

Розроблено в рамках проекту "Erasmus+ (CBHE) BioArt "Інноваційна мультидисциплінарна освітня програма зі штучних імплантів для біоінженерії для бакалаврів та магістрів"

Developed in the frame of project "Erasmus+ (CBHE) BioArt "Innovative Multidisciplinary Curriculum in Artificial Implants for Bio-Engineering BSc / MSc Degrees" (586114-EPP- 1-2017- 1-ES- EPPKA2-CBHE- JP).

DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code Date (Month / Year)	VNTU / UA Sep 2019
TITLE OF THE MODULE	Code
Synthesis of digital circuits and devices (discipline - Electronics. Digital circuit engineering)	

Teacher(s)	Department
Coordinating: As. Prof. Leonid Koval, Ph.D. Others:	Dep. for Biomedical Engineering

Study cycle (BA/MA)	Level of the module (Semester number)	Type of the module (compulsary/elective)
Bachelor	5 th (third year) for Bachelor	Compulsory

Form of delivery (theory/lab/exercises)	Duration (weeks/months)	Language(s)
Lectures, exercises, laboratory study	9 weeks / 2 months	Ukrainian, English

Prerequisites	
Prerequisites: Knowledge: basic knowledge of electronics, analog circuit engineering Skills: none Competences: none	Co-requisites (if necessary): none

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
3	90	36	54
Aim of the module (course unit): competences foreseen by the study programme			
Students should be able to: - to study and apply new methods and tools of analysis, modeling, design and optimization of medical devices and systems. - to apply physical, chemical, biological and mathematical methods in the analysis, modeling of functioning of medical digital devices and systems - to conduct research and observations on the interaction of biological, natural and artificial systems (prostheses, artificial organs, etc.).			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
Knowledge: Producers gain extensive knowledge of the design and application of devices and systems using digital circuits.	Slides, lecture notes, suggested books and literature, personal reports, written papers	Written/oral exam, essays	
Skills: Analyze, develop and apply elements of digital circuits in devices and systems.	Lectures, working groups, individual work	Exercise and lab reports	
Competences: Perform critical literature research on the subject, use the knowledge in practice, exchange notions, present the results	Working groups	Exercise reports and presentations	

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
Synthesis of circuits on logic elements under given conditions.	3						3	4	To study and understand the methods of simplifying DDNF and SCNF functions; calculation of logic circuits. Calculation of control scheme.
Combination type devices.	3						3	4	To study and understand the structure and properties of combination devices; the principle of construction of an integrated linear decoder; the principle of construction of an integrated pyramidal decoder; principle of construction of an integral cipher.
The principle of construction of an integral multiplexer.	3						3	4	To study and understand the principle of construction of an integral demultiplexer; arithmetic logic device; four bit full adder.
Synthesis of devices of serial type	3						3	4	To study and understand the principle of construction of RS-trigger in integral execution; RST flip-flops in integrated version; Integrated T-Trigger; Integrated JK Trigger; Integrated D-Trigger.
The principle of construction of integral registers	3						3	4	To study and understand the principle of construction for circuits: parallel register on clocked D-triggers; serial register on clocked D-triggers; principle of operation of the universal register.
Integrated counters and storage devices	3						3	4	To study and understand the principle of construction for circuits: binary counter; diagram of functioning; ring counter from shift register; digital pulse generators; fast storage devices; persistent storage.
Practical work				2 2 3 3			10		Creating a Dynamic Digital Circuit Model with Altium. Trigger synthesis technique. Practical schemes for the conversion of triggers. ADC performance calculation Calculation of pulse generators.
Laboratory work					2 2 2 2		8		Trigger research. Research of counters. Exploration of decoder. Encryption studies.
Course project								30	
Final exam									
Total	18			10	8		36	54	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Practical works attendance and exercise reports	15		Attendance and reports
Laboratory study and lab report	20		Attendance and reports
Colloquium (theory control)	20		Test
Individual tasks	20		Essays and presentations
Final exam	25		Written/oral exam

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
Maini, Anil K.	2007	Digital electronics: principles, devices and applications	ISBN: 978-0-470-03214-5	John Wiley & Sons
Ndjountche, Tertulien	2016	Digital Electronics 1: Combinational Logic Circuits	Vol. 1. ISBN: 978-1-848-21984-7	John Wiley & Sons
Ndjountche, Tertulien	2016	Digital Electronics 2: Sequential and Arithmetic Logic Circuits	Vol. 2. ISBN: 978-1-848-21985-4	John Wiley & Sons
Ndjountche, Tertulien	2016	Digital Electronics 3: Finite-state Machines	Vol. 3. ISBN: 978-1-848-21986-1	John Wiley & Sons
Birtwistle, Graham, and Alan Davis, (eds)	2013	Asynchronous digital circuit design	ISBN 978-1-4471-3575-3	Springer Science & Business Media

Лебедев О.М., Ладик О.І.	2005	Цифрова схемотехніка: Навчальний посібник	ISBN 966- 8458-77-X	К.: Арістей
Additional literature				
Бойко В.И. и др.	2004	Схемотехника электронных систем. Цифровые устройства		СПб.: БХВ-Петербург
Tooley, Mike	2019	Electronic circuits: fundamentals and applications	https://doi.org/10.1201/9780367822651	Routledge
За ред. В.І. Сенька	2008	Електроніка і мікросхемотехніка: У 4-х т. Том 3. Цифрові пристрої:	ISBN 978- 966-96076-7- 6	К.: Каравела

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