memory technologies are analyzed along with methods for memory and kernel space optimization. The course covers driver development for serial and communication interfaces, as well as application porting, multithreaded programming, and integration with the kernel API. Special attention is given to Real-Time Linux as an operating system for real-time operation, including analysis of interrupt and scheduler latency, memory management, and synchronization mechanisms.
Practical teaching (exercises, OFE, study and research work)	Practical instruction includes working in a Linux environment on embedded platforms such as Raspberry Pi or ARM devices. Through the command line and shell scripts, students will master working with files, directories, and basic system commands. The course covers the fundamentals of shell programming, network configuration (TCP/IP), process and thread administration, as well as their synchronization. Special focus is placed on the boot process, configuration, and compilation of the Linux kernel, as well as working with modules. Programs will be developed in C, C++, and Python, with direct application to embedded hardware, providing students with hands-on experience in developing real-time Linux systems.
Textbooks/references	
1	Operating Systems: Internals and Design Principles 9th Edition by William Stallings, ISBN-10:0134670957, ISBN-13:978-0134670959, Pearson, 2017, https://www.amazon.com/Operating-Systems-Internals-Design-Principles/dp/0134670957
2	Modern Operating Systems 4th Edition by Andrew Tanenbaum, Herbert Bos, ISBN-10: 013359162X, ISBN-13: 978-0133591620, Pearson, 2014, https://www.amazon.com/Modern-Operating-Systems-Andrew-Tanenbaum/dp/013359162X
3	Operating System Concepts 10th Edition by Abraham Silberschatz, Peter B. Galvin, Greg Gagne, SBN-10: 1119800366, ISBN-13:978-1119800361, Wiley, 2021, https://www.amazon.com/Operating-System-Concepts-Abraham-Silberschatz/dp/1119800366
4	Embedded Linux Primer: A Practical, Real-World Approach 2nd Edition by Christopher Hallinan, ISBN-10: 0137017839, ISBN-13:978-0137017836, Prentice Hall, 2010, https://www.amazon.com/Embedded-Linux-Primer-Practical-Real-World/dp/0137017839
5	

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0

Teaching methods	Lectures with the use of computers and a projector. Lectures. Auditory exercises. Laboratory exercises. Homework assignments. Seminar paper. Consultations.		
Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	10	**Written exam**	20
Exercises	15	**Oral exam**	20
Colloquia	20		
Projects	15		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Gas discharge devices –characterization and application		
Lecturer (for lectures)	Živanović N. Emilija		
Lecturer/associate (for exercises)	Živanović N. Emilija		
Lecturer/associate (for OFE)	Veljković Z. Sandra		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	To acquire theoretical knowledge necessary for understanding the operating principles of gas components, as well as their characterization and applications.
Course outcomes	Upon successful completion of the course, the student will be able to understand the physical principles underlying the operation of gaseous electronic components, analyze and characterize their electrical and functional parameters, explain the operating principles of various types of gaseous electronic components and systems, and select and apply appropriate gaseous components according to the requirements of specific applications. The student acquires knowledge of the characteristics, capabilities, and limitations of gas-filled photocells and photomultipliers, gas surge arresters, gas light sources, gas ionizing radiation detectors, gas lasers, and gas switches.
Course outline	
Theoretical teaching	Students will gain both theoretical and practical knowledge of physical processes in gases. Topics include: Basic concepts of collision and transport processes. Non-self-sustained discharges and electrical breakdown in gases. Self-sustained discharges and basic plasma characteristics. Operating principles of gas phototubes and photomultipliers, surge arresters, gas light sources, gas sensors for ionizing radiation, gas lasers, and gas electrical switches. Characterization of gas components.
Practical teaching (exercises, OFE, study and research work)	Practical classes are held in the Laboratory for Applied Physics and the Laboratory for Gas and Vacuum Technology. They include demonstrations and hands-on presentations of the operation of various gas systems.
Textbooks/references	
1	Y. P. Rayzer, Gas Discharge Physics, Berlin: Springer, Softcover reprint: 2011.
2	Eduard M. Bazelyan, Yuri P. Raizer, Lightning Physics and Lightning Protection, Institute of Physics Publishing, Bristol and Philadelphia, 2000.
3	Vladislav Mazur, Principles of Lightning Physics, IOP Publishing, Bristol, UK, 2016.
4	David B. Go, Ionization and Ion Transport: A Primer for the Study of Gas Discharges and Plasmas, 2nd Edition, IOP Publishing, 2022.
5	Toshiaki Makabe, Zoran Lj. Petrović – Plasma Electronics: Applications in Microelectronic Device Fabrication, CRC Press, 2006.

Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	1	0	0

Teaching methods	Teaching takes place through lectures, auditory and laboratory exercises and consultations.

Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	25
Exercises	10	**Oral exam**	25
Colloquia	20		
Projects	20		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Technologies of Organic Semiconductor Materials and Devices		
Lecturer (for lectures)	Paunović V. Vesna, Aleksić M. Sanja		
Lecturer/associate (for exercises)	Aleksić M. Sanja, Paunović V. Vesna		
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	The basic knowledge of organic semiconductors, components and technologies that are based on these materials .
Course outcomes	The student becomes familiar with the properties and technologies of organic semiconductor materials. Also, acquires knowledge about the components that are based on organic semiconductors, and is capable of independently using commercial Silvaco software tools for simulation of technological process and the electrical characteristics of the components.
Course outline	
Theoretical teaching	Introduction. Organic semiconductors. Transport carriers in the crystal, polycrystalline and amorphous organic semiconductors. Luminescence in organic materials, films and crystals. Spontaneous and stimulated emission. Energy transfer and excitation. Photo conduction, photo-induced charge transfer. Photovoltaic components, solar cells and photodiodes. Organic LEDs, the basic structure and charge injection. Organic LED displays, active and passive matrix displays. Organic transistors. Circuits and systems based on organic components. Photo excitation organic lasers.
Practical teaching (exercises, OFE, study and research work)	As part of a planned seminar and defend an independent project in the final exam, as well as the planned exercises that are performed on a computer, the student shall be met with organic semiconductors and components, as well as electronic circuits and systems that are based on organic components. Simulation of the structure of organic LED diodes, organic solar cells, and organic transistors, and analysis of electrical characteristics. Simulation of the structure of thin film transistors (TFT).
Textbooks/references	
1	Handbook of Organic Materials for Electronic and Photonic Devices, ed Oksana Ostroverkhova, Woodhead Publishing, 2019
2	Stephen R. Forrest, Organic Electronics: Foundations to Applications, Oxford university press, 2020.
3	Organic Electronics Emerging Concepts and Technologies, Ed. by F. Cicoira,C. Santato Wiley-VCH , 2013
4	M.Petty, Organic and Molecular Electronics: From Principles to Practice, Wiley and sons, 2019
5	Handbook of Flexible Organic Electronics, Materials, Manufacturing and Applications, ed: Stergios Logothetidis, Woodhead Publishing, 2014

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	0	0	0

Teaching methods	Lectures, consultations, exercises, exercises on the computer, the project

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	10	Written exam	25
Exercises	20	Oral exam	25
Colloquia			
Projects	20		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Multi-Layer Printed Circuit Boards Design		
Lecturer (for lectures)	Prijić D. Zoran, Danković M. Danijel		
Lecturer/associate (for exercises)	Stojković S. Aleksandra		
Lecturer/associate (for OFE)	Stojković S. Aleksandra		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	Learning objectives are defined so that the student will: - Learn the technology of producing multilayer printed circuit boards; - Learn the process of designing multilayer printed circuit boards; - Learn the sources of parasitic effects that may appear on the multilayer printed circuit board; - Understand ways to reduce the impact of parasitic effects; - Know techniques for the realization of planar components on the printed circuit board; - Know techniques for interconnecting integrated circuits on the multilyer printed circuit board; - Be able to use the ECAD package for the design of multilayer printed circuit boards of medium complexity.
Course outcomes	Learning outcomes are defined so that the student will: - Distinguish the elements of the structure of multilayer printed boards and the technology of their production; - Explain the procedure for designing multilayer printed boards using the given example; - Distinguish grounding topologies and ways of partitioning the ground level, according to the given examples; - Identify sources of parasitic effects and propose ways to minimize them, according to the given examples; - Design planar components on the printed circuit board according to the given technical specifications, using the ECAD package; - Arrange and interconnect on the printed circuit board an integrated circuit with a large number of copies, using ECAD package; - Identify heat sources on the printed circuit board and design appropriate structures for heat removal.
Course outline	
Theoretical teaching	Technology of production of multilayer printed boards. Buried and the blind vias. Distribution of signal type by layers. Ground loops, grounding topology, partitioning the ground level. Power and current flows. Signal integrity. Impact of noise, guard rings. Influence of parasitic components between and within layers. Effects of high frequencies. Electromagnetic interference and crosstalk. Arrangement and ways of connecting integrated circuits with a large number of pins. Optionally: Planar components on the printedcircuit board (sensors, transformers, antennas). Distribution of temperature inside the board structure.The influence of connected peripheral components.
Practical teaching (exercises, OFE, study and research work)	Using the ECAD package. Laboratory exercises. Research work related to a given or self-proposed subject.
Textbooks/references	
1	D. Brooks, "Signal Integrity Issues and Printed Circuit Board Design", Prentice Hall, 2003.
2	D. Brooks, "PCB Currents: How They Flow, How They React", Prentice Hall, 2013.
3	https://www.analog.com/media/en/training-seminars/design-handbooks/Basic-Linear-Design/Chapter12.pdf
4	
5	

Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**

2	2	1	0	0	
Teaching methods	ECAD packages usage. Laboratory work. Research work on selected topics.				
Grade (maximum number of points 100)					
Pre-exam duties		**Points**	**Final exam**	**Points**	
Activity during lectures		10	**Written exam**	25	
Exercises		20	**Oral exam**	25	
Colloquia					
Projects		20			

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Photovoltaic Systems		
Lecturer (for lectures)	Pantić S. Dragan, Aleksić M. Sanja		
Lecturer/associate (for exercises)	Branković Lj. Neda		
Lecturer/associate (for OFE)	Branković Lj. Neda		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective

Prerequisites	None
Course objectives	Training students in the design, analysis, optimization, and integration of photovoltaic (PV) systems for various applications. Students will become familiar with modern PV cell technologies, methods of energy conversion and management, as well as the influence of local climatic and meteorological conditions on system performance.
Course outcomes	Upon completion of the course, the student will be able to: Explain the operating principles of different types of PV cells and modules; Calculate the effective energy yield based on location and system configuration; Design PV systems (both on-grid and off-grid) with the appropriate power electronics; Apply simulation tools for PV system performance analysis (e.g., PVsyst, MATLAB, SAM); Evaluate the economic feasibility and environmental impact of PV systems; Analyze the challenges related to the integration of PV systems into the power grid.
Course outline	
Theoretical teaching	Introduction to photovoltaic (PV) systems. Global trends. Solar radiation and meteorological influences. Structure and types of PV cells (Si, CdTe, CIGS, perovskites). PV modules: characteristics, degradation, testing. Electrical behavior of PV cells: I–V and P–V characteristics. MPPT methods and DC/DC converters. PV system configurations: on-grid, off-grid, hybrid. Inverters and AC grid connection. Energy storage: batteries, supercapacitors. Installation, orientation, shading. System monitoring: SCADA, IoT, real-time data. PV system economics: investment, LCOE, ROI. Environmental and energy aspects: CO_2eq, EROI, recycling. Grid integration, variability, and solutions. Final project presentation and discussion.
Practical teaching (exercises, OFE, study and research work)	Analysis of local meteorological conditions for electricity generation; Understanding the electrical characteristics of PV cells; Modeling a PV array connected to a DC/DC converter; Estimating PV system energy production and losses; Designing an off-grid PV system with battery storage using PVsyst; Performing energy and environmental analysis of a PV system; Monitoring real-time operational data from a PV system.
Textbooks/references	
1	Fundamentals of Photovoltaic Modules and Their Applications, Tiwari, G. N., & Dubey, S. Alpha Science International Ltd. (2010). ISBN: 9781842656619
2	Solar Cells: Operating Principles, Technology, and System Applications, Green, M. A. (1982). Solar Cells: Operating Principles, Technology, and System Applications. Prentice-Hall, Inc. ISBN: 9780138222709
3	PVsyst Help Manual & PVGIS Documentation - PVsyst SA. (2023). PVsyst Software Help Documentation [Software manual]. Retrieved from https://www.pvsyst.com, European Commission. (2023). Photovoltaic Geographical Information System (PVGIS) Documentation. Joint Research Centre (JRC), European Commission. Retrieved from https://joint-research-centre.ec.europa.eu/pvgis
4	Solar Components: Solved Problems and Exercises, S. Aleksić, A. Pantić, N. Stanojević, A. Petković, D. Pantić, Faculty of Electronic Engineering, 2023. ISBN: 978-86-6125-263-1
5	Internal scripts and lectures by the instructors are available on the course website.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0

Teaching methods	Teaching is delivered through interactive lectures, case studies, computer-based and laboratory exercises, and project work. Lectures address specific problems in the design, optimization, and integration of photovoltaic systems, supported by discussion of relevant scientific and professional literature. During exercises, students model and simulate PV system operation, estimate energy yield and losses, optimize system configurations, and analyze real meteorological and operational data using PVsyst, MATLAB/Simulink, SAM, and PVGIS. A seminar paper or course project is completed under mentorship and includes technical documentation and a public presentation of the results.		
Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	5	**Written exam**	20
Exercises	20	**Oral exam**	30
Colloquia			
Projects	25		

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Doctoral Studies		
The name of the course	Professional Practice		
Lecturer (for lectures)			
Lecturer/associate (for exercises)			
Lecturer/associate (for OFE)			
Number of ECTS	3	**Course status (obligatory/elective)**	Obligatory
Prerequisites			
Course objectives	Introduction to the work process in the company where the professional practice is carried out, its goals and organizational units. Introduction to the team and project that the student joins as part of their professional practice, which is selected in accordance with the study electives that the student has chosen. Understanding the work process in the company, business processes, understanding work risks, participation in design, documentation or quality control, in accordance with the work process and the possibilities of the work environment.		
Course outcomes	Improving the student's ability to engage in the work process after completing their studies. Developing responsibility, a professional approach to work, and communication skills in a team. Supplementing the theoretical knowledge acquired within the study program and gaining practical knowledge of the issues studied within the studies that the student is attending. Using the experience of experts employed at the institution where the internship is conducted to expand the practical knowledge and motivation of students. Gaining a clear insight into the possibility of applying the acquired knowledge and skills covered by the study program in practice.		
Course outline			
Theoretical teaching			
Practical teaching (exercises, OFE, study and research work)	The content of the internship is in full accordance with the goals of the internship. The student learns about the structure of the company and its business goals, adapts his/her own engagement to the field of study he/she has chosen, and duly fulfills work obligations in accordance with the duties of employees in the company. The student describes his/her own engagement during the internship and gives a critical review of his/her own experience, knowledge, and skills acquired during the internship.		
Textbooks/references			
1			
2			
3			
4			
5			

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
				6

Teaching methods	The student independently chooses a company from the state, private or public sector or a laboratory of the Faculty of Electronics in Niš in which he will complete his professional internship. Professional internship can also be completed abroad, in which case the student, among other things, improves his foreign language skills. At the student's proposal, the head of the elective area-module approves that the internship be completed in the desired institution and, upon request, issues a written instruction for professional internship to the person responsible for carrying out the internship in the given institution. After the completed internship, and based on the student's report and the confirmation of the responsible person who confirms with the signature and seal of the company that the internship has been completed, the student is awarded 3 ECTS credits for the completed professional internship.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures		Written exam	
Exercises	70	Oral exam	30

Colloquia			
Projects			

Specification for the book of courses

Study program	Electron Devices and Microsystems		
Type and level of studies	Master Academic Studies		
The name of the course	Master Thesis – Study and Research Work		
Lecturer (for lectures)			
Lecturer/associate (for exercises)			
Lecturer/associate (for OFE)			
Number of ECTS	6	**Course status (obligatory/elective)**	Obligatory

Prerequisites	
Course objectives	Application of fundamental, theoretical-methodological, scientific-professional, and professionally applied knowledge and methods to solving specific problems. The student examines the problem, its structure and complexity, and draws conclusions about possible approaches to its solution based on the analyses performed. By reviewing the relevant literature, the student becomes familiar with methods used to solve similar problems and with established engineering practices in this field.
Course outcomes	Enabling students to independently apply previously acquired knowledge from various fields of study in order to understand the structure of a given problem and perform its systematic analysis, with the aim of drawing conclusions about possible approaches to its solution. Through independent use of relevant literature, students broaden their knowledge by studying different methods and research papers addressing similar problems. In this way, they develop the ability to conduct analyses and identify problems within the given field. By applying the acquired knowledge in practice, students develop an understanding of the role and position of engineers in the selected field, as well as the need for cooperation with other professions and for teamwork.
Course outline	
Theoretical teaching	The content is defined individually in accordance with the requirements, complexity, and structure of the specific Master's Thesis. Based on their interests and preferences, students select the field of study and a supervisor from the list of instructors involved in the study programme, who then defines the specific assignment. Students review professional literature and relevant scientific and technical papers addressing similar topics, conduct analyses to identify an appropriate solution to the given problem, or perform experiments in a laboratory. The study work also includes actively following current primary research findings, organising and conducting experiments, performing numerical simulations and statistical data analysis, and preparing a seminar paper in the specific scientific and academic field to which the topic of the independent research belongs.
Practical teaching (exercises, OFE, study and research work)	
Textbooks/references	
1	University of Niš, Faculty of Electronic Engineering, Guidelines and Template for the Preparation of Final, Diploma and Master's Theses, Niš, available at: https://sip.elfak.ni.ac.rs/downloads/obrasci/forma-diplomski-rad.pdf
2	T. M. Young, Technical Writing A-Z: A Commonsense Guide to Engineering Reports and Theses, ASME Press, New York, 2005, ISBN 978-0-7918-0236-6.
3	E. J. Rothwell and M. J. Cloud, Engineering Writing by Design: Creating Formal Documents of Lasting Value, CRC Press, 2017, ISBN 9781482234329.
4	H. El Chaarani and Z. El Abiad, How to Write a Master Thesis: The Easy Handbook Guide, New Edition, Journal of Contemporary Research in Business Administration and Economic Sciences, 2021.
5	

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
			12	

Teaching methods	Mentoring and individual consultations.		
Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	
Exercises		**Oral exam**	50
Colloquia			
Projects	50		

Specification for the book of courses

Study program			Electron Devices and Microsystems	
Type and level of studies			Master Academic Studies	
The name of the course			Master Thesis	
Lecturer (for lectures)				
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		11	**Course status (obligatory/elective)**	Obligatory
Prerequisites				
Course objectives	The preparation of the Master’s Thesis aims to integrate, validate, and practically apply the knowledge acquired during the Master’s academic studies. Students are provided with an opportunity to demonstrate their ability to independently carry out a project of a practical, research-oriented, or theoretical and methodological nature. They also gain experience in presenting their work in written form and through an oral presentation during the thesis defence.			
Course outcomes	Ability to independently manage a project, formulate and analyse problems, critically evaluate possible solutions, and review the relevant literature. Application of acquired engineering and design knowledge and skills to problem solving, taking into account the complexity, cost, reliability, and efficiency of the proposed solutions. Ability to prepare a written thesis in the prescribed format and to clearly present and explain the completed project during the oral thesis defence.			
Course outline				
Theoretical teaching	The Master’s Thesis is an independent research, practical, or theoretical-methodological work appropriate to the level of study. Through its preparation, the student becomes familiar with a specific field by reviewing the relevant literature and adopts the research or design methodology required for completing the thesis. The student applies the practical and theoretical knowledge acquired during the course of study. As a rule, the written thesis includes an introductory chapter, a definition of the problem, an overview of the field and existing solutions, a proposal and description of the developed solution, a conclusion, and references. The public oral defence is conducted before a three-member committee, one of whom is the thesis supervisor. During the defence, the candidate presents and explains the results of the work and then answers questions posed by the committee members, thereby demonstrating the ability to present the project orally.			
Practical teaching (exercises, OFE, study and research work)				
Textbooks/references				
1	University of Niš, Faculty of Electronic Engineering, Guidelines and Template for the Preparation of Final, Diploma and Master’s Theses, Niš, available at: https://sip.elfak.ni.ac.rs/downloads/obrasci/forma-diplomski-rad.pdf			
2	T. M. Young, Technical Writing A-Z: A Commonsense Guide to Engineering Reports and Theses, ASME Press, New York, 2005, ISBN 978-0-7918-0236-6.			
3	E. J. Rothwell and M. J. Cloud, Engineering Writing by Design: Creating Formal Documents of Lasting Value, CRC Press, 2017, ISBN 9781482234329.			
4	H. El Chaarani and Z. El Abiad, How to Write a Master Thesis: The Easy Handbook Guide, New Edition, Journal of Contemporary Research in Business Administration and Economic Sciences, 2021.			
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
				2
Teaching methods				
Grade (maximum number of points 100)				

Pre-exam duties	Points	Final exam	Points
Activity during lectures		Written exam	70
Exercises		Oral exam	30
Colloquia			
Projects			