



University of Zagreb
Faculty of Graphic Arts



University of Zagreb Faculty of Graphic Arts

Information package

Undergraduate university study programme *Graphic technology*

BASIC INFORMATION ABOUT THE STUDY PROGRAMME

Name, address, and OIB of the higher education institution:

University of Zagreb Faculty of Graphic Arts, Getaldićeva 2, Zagreb, OIB: 25564990903

Name and type of study: Undergraduate university study programme *Graphic technology*

HKO/EQF/QF-EHEA level: HKO - Level 6.sv / EQF – Level 6 / First cycle

Scientific or artistic field of study:

Area: 2. Technical Sciences, Field: 2.06. Graphic Technology (according to the Regulation on Scientific and Interdisciplinary Fields, Areas, and Branches, as well as Artistic Fields, Areas, and Branches)

According to ISCED FoET classification: 071 – Engineering and engineering trades

Duration of study: 6 semesters (3 years)

Number of ECTS credits earned upon completion of the study: 180

Academic or professional title, i.e., academic degree: University Bachelor (baccalaureus/baccalaurea) Engineer in Graphic Technology

Language of instruction: Croatian

Place of instruction: Zagreb

Mode of instruction: classical

Enrollment quota: 85 full-time students

Academic year in which the study starts: 2025/2026.

ENROLLMENT QUOTAS

For the Undergraduate university study programme *Graphic technology*, the [enrollment quotas](#) are the same as those of the existing program, Undergraduate University Study of Graphic Technology, technical-technological specialization (which will be replaced by the new program). This means that an enrollment quota of 85 full-time students is proposed.

ADMISSION REQUIREMENTS, CONDITIONS FOR ENROLLMENT IN THE NEXT SEMESTER, TRIMESTER, OR ACADEMIC YEAR, AND CONDITIONS FOR OTHER ACADEMIC OBLIGATIONS

Admission requirements are regulated by the [Study Regulations](#). Enrollment in the undergraduate university study and the graduate university study of the University of Zagreb, Faculty of Graphic Arts, is conducted based on a [public competition](#) announced by the Senate. The content of the competition for admission to the undergraduate university study and graduate university study of the University of Zagreb, Faculty of Graphic Arts, is prescribed by the University's Statute. The competition for admission to the undergraduate university study of the University of Zagreb Faculty of Graphic Arts, is published on the [Faculty's website](#) and as part of the special section of the public competition announced by the Senate in paragraph 1 of this article on the University's website.

Eligibility for applying to the competition for admission to the undergraduate university study of the University of Zagreb, Faculty of Graphic Arts, is granted to:

- Candidates who have completed, or will complete by the application deadline, at least a four-year secondary education program and pass the state high school graduation
- Candidates without a passed state high school graduation, if they completed an appropriate four-year secondary education program in the Republic of Croatia before 2010
- Candidates who have completed an equivalent education abroad lasting 12 years, or the equivalent of level 4.2 of the Croatian Qualification Framework, in accordance with the admission conditions and criteria established by the competition.

The selection of candidates for admission to the undergraduate university study and graduate university study of the University of Zagreb, Faculty of Graphic Arts, is conducted through a selection process.

Ranking lists of applicants for admission to the study program are compiled according to the following scoring system:

a) Based on secondary school success – up to 300 points

b) Based on the results of state high school graduation exams:

➤ Croatian language (B level) – up to 100 points

➤ Mathematics (B level, minimum score of 45.00%) – up to 300 points

- Foreign language (B level) – up to 100 points
- Informatics or Chemistry or Physics* – up to 100 points

**The candidate is not required to pass any of the three mentioned subjects. Passing these subjects earns additional points. The best result will be evaluated with 100 points, the second with 50 points, and the third with 50 points.*

c) Based on an additional assessment of special abilities:

- Written motivation test (Motivational letter) ** – up to 100 points

d) Based on competition results:

- Winning one of the top three places in state or international competitions in:

Discipline	Evaluation
Physics	1000 points – direct enrollment
Graphic technology and design	1000 points – direct enrollment
Informatics	1000 points – direct enrollment
Chemistry	1000 points – direct enrollment
Mathematics	1000 points – direct enrollment
Multimedia	1000 points – direct enrollment
EGMO (European Girls Mathematical Olympiad)	1000 points – direct enrollment
(CMC) Cyberspace Mathematical Competition	1000 points – direct enrollment
(RMM) Romanian Master of Mathematics	1000 points – direct enrollment

- Placement in a national competition in Informatics, Chemistry, Physics, Mathematics, or Graphic Technology and Design or Multimedia – 50 points

e) Based on additional student achievements:

- Passed second elective subject in the state matura (excluding Informatics, Chemistry, and Physics) – up to 50 points

f) Athlete category:

➤ Gifted, top, and excellent athletes (athletes of Croatian categories I to VI according to the Croatian Olympic Committee's Regulations on Athlete Categorization)

From	To	Evaluation
I	IV	100
V	VI	50

Applications for admission to the study program 1 are submitted online through NISpVU – the National Information System for Applications to Higher Education Institutions:
www.postani-student.hr

ENROLLMENT IN THE NEXT STUDY YEAR

By enrolling in the academic year, the student regulates their status. A student acquires the right to enroll in the next study year after fulfilling the study obligations expressed in ECTS credits, in accordance with the [general regulations of the Faculty](#). Study obligations are enrolled semester-wise (or for the entire year if provided by the study plan and program). A student can only enroll in courses for which they have met the prerequisites according to the study program and the study execution plan. A student who has not completed all study obligations in the previous academic year, upon enrolling in the new academic year, enrolls in the study obligations they did not complete in the previous year, as well as new obligations from the next study year if the conditions for enrolling in courses have been met.

HORIZONTAL MOBILITY

Based on Article 16 of the Regulations on Studying at the University Undergraduate and University Graduate Study Programs of the University of Zagreb, Faculty of Graphic Arts, a specific procedure has been established for implementing horizontal mobility.

OUTGOING HORIZONTAL MOBILITY

Upon submission of a request to the Office for Students and Studies, a student may be granted approval to attend and take examinations in courses at another higher education institution within the University of Zagreb (horizontal mobility). Along with the request, the student is required to submit a confirmation of approval for attending and taking the course at the other institution. The [request](#) and/or confirmation must include the following details: course title, ECTS credits, course instructor, number of hours per type of instruction, and the course title in English. The course for which the student has been approved to attend and

take exams at another higher education institution within the University of Zagreb is recorded in the Faculty of Graphic Arts' information system. The completed exam is officially recognized upon submission of an authenticated transcript of records from the other institution or an official certificate confirming the passed exam.

ECTS credits earned in this manner are recognized as if they were obtained within the student's home study program and are recorded in the diploma supplement. The credit value of the course corresponds to the value assigned to it in the study program in which it is conducted.

INCOMING HORIZONTAL MOBILITY

A student from another higher education institution within the University of Zagreb may, upon submission of a request to the Office for Students and Studies of the Faculty of Graphic Arts, and with the consent of the course instructor, be granted approval to attend and take examinations in university undergraduate or university graduate study courses at the Faculty of Graphic Arts, University of Zagreb. The Office for Students and Studies will issue documentation confirming the course title and determining its credit value (number of ECTS credits).

VERTICAL MOBILITY

Based on an analysis of the comparability of the Undergraduate university study programme *Graphic technology* with programs of accredited higher education institutions in the Republic of Croatia and the European Union, significant opportunities for establishing vertical mobility for students of the Faculty of Graphic Arts can be identified.

The expected learning outcomes of the study program fully align with the requirements of Level 6. sv of the CROQF and level 6 of EQF, ensuring the recognition of acquired competencies in a broader European context. The program encompasses theoretical knowledge, practical and technical skills, as well as professional and entrepreneurial competencies, providing a foundation for further academic and professional advancement. Vertical mobility within the Faculty of Graphic Arts enables students to transition from undergraduate to graduate study, as well as from graduate to doctoral levels. Students who complete the undergraduate university study programme *Graphic technology* can continue their education at the graduate level, where their acquired competencies are further enhanced through specialized courses and research work. Upon approval of the new Undergraduate university study programme *Graphic technology*, the Faculty of Graphic Arts, University of Zagreb, will initiate the initial accreditation process for the new graduate university study programme *Graphic technology*. This will allow students to continue their education, deepen their expertise, and develop competencies in the field of graphic technology, ensuring continuity of education and adaptation to contemporary labor market demands.

After completing the graduate program, students have the opportunity to enroll in doctoral studies, where they focus on scientific research in the graphic industry. Vertical mobility

enables seamless academic progression, while the program structure ensures that students, at each level of education, acquire deeper theoretical insights, develop research skills, and enhance their professional competencies in the field of graphic technology and design.

Given the above, there is a clear potential for further development of vertical mobility through the formalization of cooperation with selected European institutions, the creation of additional opportunities for continuing education at graduate and postgraduate levels, and the adaptation of programs to ensure easier recognition of previously acquired knowledge and competencies.

COMPLETION OF STUDIES

The undergraduate university program at the University of Zagreb Faculty of Graphic Arts, is completed by passing all exams, fulfilling other study obligations, and completing and defending the final thesis.

The Rules on the Final and Graduate Thesis of the University of Zagreb Faculty of Graphic Arts, will further regulate all matters related to the final or graduate thesis, such as the topic submission, the creation and formatting of the final or graduate thesis, evaluation of the final or graduate thesis, the defense procedure, rules on dealing with copyrighted works, and rules regarding the handling of industrial property rights and their utilization. The Rules on the Final and Graduate Thesis will be publicly available on the Faculty's website.

The Faculty is obliged to make the student's final/graduate thesis publicly available through an appropriate public online database of the Faculty's library and the public database of final/graduate theses of the National and University Library.

STRUCTURE OF THE UNDERGRADUATE UNIVERSITY STUDY PROGRAMME

GRAPHIC TECHNOLOGY

The structure of the Undergraduate university study programme *Graphic technology*, as shown in Table 1, includes the following: study year and semester, course name and status, course holder, forms of teaching, and ECTS credits.

The proposed study program consists of compulsory and elective courses. Compulsory courses ensure the achievement of key learning outcomes necessary for the successful completion of the study. In addition, students have the opportunity to choose a certain number of ECTS credits from the elective course offerings, allowing them to tailor the program to their interests and goals. In the first semester, students enroll in 26 compulsory ECTS credits, while the remaining 4 ECTS credits are chosen from the group of elective courses. In the second semester, students enroll in 27 compulsory ECTS credits, while the remaining 3 ECTS credits come from elective courses. In the third semester, students take 24 compulsory ECTS credits

and the remaining 6 ECTS credits from elective courses. In the fourth semester, students enroll in 24 compulsory ECTS credits and the remaining 6 ECTS credits as elective courses. In the fifth semester, students take 22 compulsory ECTS credits and the remaining 8 ECTS credits as electives. In the sixth semester, students enroll in 25 compulsory ECTS credits, while the remaining 5 ECTS credits come from elective courses. A full-time student studies within the framework of a full teaching schedule. Typically, a full-time student enrolls in 60 ECTS credits per academic year, in accordance with the study plan.

Table 1. The structure of the Undergraduate university study programme *Graphic technology*

LIST OF COURSES						
Study year: 1.						
Semester: 1.						
COURSE	TEACHER	L	E	S	ECTS	STATUS ¹
Mathematics 1	Ivan Budimir	2	2	0	5	C
Introduction to graphic technology	Suzana Pasanec Preprotić, Igor Zjakić, Maja Strgar Kurečić	2	0	0	3	C
Engineering graphics	Dubravko Banić	1	1	1	4	C
Digital multimedia	Klaudio Pap, Maja Rudolf	2	2	0	4	C
Presentation of information	Nikola Mrvac, Martina Hajdek	2	0	2	4	C
Physical education and health I	Katarina Knjaz	0	2	0	1	C
Laboratory methods in graphic technology	Željka Barbarić-Mikočević, Ivana Plazonić	2	2	0	5	C
LIST OF ELECTIVE COURSES OF THE FIRST SEMESTER						
Fundamental principles of graphic design	Filip Cvitić	1	0	1	2	E
English for graphic engineers	Ana Nemec	1	0	2	2	E
German for graphic engineers	Ana Nemec	1	0	2	2	E

LIST OF COURSES						
Study year: 1.						
Semester: 2.						
COURSE	TEACHER	L	E	S	ECTS	STATUS
Mathematics 2	Ivan Budimir	2	2	0	5	C
Technical representation systems	Dubravko Banić	2	1	0	4	C

¹ **Note:** If the course is compulsory, it is denoted as C, but if it is elective it is denoted as E.

Fundamentals of computing and programming	Tibor Skala, Marko Maričević	2	2	0	5	C
Structuring of print media	Nikola Mrvac	2	2	0	4	C
Physical education and health II	Katarina Knjaz	0	2	0	1	C
Mechanics and wave phenomena	Katarina Itrić Ivanda	2	2	0	5	C
Structural properties of organic compounds	Željka Barbarić-Mikočević, Ivana Plazonić	2	0	0	3	C
LIST OF ELECTIVE COURSES OF THE SECOND SEMESTER						
Art in visual media	Vanda Jurković	1	0	1	3	E
Cellulose fibres preparation technologies	Ivana Plazonić	2	0	0	3	E
Colors, tones and perception	Mile Matijević	2	0	1	3	E

LIST OF COURSES						
Study year: 2.						
Semester: 3.						
COURSE	TEACHER	L	E	S	ECTS	STATUS
Probability and statistics	Ivan Budimir	2	1	0	4	C
Machines in postpress processes	Davor Donevski	2	0	1	4	C
Graphic prepress	Lidija Mandić, Maja Strgar Kurečić	2	2	0	4	C
Interaction of graphic materials	Marina Vukoje	2	0	1	3	C
Fibrous printing substrates	Branka Lozo, Maja Stržić Jakovljević	2	2	0	4	C
Physical education and health III	Katarina Knjaz	0	2	0	1	C
Properties and transfer of image on printing plates	Sanja Mahović Poljaček, Tomislav Cigula, Tamara Tomašegović	2	2	0	4	C
LIST OF ELECTIVE COURSES OF THE THIRD SEMESTER						
Communication science	Daria Mustić	2	1	0	3	E
Biological factors in graphic technology	Marina Vukoje	2	1	0	3	E
Fundamentals of 3D modeling	Lidija Mandić	2	2	0	4	E
Codes in packaging	Denis Jurečić	1	2	0	3	E

LIST OF COURSES						
Study year: 2.						
Semester: 4.						
COURSE	TEACHER	L	E	S	ECTS	STATUS

Typography	Ivana Žiljak Stanimirović	2	2	0	4	C
Main printing techniques	Igor Zjakić	2	2	0	4	C
Packaging	Denis Jurečić	2	2	0	4	C
Fundamentals of colorimetry	Rahela Kulčar	2	1	0	4	C
Color management	Lidija Mandić	2	0	1	3	C
Printing inks	Sonja Jamnicki Hanzer	2	1	0	4	C
Physical education and health IV	Katarina Knjaz	0	2	0	1	C
LIST OF ELECTIVE COURSES OF THE FOURTH SEMESTER						
Imposition of selected graphic products	Tamara Tomašegović	1	2	0	3	E
Packaging design	Ivana Žiljak Stanimirović	2	2	0	4	E
Book prototype design	Suzana Pasanec Preprotić	1	2	0	3	E
Fundamentals of photography	Miroslav Mikota	2	1	1	4	E
LIST OF COURSES						
Study year: 3.						
Semester: 5.						
COURSE	TEACHER	L	E	S	ECTS	STATUS
Graphic programming languages	Klaudio Pap	2	1	0	3	C
Fundamentals of entrepreneurship	Zoran Najdanović	2	0	1	3	C
Maintenance of graphic machines	Dubravko Banić	1	0	2	3	C
Sustainability in graphic technology	Ivana Bolanča Mirković	2	1	0	3	C
Fundamentals of digital printing	Igor Majnarić	2	2	0	4	C
Publishing	Mile Matijević	2	1	0	3	C
Engineering of paperboard products	Josip Bota	1	2	0	3	C
LIST OF ELECTIVE COURSES OF THE FIFTH SEMESTER						
Polymeric graphic materials	Sonja Jamnicki Hanzer	2	0	1	3	E
Introduction to regulations and standards	Irena Bates	2	0	1	3	E
Creative techniques in graphic reproduction	Sanja Mahović Poljaček	1	2	0	3	E
Box making techniques	Suzana Pasanec Preprotić	1	2	0	3	E
Digital image processing	Vladimir Cviljušac	1	2	0	3	E
Physical education and health V	Katarina Knjaz	0	2	0	1	E

LIST OF COURSES						
Study year: 3.						
Semester: 6.						
COURSE	TEACHER	L	E	S	ECTS	STATUS
Intellectual property	Petar Mišević	2	0	1	3	C
Quality control	Diana Milčić	2	1	0	3	C
Printing of labels and marks	Irena Bates	2	2	0	3	C
Special effects in printing	Igor Majnarić	2	2	0	4	C
Packaging technologies	Davor Donevski	2	2	0	4	C
Bookbinding	Suzana Pasanec Preprotić	2	2	0	4	C
Final project		0	2	0	2	C
Professional practice		0	2	0	2	C
LIST OF ELECTIVE COURSES OF THE SIXTH SEMESTER						
Project planning in graphic technology	Diana Milčić, Tomislav Cigula	1	0	2	3	E
Product sustainability and recycling	Ivana Bolanča Mirković	2	1	0	3	E
Additive manufacturing techniques	Marko Maričević	2	1	0	3	E
Restoration of paper	Branka Lozo, Maja Strižić Jakovljević	2	0	1	3	E
Quality control in colour printing	Igor Zjakić	1	0	1	3	E

COMPETENCIES ACQUIRED UPON COMPLETION OF STUDIES

A University Bachelor (baccalaureus/baccalaurea) Engineer in Graphic Technology is a highly educated professional responsible for creatively designing, developing, and managing production processes in the graphic industry. Their role encompasses planning maintenance costs of equipment, managing inventory of raw materials, and testing and analyzing graphic materials. They also apply principles of ecological sustainability, ensure compliance with standards and regulations, and keep up with new technologies and trends in the industry. The engineer communicates effectively with colleagues, clients, and suppliers, utilizing various presentation techniques. They are skilled in working in teams, where they contribute to collective solutions. Additionally, the graphic technology engineer is responsible for preparing and executing work orders, as well as managing procurement and sales processes for graphic raw materials and products. Moreover, they plan costs, conduct calculations, and engage in other tasks characteristic of the publishing industry. Given the growing demands for knowledge of new technological standards in production and the focus on specialized and non-standard products and materials, a graphic technology engineer must possess a high level of technical literacy and competencies.

Table 2. Matrix of alignment of learning outcome sets (OSIU) from qualification standards with the learning outcomes of the study program.

– It is filled out only if there is a qualification standard in the Register of the Croatian Qualifications Framework

Mandatory sets of learning outcomes (OSIU)	OSIU 1	OSIU 2	OSIU 3	OSIU 4	OSIU 5	OSIU 6	OSIU 7	OSIU 8	OSIU 9	OSIU 10	OSIU 11	OSIU 12	OSIU 13	OSIU 14	OSIU 15	OSIU 16
Learning outcomes of the study program	3	3	3	4	4	2	3	3	3	3	3	3	4	6	5	3
LO 1	+	+		+	+											
LO 2							+									
LO 3								+								
LO 4									+							
LO 5			+													
LO 6				+	+											
LO 7										+	+			+		
LO 8										+			+			
LO 9								+						+		
LO 10						+						+	+	+	+	
LO 11							+							+		+
LO 12									+							
LO 13				+						+	+				+	
LO 14	+	+			+	+	+		+				+		+	+
LO 15			+													
LO 16												+				
LO 17														+		+
LO 18															+	
LO 19			+											+	+	
LO 20	+	+		+	+			+			+	+	+			

Table 2. Learning outcomes at the program level. *From this table, the committee assesses whether the learning outcomes are of the appropriate level and profile, whether both generic and specific competencies are included, and whether the learning outcomes of the program and courses are aligned (standards 1.2, 1.3, 1.4).*

Learning outcomes of the study program	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13	LO 14	LO 15	LO 16	LO 17	LO 18	LO 19	LO 20
Total number of courses for a specific learning outcome	16	21	4	5	12	8	13	7	10	8	6	10	5	15	7	5	8	8	8	10
Mathematics 1	+		+																	
Introduction to Graphic Technology		+			+			+		+				+			+			
Engineering graphics	+	+		+								+								
Digital multimedia			+						+										+	
Presentation of information					+				+	+		+		+				+	+	+
Laboratory methods in graphic technology	+					+	+					+								
Mathematics 2	+																+			
Technical representation systems				+								+	+							+
Fundamentals of computing and programming			+						+											
Structuring of print media							+	+	+	+	+	+	+	+	+		+	+	+	+
Mechanics and wave phenomena	+	+			+	+														
Structural properties of organic compounds	+	+											+							
Probability and statistics	+													+						
Machines in postpress processes		+			+						+					+				
Graphic prepress							+	+	+			+					+			
Interaction of graphic materials	+	+			+						+		+							
Fibrous printing substrates		+				+	+						+	+		+		+		+
Properties and transfer of image on printing plates	+	+					+	+	+					+						
Typography		+		+		+			+											

Main printing techniques		+										+		+		+		+		
Packaging	+	+		+		+	+				+				+			+		+
Fundamentals of colorimetry		+			+	+								+	+					
Color management		+			+									+						
Printing inks	+	+				+	+			+				+				+		
Graphic programming languages	+		+						+			+								
Fundamentals of entrepreneurship																	+		+	
Maintenance of graphic machines	+	+			+											+		+		
Sustainability in graphic technology	+	+				+									+			+		+
Fundamentals of digital printing		+					+	+		+				+						
Publishing		+			+				+	+				+	+				+	
Engineering of paperboard products	+			+	+		+		+		+	+								
Intellectual property															+		+		+	
Quality control	+							+	+			+		+	+		+		+	
Printing of labels and marks		+			+		+	+		+				+						+
Special effects in printing		+					+	+		+				+		+				+
Packaging technologies		+			+							+								+
Bookbinding							+				+						+	+	+	+

Learning outcomes – legend

Learning outcome label	Description of learning outcomes
LO 1	Apply fundamental knowledge from natural and technical sciences to solve engineering problems in graphic technology
LO 2	Explain the basic principles of graphic technology and their applications in the industry
LO 3	Develop simple applications using programming languages relevant to graphic technology
LO 4	Create technical drawings using relevant graphic tools
LO 5	Effectively communicate technical information and project results using various presentation techniques
LO 6	Apply laboratory skills to conduct experiments and analyses in the field of graphic technology
LO 7	Select appropriate graphic materials based on analyzed needs
LO 8	Recommend printing forms for the purpose of preparing for printing
LO 9	Apply appropriate computer tools for processing digital content in the graphic preparation process
LO 10	Analyze printing techniques with the aim of selecting the appropriate one for specific needs
LO 11	Recommend appropriate finishing processes
LO 12	Develop simple graphic products using relevant technologies
LO 13	Apply simple methods for improving and protecting printed surfaces, materials, and graphic products
LO 14	Ensure the quality of graphic products
LO 15	Communicate with clients regarding orders based on specific requirements
LO 16	Plan the maintenance of printing and packaging machines
LO 17	Evaluate the economic aspects of graphic technology
LO 18	Demonstrate the ecological sustainability of various processes and materials in accordance with legal regulations in graphic technology
LO 19	Apply ethical principles in a professional context
LO 20	Identify personal needs for continuous learning using appropriate resources

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Dubravko Banić, PhD	
Course title	Engineering graphics	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	1+1+1

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to equip students with the skills to apply technical standards and methods of representation in technical drawing, with a focus on orthogonal projections and various types of axonometric projections. Students will master basic technical concepts and rules necessary for accurately representing objects through sections, detail drawings, and dimensioning. By analyzing simple and complex shapes, students will develop the ability to visualize symmetry, dimensioning, and view simplification. By the end of the course, they will be able to produce technical drawings that meet professional standards and the requirements of technical documentation.</i>
1.2. Enrollment conditions
No enrollment conditions
1.3. Expected learning outcomes
1. Analyze technical drawings/sketches. 2. Apply technical standards and basic concepts in technical representation. 3. Perform accurate dimensioning on technical drawings in accordance with standards. 4. Apply the fundamental rules of orthogonal projection for simple shapes. 5. Utilize axonometric projections, including isometric, dimetric, and oblique projections.
1.4. Course content
1. Standards, scales, and basic technical concepts required for technical representation. 2. Defining and visualizing the symmetry of various shapes. 3. Representing objects through sections. 4. Simplified views and detailed drawing. 5. Dimensioning. 6. Basic rules of orthogonal projection. 7. Orthogonal projection of simple shapes. 8. Orthogonal projection of complex shapes. 9. Introduction to axonometry. 10. Isometry.

11. Dimetry.							
12. Oblique projection.							
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Successfully completed exercises: 90%							
Accepted project assignments and seminar attendance: 90%							
Class attendance: 70%							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation:							
Exercise tasks: 10%							
Project assignments in seminars: 25%							
Class attendance: 5%							
Midterm exam 1: 30%							
Midterm exam 2: 30%							
Or final written exam at the end of the semester: 60%							
Assessment:							
1. Analyze technical drawings/sketches.							
2. During exercises, students will apply technical standards and basic concepts in technical representation.							
3. In exercises and project assignments during seminars, students will perform accurate dimensioning on technical drawings according to standards.							
4. In exercises and project assignments during seminars, students will apply basic rules of orthogonal projection for simple shapes.							
5. In the written exam and/or midterm, students will apply knowledge of axonometric projection, including isometric, dimetric, and oblique projections.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Tehcnical drawing / Milan Opalić, Milan Kljajin, Slavko Sebastijanović. Čakovec : Zrinski, 2003.</i>	10	
<i>Technical Drawing in Images with Computer Applications / Ćiril Koludrović, Irena Koludrović-Harbić, Rudolf Koludrović. Rijeka : Autorska naklada Koludrović Ć.I.R., 1994.</i>	10	
<i>Technical Drawing: A Handbook for the Metalworking Profession / Branko Kovač. Zagreb : Školska knjiga,, 1970.</i>	2	
<i>1.10. Supplementary literature</i>		
<i>1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Dubravko Banić, PhD	
Course title	Maintenance of graphic arts machinery	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+0+2

COURSE DESCRIPTION
<i>1.1. Course objectives</i>
<i>The objectives of the course are centered on developing a theoretical understanding and foundational knowledge of printing machine maintenance. Through case study analyses, students will explore specialized maintenance methods and become familiar with the theory behind maintaining electronic, hydraulic, and pneumatic systems. Additionally, they will learn to identify technological components within graphic production, which will assist in selecting the most effective maintenance model. The course will also highlight the role of automation, performance optimization, and the importance of environmentally sustainable practices in the maintenance of printing machines.</i>

1.2. Enrollment conditions							
Successfully completed the course 'Major Printing Techniques.							
1.3. Expected learning outcomes							
1. Explain the fundamental concepts and theories of printing machine maintenance. 2. Analyze specialized methods for the maintenance of printing machines. 3. Identify technological components in graphic production to determine the optimal maintenance model. 4. Propose a sequence of maintenance procedures for printing machines. 5. Recognize the importance of sustainability in the maintenance of printing machines.							
1.4. Course content							
1. Introduction to Graphic Arts Machinery Maintenance 2. Preventive, Predictive, and Proactive Maintenance 3. Root Cause Analysis of Failures 4. Diagnostics and Troubleshooting 5. Specialized Tools and Equipment 6. Maintenance and Diagnostics of Electronic Components 7. The Role of Automation in Maintenance 8. Maintenance of Hydraulic and Pneumatic Systems 9. Identifying Key Components in Production and Selecting the Optimal Maintenance Model 10. Calibration and Performance Optimization 11. Maintenance Management Systems 12. Sustainability in Graphic Arts Machinery Maintenance							
1.5. Types of Teaching Methods				x Lectures x Seminars and workshops ☐ Exercises x Online education ☐ Fieldwork		x Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Project assignments from seminars accepted; seminar attendance: 90% Class attendance: 70%							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: Project assignments from seminars: 30%							

<i>Class attendance: 10%</i> <i>Midterm Exam 1: 30%</i> <i>Midterm Exam 2: 30%</i> <i>Alternatively, a final written exam at the end of the semester: 60%</i> <i>Assessment:</i> <i>1. In the project assignments during seminars, students will explain the fundamental concepts and theories of graphic arts machinery maintenance.</i> <i>2. In the project assignments during seminars, students will analyze specialized methods for maintaining graphic arts machinery.</i> <i>3. In the written exam and/or midterm, students will identify technological components in graphic production to determine the optimal maintenance model.</i> <i>4. In the written exam and/or midterm, students will propose a sequence of maintenance procedures for graphic arts machinery.</i> <i>5. In the written exam and/or midterm, students will recognize the importance of sustainability in the maintenance of graphic arts machinery.</i>		
<i>1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>K. Helmut, "Handbook of Print Media Technologies and production methods", Springer, 2001.</i>	<i>1</i>	
<i>G. J. Moubray, Reliability –centered Maintenance, Butterworth-Heinemann, Oxford, 1997.</i>	<i>1</i>	
<i>Nakajima, S: TPM, Introduction to TPM, ProductivityPress, 1988.</i>	<i>1</i>	
<i>Palmer, D.,R: Planningand Controlof Maintenance Systems, JohnWiley&sons, 1998.</i>	<i>1</i>	
<i>L. R. Higin: R.K. Mobley: Maintenance Engineering Hand Book, Mc Graw Hill, Now York, 2002, sixthedition,</i>	<i>1</i>	
<i>1.10. Supplementary literature</i>		
<i>1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Dubravko Banić, PhD	
Course title	Technical Representation Systems	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
<i>1.1. Course objectives</i>
<i>The course aims to equip students with the skills to independently use technical methods and tools for representation, visualization, and documentation of technical information. Throughout the course, students will develop essential skills for accurate design and three-dimensional drawing, with a focus on computer graphics. This knowledge will enable them to apply these abilities in various stages of graphic production and multimedia design, allowing them to effectively communicate technical specifications and create visualizations tailored to the demands of graphic technology.</i>
<i>1.2. Enrollment conditions</i>
<i>No enrollment conditions</i>
<i>1.3. Expected learning outcomes</i>
1. Apply basic methods of technical representation for precise visualization and documentation of technical information. 2. Utilize computer tools for three-dimensional drawing of shapes in accordance with industry standards. 3. Design technical elements and shapes in three-dimensional space, focusing on applications in graphic production and multimedia design. 4. Analyze technical specifications to produce accurate and functional three-dimensional visualizations. 5. Adapt three-dimensional drawings to various stages of graphic production. 6. Communicate technical concepts and solutions through technical documentation and visualizations.
<i>1.4. Course content</i>
13. Fundamentals of Technical Representation 14. Methods of Representation and Their Applications in Industry 15. Techniques for Visualizing Technical Information 16. Methods for Accurate Visualization and Documentation of Technical Data 17. Computer Tools for Three-Dimensional Drawing 18. Designing Technical Elements 19. Basics of Shape Design in Three-Dimensional Space 20. Aligning Three-Dimensional Drawings with Industry Standards 21. Analyzing Technical Specifications for Creating Accurate Visualizations 22. Adapting Drawings for Graphic Production

23. Methods for Adjusting Three-Dimensional Drawings to Different Stages of Production							
24. Creating Technical Documentation and Visualizations for Communicating Concepts							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Mandatory attendance for lectures and exercises. Students complete exercises independently each week, with a review of each student's final solutions recorded through the e-learning system. Requirement for exam eligibility: a minimum attendance of 40% for lectures and 100% completion of exercises.							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	
Portfolio		Class attendance	x				
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: Exercise tasks: 40% Project assignment: 20% Class attendance: 10% Continuous knowledge assessment: 30% If a student has not participated in the continuous knowledge assessment, they will take a written exam worth 30%. Assessment: - In the exercises, students will apply basic methods of technical representation for accurate visualization and documentation of technical information. - In the exercises and project assignments, students will use computer tools for three-dimensional drawing of shapes in line with industry standards. - In the exercises and project assignments, students will design technical elements and shapes in three-dimensional space, focusing on applications in graphic production and multimedia design. - In the exercises, students will analyze technical specifications to create precise and functional three-dimensional visualizations. - Through continuous assessment or in a written exam, students will adapt three-dimensional drawings to different stages of graphic production. - Through continuous assessment or in a written exam, students will communicate technical concepts and solutions using technical documentation and visualizations.							

<i>1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Kouznetsova, Anja: 3D printing failures: how to diagnose and repair all desktop 3D printing issues</i>	<i>1</i>	
<i>Jordan, John: 3D printing</i>	<i>1</i>	
<i>Ben Redwood, Filemon Schoeffer, Brian Garret: The 3D printing handbook: technologies, design and</i>	<i>1</i>	
<i>Liza Wallach Kloski and Nick Kloski: Getting started with 3D printing: a hands-on guide to the hardware, software, and services behind the new manufacturing revolution</i>	<i>1</i>	
<i>Samuel N Bernier, Bertier Luyt, Tatiana Reinhard: Design for 3D printing: scanning, creating, editing, remixing and making in three dimensions</i>	<i>1</i>	
<i>1.10. Supplementary literature</i>		
<i>1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Željka Barbarić-Mikočević, PhD Assoc. prof. Ivana Plazonić, PhD	
Course title	Laboratory methods in graphic technology	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	5
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION

1.1. Course objectives							
Train the student to work with chemicals, laboratory ware and measuring instruments for monitoring the technological processes of the graphic industry. Classify chemicals according to chemical composition and aggregate state of matter. Prepare solutions/reagents needed for analyses. List and describe labware and laboratory equipment made of different materials and explain the purpose of their use in the laboratory. Handle measuring instruments: analytical balance, dryer, laboratory furnace, pH-meter, areometer, microscope. Qualitative and quantitative analysis of inorganic and organic components in cellulose fibrous graphic materials.							
1.2. Enrollment conditions							
-							
1.3. Expected learning outcomes							
1. Choose laboratory ware for a particular application. 2. Handle measuring instruments. 3. Calculate the mass/volume of the substance needed to prepare a solution of a defined concentration as a reagent in analyses. 4. Interpret different types of chemical reactions with appropriate chemical equations. 5. Interpret the differences in the chemical composition of cellulose based graphic materials.							
1.4. Course content							
1. Chemical nomenclature. Chemicals. Laboratory ware and measuring instruments. 2. Physical quantities and units. 3. Chemical analyses. Weighing, drying of sample and sample ignition. Substances. Mass fraction. 4. Solutions. Quantitative composition of solutions. Amount of substance and equivalence. Preparation of solutions required for technological processes. Solution dilution. 5. Density of solutions. 6. pH value of solutions. 7. Chemical reactions of neutralization. Acid and alkali strength. Hydrolysis reactions. 8. Chemical reactions and chemical equations. 9. Buffers. 10. Redox reactions. 11. Organic and inorganic components in paper. 12. Analysis of the results of laboratory tests.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork		☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Compulsory attendance of laboratory exercises.							
1.7. Student work monitoring							
Attendance		Activity in classes		Seminar paper		Experimental work	

Written exam	x	Oral exam		Essay		Research	
Project		Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: <i>Students' work during classes is evaluated by continuous knowledge assessment through 5 short colloquiums. Students who do not pass the continuous knowledge colloquiums have the opportunity to take the final written exam within the official exam deadlines. Students who are not satisfied with the grade of the written exam can take the oral exam.</i> Evaluation: <i>1. As part of the laboratory exercises, students will choose appropriate laboratory ware for certain analyses.</i> <i>2. As part of the laboratory exercises, students will apply the acquired knowledge to work with measuring instruments.</i> <i>3. In written form, at the colloquium/written exam, students will calculate the mass of a substance in a solid aggregate state/volume of a substance in a liquid aggregate state for the preparation of solutions of the desired concentration.</i> <i>4. In written form, at the colloquium/written exam, students will present a certain type of chemical reaction with chemical equations.</i> <i>5. In written form, at the colloquium/written exam, students will justify their knowledge of the different composition of paper by applying the acquired knowledge of analysis of organic and inorganic components in laboratory exercises.</i>							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Sikirica, Milan: Stehiometrija, Zagreb: Školska knjiga, 1995.		13		100			
Ivan Filipović, Stjepan Lipanović: Opća i anorganska kemija: 1. dio, Zagreb: Školska knjiga, 1991.		16		100			
Golubović, Adrijano: Tehnologija izrade i svojstva papira, Zagreb : Viša grafička škola, 1984.		13		100			
1.10. Supplementary literature							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey, self-evaluation form, etc..							

GENERAL INFORMATION		
Course leader	Assoc. prof. Irena Bates, PhD	
Course title	Introduction to regulations and standards	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION												
1.12.	Course objectives											
<i>The aim of the course is to enable students to independently understand the regulations and standards in the graphic industry. After attending this course, students will gain knowledge of standards in the field of graphic technology and will be able to anticipate the possible application of rules and regulations. Through this course, students will gain knowledge of trends, standardization and regulations in the EU and the world. Based on the guidelines received, they will have knowledge for the development and sustainability of business in the graphic industry and the necessary legislation in the field of packaging and packaging waste.</i>												
1.13.	Enrollment conditions											
1.14.	Expected learning outcomes											
<i>1. Application of regulations in the field of graphic technology. 2. Distinguishing between norms and standards in the graphic industry. 3. Apply guidelines for the development and sustainability of the company in the graphic industry. 4. Analyze the legal regulations in the field of packaging.</i>												
1.15.	Course content											
<i>1. Standards in the graphic industry 2. Standards for printing – Part 1 3. Standards for printing - Part 2 4. Standards for determining the durability of a graphic product 5. Guidelines for the development and sustainability of business within the graphic industry in accordance with legal requirements 6. Comparison of trends, standardization and regulations in the EU and the world 7. Regulation on packaging and packaging waste in the EU (guidelines for materials) 8. Regulation on packaging and packaging waste in the EU (guidelines for product design)</i>												
1.16.	Types of Teaching Methods	<table><tr><td>☒ Lectures</td><td>☒ Independent tasks</td></tr><tr><td>☒ Seminars and workshops</td><td>☐ Multimedia and network</td></tr><tr><td>☐ Exercises</td><td>☐ Laboratory</td></tr><tr><td>☒ Online education</td><td>☐ Mentorship</td></tr><tr><td></td><td>☒ Other_</td></tr></table>	☒ Lectures	☒ Independent tasks	☒ Seminars and workshops	☐ Multimedia and network	☐ Exercises	☐ Laboratory	☒ Online education	☐ Mentorship		☒ Other_
☒ Lectures	☒ Independent tasks											
☒ Seminars and workshops	☐ Multimedia and network											
☐ Exercises	☐ Laboratory											
☒ Online education	☐ Mentorship											
	☒ Other_											

				☐ Fieldwork			
1.17. Student obligations							
30% attendance at seminars and lectures is compulsory. Students complete the seminar part of the course in teamwork, which is recorded via the e-learning system. Attendance of at least 30% in the lectures and 80% in the seminars is a prerequisite for taking the examination.							
1.18. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	
Portfolio							
1.19. Assessment and evaluation of student work during classes and at the final exam.							
Project assignment/seminar paper as part of the seminar part of the course 25% Written and oral examination - 50% or as part of the continuous assessment (colloquium) Colloquium 1 – 25% Colloquium 2 – 25% Attendance in the course – 5% e-Learning – 20%							
Assessment: 1. Explain in writing the basic knowledge of the application of rules and regulations in the field of graphic technology. 2. In written form, justify knowledge of the application of norms/standards. 3. As part of the seminar part of the course and the project assignment/seminar work, students apply guidelines for the development and sustainability of graphic companies. 4. As part of the seminar part of the course and the project assignment/seminar work, students design a graphic product taking into account norms and standards.							
1.20. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
H. Kipphan: Handbook of Print Media (Springer, Berlin, 2001) ISBN 3540673261		2		2			
Handbook of environmental materials management / [edited by] Chaudhery Mustansar Hussain (New York : Springer, 2019.) ISBN 9783319736440		5		5			
1.21. Supplementary literature							
1.22. Methods for monitoring the quality of acquired knowledge, skills, and competencies							

Student survey

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. prof. Irena Bates, PhD	
Course title	Printing of labels and marks	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to enable students to independently understand the most important terms and terminology in the field of printing labels, marks and codes. Students will be able to independently choose the printing technique and printing substrate for printing labels and marks. After attending this course, students will have knowledge of trends, laws and regulations in the field of label and mark printing. Students will acquire knowledge that will enable them to compare the quality of printed labels and marks on different media.</i>
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Differentiation of key concepts and terminology in the field of label printing and marking. 2. Classification of substrates for printing labels and markings. 3. Categorize techniques for printing labels and markings. 4. Recognize trends and regulations for label and marks printing. 5. Apply methods and standards to evaluate the quality of label printing. 6. Compare the print quality of labels and marks on different media.
1.4. Course content
1. Important terms and terminology in the field of label printing and marking. 2. Laws and regulations in the field of label printing and marking. 3. Classification of substrates for printing labels and markings. 4. Trends in label and mark printing. 5. Methods and standards for evaluating the quality of label printing.

6. Methods and standards for evaluating the quality of printed marks. 7. Comparison of the quality of printed labels and marks on different media. 8. Printing and categorization of codes.								
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other_			
1.6. Student obligations								
30% attendance at exercises and lectures is compulsory. Students complete the practical part of the course in teamwork, which is recorded via the e-learning system. Attendance of at least 30% in the lectures and 80% in the exercises is a prerequisite for taking the examination.								
1.7. Student work monitoring								
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work		
Written exam	X	Oral exam	X	Essay		Research		
Project		Continuous knowledge assessment	X	Report		Practical work		
Portfolio								
1.8. Assessment and evaluation of student work during classes and at the final exam.								
Project assignment/seminar paper as part of the seminar part of the course 25% Written and oral examination - 50% or as part of the continuous assessment (colloquium) Colloquium 1 – 25% Colloquium 2 – 25% Attendance in the course - 5 e-Learning – 20% Assessment: 1. In the examination, students explain the most important terms from the field of label and mark printing 2. The students classify the substrates for label and mark printing in examination 3. Students categorize the printing techniques for label and mark printing. 4. In a written part, students explain their knowledge of trends and regulations in the field of label and marking printing. 5. As part of the practical section of the course, students apply methods and standards for assessing the quality of label printing 6. As part of the practical section and the project/seminar work, students compare the quality of label and marking on different media.								
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course								
Title		Number of copies		Number of students				

<i>Encyclopedia of label technology / Michael Fairley ; technical editors Andy Thomas, Barry Hunt.</i>	1	
<i>The history of labels : the evolution of the label industry in Europe / Michael Fairley, Tony White. ISBN 9780954751883</i>	1	
Conventional label printing processes : letterpress, lithography, flexography, screen, gravure and combination printing / John Morton, Robert Shimmin. ISBN 9780954751890	1	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
<i>Student survey</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Ivana Bolanča Mirković, PhD	
Course title	Product sustainability and recycling	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Elective</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The goal of the course is to enable students to understand the basic principles of the durability of materials and their degradation processes: Students will study the mechanisms and processes from the environment that affect the degradation processes in materials. Knowledge of degradation processes will enable students to realistically assess the durability of individual graphic products. Knowledge of the durability of materials will contribute to the clarification of ways to extend the life cycle of products. Students will study recycling methods with theoretical and practical mentored work on real samples. Through the study of recycling techniques, environmental impact analysis and innovative approaches, students will acquire the skills necessary to apply sustainable practices in industry. The course also emphasizes the importance of the cyclical economy in the field of material recycling.</i>
1.2. Enrollment conditions

1.3. Expected learning outcomes							
1. Explain basic terms related to the durability of materials and their degradation processes. 2. Classify different degradation mechanisms, such as corrosion, oxidation, UV radiation, mechanical stress and biological degradation 3. Categorize different recycling processes for different types of materials, including mechanical, chemical and thermal methods. 4. Perform durability tests and comment on the results to evaluate the durability of materials under different conditions. 5. Apply appropriate recycling methods, certain reagents and evaluate their effectiveness and impact on the environment. 6. Explain possible solutions related to the degradation and recycling of materials.							
1.4. Course content							
•Introduction to material sustainability and recycling • Definition and importance of material stability, • Types of materials and physical and chemical properties of materials, • Methods of testing material stability, • Degradation mechanisms • The influence of the environment on the durability of the material, • Introduction to recycling: history and significance, • Overview of ecological and economic aspects of recycling, • Recycling processes for different types of materials, • Techniques and methods for removing impurities							
1.5. Types of Teaching Methods				x Lectures ☐ Seminars and workshops x Exercises x Online education, ☐ Fieldwork		X Independent tasks ☐ Multimedia and network x Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Continuous student participation in classes throughout the semester through activities in lectures and laboratory exercises and writing assignments. The student is obliged to complete all laboratory exercises and submit a correct and accurate work diary from the laboratory exercises, which is graded based on the accuracy and quality of the data analysis. A passing grade in the written exam or both colloquiums is required							
1.7. Student work monitoring							
Attendance		Activity in classes	x	Seminar paper		Experimental work	x
Written exam	x	Oral exam		Essay		Research	
Project		Continuous knowledge assessment	x	Report	x	Practical work	
Portfolio							

1.8. Assessment and evaluation of student work during classes and at the final exam.		
<i>Evaluation:</i> <i>Active participation in discussions at the lecture - 5%</i> <i>Homework - 5%</i> <i>Active participation in laboratory exercises - 5%</i> <i>Handing in the work log (Evaluated based on accuracy and quality of data analysis) – 15%</i> <i>Final written exam – 70% or 2 colloquia:</i> <i>Colloquium I – 35%</i> <i>Colloquium II – 35%</i> <i>Evaluation:</i> <i>In written form through assignments and a written exam and in oral form through active participation in lectures, students will explain basic terms related to the durability of materials and their degradation processes.</i> <i>In written form through assignments and a written exam and in oral form through active participation in lectures, students will explain different mechanisms of degradation, such as corrosion, oxidation, UV radiation, mechanical stress and biological degradation</i> <i>In written form through assignments and a written exam and in oral form through active participation in lectures, students will categorize different recycling processes for different types of materials, including mechanical, chemical and thermal methods.</i> <i>As part of the exercises and in written form in the work diary, students will perform stability tests and comment on the results to evaluate the stability of the material under different conditions.</i> <i>As part of the exercises and in written form in the work diary, students will apply appropriate recycling methods, certain reagents and evaluate their effectiveness and impact on the environment.</i> <i>As part of the exercises and in written form in the work diary, students will explain possible solutions related to the degradation and recycling of materials.</i>		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Newaz K. S., Pulp and paper processing, London: IntechOpen, 2018, ISBN: 9781789238471</i>	1	
<i>Lancaster, PA: DEStech Publications, 2015., ISBN: 9781605951355</i>	1	
<i>Twede, D., Selke, S. E. M., Kamdem, D. P., Shires D., Cartons, crates and corrugated board: handbook of paper and wood packaging technology, 2nd ed</i>	1	
<i>Pratima, B., Recycling and deinking of recovered paper, Waltham, MA : Elsevier, 2014., ISBN: 9780124169982</i>	1	
<i>Carver, J., Rethinking paper & ink: the sustainable publishing revolution, Portland: Ooligan Press, 2011., ISBN: 9781932010398</i>	1	
1.10. Supplementary literature		

1.11. Strli, M., Kolar, J., <i>Ageing and stabilisation of paper</i> , Ljubljana : National and University Library, 2005., ISBN: 9616551035
1.12. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>
Student survey, Self-evaluation form

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Ivana Bolanča Mirković, PhD	
Course title	Sustainability in graphic technology	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The course examines environmentally friendly methods and practices in the printing industry. Students study environmental phenomena caused by graphic and related industries, ways of spreading emissions and purification processes. The reduction of waste, the use of recycled and advanced graphic materials and the optimisation of production processes through the minimization of the use of harmful chemicals and energy efficiency are studied. The implementation of the circular economy is being studied, among others recycling and reusing materials within the production cycle. LCA is studied to identify areas for improvement and lean production while respecting Kaizen principles. The course prepares students for the application of sustainable methods in graphic technology, reducing the negative impact on the environment and promoting responsible business.</i>
1.2. <i>Enrollment conditions</i>
1.3. <i>Expected learning outcomes</i>
1. Explain the basic principles and methodologies of sustainable graphic technology, including the use of innovative materials, energy-efficient processes and waste reduction. 2. Interpret the life cycle analysis (LCA) of graphic products to identify and reduce their ecological footprint. 3. Understand the principles of lean production to optimize graphic processes and reduce waste. 4. Implement the production of sustainable materials and the use of advanced dyes and energy-efficient technologies in the graphic industry.

5. Demonstrate graphic projects using sustainable practices, reducing the negative impact on the environment. 6. Comment on sustainability in the graphic industry and plan solutions to reduce the negative impact on the environment.							
1.4. Course content							
• The basics of sustainability and the importance of sustainability in the graphics industry • Impacts of graphic and related industries on the environment • Contaminant dispersion and purification methods • Waste reduction strategies: Lean production, recycling, • Waste management in printing: Proper disposal and recycling, • Product life cycle analysis (LCA), application in the graphic industry • Energy efficiency in the graphic industry • Carbon footprint • Impact of graphic materials on the environment • Use of sustainable and advanced graphic materials • Sustainable and advanced materials in 3D printing • Waste management in 3D printing							
1.5. Types of Teaching Methods				xLectures ☐ Seminars and workshops X Exercises x Online education ☐ Fieldwork		x Independent tasks ☐ Multimedia and network x Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Continuous student participation in classes throughout the semester through activity in lectures and laboratory exercises and writing assignments. The student is obliged to complete all laboratory exercises and submit a correct and accurate work diary from the laboratory exercises, which is graded based on the accuracy and quality of the data analysis. A passing grade in the written exam or both colloquiums is required.							
1.7. Student work monitoring							
Attendance		Activity in classes	x	Seminar paper		Experimental work	x
Written exam	x	Oral exam		Essay		Research	
Project		Continuous knowledge assessment	x	Report	x	Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: Active participation in discussions at the lecture - 5% Homework - 5% Active participation in laboratory exercises - 5% Handing in the work log (Evaluated based on accuracy and quality of data analysis) – 15% Final written exam – 70% or 2 colloquia:							

Colloquium I – 35% Colloquium II – 35% Evaluation: written form through assignments and a written exam, and oral form through active participation in lectures, students will explain basic knowledge in the field of basic principles and methodology of sustainable graphic technology, including the use of innovative materials, energy-efficient processes and waste reduction. written form through assignments and a written exam, and oral form through active participation in lectures, students will demonstrate their knowledge of the life cycle analysis (LCA) approach of graphic products to identify and reduce their ecological footprint. written form through assignments and a written exam, and oral form through active participation in lectures, students will understand the principles of lean production for optimizing graphic processes and reducing waste. written form through assignments and a written exam and oral form through active participation in lectures, students will comment on sustainability in the graphics industry and plan solutions to reduce the negative impact on the environment part of the exercises and in written form in the work diary, students will create sustainable materials and use innovative dyes and energy-efficient technologies in the graphic industry. part of the exercises and in written form in the work diary, students will plan, develop and demonstrate graphic projects using sustainable practices, reducing the negative impact on the environment.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
Title	Number of copies	Number of students
Hussain C. M., Handbook of environmental materials management, New York : Springer, 2019., ISBN: 9783319736440	1	
Karana, E., Pedgley, O., & Rognoli, V. (2014). Materials Experience: Fundamentals of Materials and Design. Butterworth-Heinemann.	1	
Morris, G. P., & Saunders, P. J. (2013). Environment, Health and Sustainable Development. Open University Press	1	
Ashby, M. F. (2013). Materials and the Environment: Eco-informed Material Choice (2nd ed.). Butterworth-Heinemann, ISBN: 9780123859723	1	
Hoefer, R., Matharu, A. S., Zhang, Z., Green chemistry for surface coatings, inks and adhesives: sustainable applications, Cambridge: Royal Society of Chemistry, 2019., ISBN: 9781782629948	1	
1.10. Supplementary literature		

1.11. Shapiro, Fred, <i>Environmental regulations for printers: how to comply with environmental rules while making your printing operations more productive and profitable</i> , Plainview, NY : Jelmar Publishing Co., 2003
1.12. Holik, H., <i>Handbook of paper and board</i> , 2nd revised and enlarged edition, Weinheim: Wiley-VHC, 2013., ISBN: 9783527331840
1.13. Shapiro, Fred, <i>Environmental regulations for printers: how to comply with environmental rules while making your printing operations more productive and profitable</i> , Plainview, NY : Jelmar Publishing Co., 2003
1.14. Goodship, V. (Ed.). (2010). <i>Life Cycle Engineering of Plastics: Technology, Economy and Environment</i> . Carl Hanser Verlag.
1.1. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>
Student survey, Self-evaluation form

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Asst.prof. Josip Bota, PhD	
Course title	Engineering of Paperboard Products	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1 + 2 + 0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The objectives of the course are to equip students with the necessary knowledge and skills for working in the production of paperboard products. Students will be able to explain and apply various functional parametric designs for packaging components and paperboard products. They will be educated to select appropriate materials, construct cutting layouts, and plan manufacturing processes for simple products. Students will develop skills in using specialized CAD software required for designing and creating 3D visualizations and animations of product assembly processes involving multiple structural components. Additionally, students will gain the knowledge and experience needed to safely and efficiently operate flatbed cutters, following specific production requirements.</i>
1.2. <i>Enrollment conditions</i>
<i>Completed courses: Engineering Graphics, Technical Visualization Systems, and Packaging.</i>
1.3. <i>Expected learning outcomes</i>
1. <i>Apply functional parametric elements for the purpose of constructing a paperboard product.</i>

2. Carry out the procedures required for producing a paperboard product. 3. Construct simple cutting layouts for multi-part paperboard products using specialized CAD software 4. Adjust the design to the limitations of the manufacturing technology. 5. Develop 3D visualizations and animations of the assembly processes for paperboard products. 6. Safely operate flatbed cutters in accordance with specific cutting requirements.							
1.4. Course content							
1. Introduction to Paperboard Products 2. Parametric Design 3. Functional Elements of Construction 4. Product Safety 5. Multi-part Products 6. Production Processes 7. Technological Issues 8. Optimization for Manufacturing 9. Workplace Safety 10. Product Synergy with Graphic Design 11. Application and Case Studies							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other	
1.6. Student obligations							
Active participation in classes and online activities Keeping a work journal Develop and present a project assignment Revision and correction of the project assignment according to feedback Regularly complete weekly practical assignments							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam	X	Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment		Report		Practical work	X
Portfolio		Work journal	X				
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Continuous monitoring and participation in lectures and exercises – 10% Completion of project assignment and presentation – 50% Timely and correct completion of weekly practical assignments – 20% Final written exam – 20%							

Evaluation:		
1. Through a practical project assignment, students will create a parametric design of a product made from cardboard and paperboard. 2. In the exercises, students will carry out the procedures for making a paperboard product. 3. In the exercises, students will create simple cutting layouts of paperboard products composed of multiple parts using specialized CAD software. 4. In the exercises, students will adjust construction to the limitations of production technology. 5. In the written exam, students will develop a 3D visualization and animation of the assembly process of cardboard products. 6. In the exercises, students will demonstrate the safe handling of flatbed cutters.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Structural packaging : design your own boxes and 3-D forms / Paul Jackson (2012)</i>	1	
Paper engineering : 3D design techniques for a 2D material / Natalie Avella (2006) (2009)	1+1	
<i>Packaging Machinery Handbook : the complete guide to automated packaging machinery, including packaging line design/ John R Henry (2013)</i>	2	
Packaging technology: fundamentals, materials and processes / Anne Emblem, Henry Emblem (2012)	4	
Protective packaging for distribution: design and development / Daniel Goodwin, Dennis Young (2011)	2	
1.10. Supplementary literature		
Package form and design : encyclopedia of paper-folding designs / Sayoko Boku (2007)		
Packaging prototypes / Edward Denison and Richard Cawthray / Denison, Edward (1999)		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form, discussions with future employers and alumni.		

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Assoc. Prof. Ivan Budimir Ph.D.
Course title	Mathematics 1
Study programme	Undergraduate university study programme Graphic technology

Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	5
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is for students to be able to explain, interpret and connect basic mathematical concepts such as functions, limits and derivatives and recognize their role in graphic engineering, visual communications and multimedia. They will be able to recognize basic mathematical functions, determine their main features, and draw graphs. Students who pass the course will be able to interpret functions as well as the fundamental principles of differential calculus and their application in other areas. Students will be able to mathematically pose a problem from a real context, and consider, choose and propose a mathematical method of solving it. The goal of the course is for students to be able to adequately select suitable mathematical models based on functions and differential calculus in graphics, multimedia and visual communication, evaluate them, and use them to make calculations and draw precise and accurate conclusions.</i>
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Determine the basic properties of elementary functions and their boundary behavior. 2. Perform calculus from selected examples of differential calculus applications. 3. Examine the flow of a function using differential calculus methods. 4. Construct mathematical models of problems from graphic and multimedia contexts. 5. Communicate quantitative information in a graphic and multimedia environment. 6. Interpret mathematical concepts such as function, limits and derivatives.
1.4. Course content
1. Introduction to mathematical logic, computational logic and set theory. 2. Number sets, real numbers, rational and irrational numbers, and the golden ratio and the application of the golden ratio in graphic design. 3. Cartesian coordinate systems and complex numbers with application to fractal geometry in graphic design. 4. In-plane curves and their application in computer graphics with reference to Bezier curves. 5. Basics of the theory of functions with their given and fundamental determinants. 6. Basic properties of elementary functions with examples of their application in natural sciences, graphic technology and visual communications. 7. Linear transformation of the graph of a function with reference to the transformation of a digital image in vector graphics. 8. Definition of arrays, limits of arrays, and stacks of arrays. 9. Limits of functions and continuous functions with examples of continuity in natural phenomena.

10. Definition of the derivative of a function in a point with reference to Newton's and Leibniz's definition of derivative. 11. Definition of the derivative of a function, derivative theorems and derivative techniques. 12. Applications of derivatives in physics, chemistry, geometry and graphics. 13. Determination of monotony intervals, extremes and curvature intervals using derivatives. 14. Analysis of the flow of a function using derivatives with analysis of graphical functions. 15. Optimization methods with examples from the graphical context.							
1.5. Types of Teaching Methods				X Lectures X Seminars and workshops ☐ Exercises X Online education ☐ Fieldwork		X Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Attendance at lectures and seminars is mandatory. Condition for taking the exam: Attending at least 70% of lectures and 70% of seminars.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay	X	Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Seminar paper-10% Presentation of seminar paper within lectures and seminars Activities in class – 10% problem solving, solving short quizzes, participation in the teaching process Written exam – 80% or within the framework of continuous examination of knowledge through colloquium The paper, practical essay - it is intended to raise the acquired grade. Oral exam - they are designed to raise the acquired grade. Evaluation: 1. In writing, the student will determine the basic properties of elementary functions, calculate the limits and asymptotes of curves. 2. In writing, the student will implement the calculus from the selected examples of differential calculus applications through the tasks. 3. The student will examine the course of the function in writing using the methods of differential calculus. 4. In writing, the student will construct simpler mathematical models of selected problems from the graphic and multimedia context, and look for their solutions. 5. At lectures or seminars, the student will present a seminar paper. 6. In the oral exam, students will interpret mathematical concepts such as function, limits and derivative.							

1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>P. JAVOR, Mathematical Analysis 1, Element, Zagreb, 1995.</i>		
<i>B. P. DEMIDOVICH, Tasks and Solved Examples from Higher Mathematics with Application to Technical Sciences, Tehnička knjiga, Zagreb, 1978.</i>		
<i>F. AYRES, Jr., E. MENDELSON, Shaum's Outline of Theory and Problems in Differential and Integral Calculus, Mc Graw-Hill, Inc., USA, 1990.</i>		
1.10. Supplementary literature		
1. J. Stewart, <i>Calculus</i> , Cengage Learning, 7-th edition, 2012.		
2. Steven H. Strogatz, <i>Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering (Studies in Nonlinearity)</i> , 2-nd edition, 2014.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation for.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Ivan Budimir, Ph.D.	
Course title	Mathematics 2	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	I.	
ECTS credit and teaching method	ECTS credits	5
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The goal of the course is for students to be able to interpret the fundamental concepts of linear algebra and integral calculus. Students who pass the course will be able to mathematically analyze and pose a problem from a graphical and multimedia context, and consider, choose and propose a method of solving linear algebra, integral calculus and differential equations. The goal of the course is for students to be able to choose and construct mathematical models of real problems, evaluate and evaluate proposed models, make</i>

<i>relevant calculations and draw mathematical conclusions. Students will be able to clearly and clearly present the results in a precise mathematical vocabulary.</i>		
1.2. Enrollment conditions		
1.3. Expected learning outcomes		
1. Calculate rank, inverse, determinant of matrix and matrix equations. 2. Solve systems of linear equations with Gaussian algorithm and other methods. 3. Solve indefinite and definite integrals and differential equations with applications in graphic technology and visual communications. 4. Create mathematical models of problems from a real graphical environment using linear algebra methods and differential equations. 5. Communicate mathematical conclusions in different professional and business environments. 6. Explain concepts from linear algebra and infinitesimal calculus.		
1.4. Course content		
1. Basic concepts of matrix calculus and algebraic operations with matrices. 2. Rank, inverse, determinant of a matrix with applications to matrix equations. 3. Digital image as a matrix and matrix as an image and discussion of different mathematical methods of image filtering. 4. Definition of different types of systems of equations, Gauss-Jordan method of elimination and other methods. 5. Mathematical modeling of problems from a real context with an emphasis on graphic technology and multimedia using linear algebra methods. 6. Definition and computation of an indefinite integral using integration techniques such as methods of substitution and partial integration in an indefinite integral. 7. Definition and calculation of a definite integral by the Newton-Leibniz formula. 8. Application of a definite integral to problems from geometry, i.e. to surfaces, volumes, surfaces, centers of gravity of bodies and lengths of curves. 9. Application of certain integrals in chemistry and physics, mechanics and visual communications. 10. Definition of Differential Equation with Methods for Solving Selected Types of 1st Order Differential Equations. 12. Differential equations of the 2nd order with methods of solving. 13. Mathematical modeling with differential equations of problems from various fields such as graphic technology, design, multimedia and visual communications.		
1.5. Types of Teaching Methods	X Lectures X Seminars and workshops ☐ Exercises X Online education ☐ Fieldwork	X Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other
1.6. Student obligations		
Obligations of students Attendance at lectures and seminars is mandatory.		

<i>Condition for taking the exam: Attending at least 70% of lectures and 70% of seminars.</i>							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay	X	Research	
Project		Continuous knowledge assessment	X	Report	X	Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: <i>Seminar paper-10% presentation of seminar paper within lectures and seminars.</i> <i>Activities in class – 10% problem solving, solving short quizzes, participation in the teaching process.</i> <i>Written exam – 80% written exam or within the framework of continuous examination of knowledge through colloquiums.</i> <i>The essay is designed to raise the acquired grade.</i> <i>The oral exam, report and practical work are provided for raising the acquired grade.</i> Evaluation: <i>In writing, the student will calculate the rank, inverse, determinant of the matrix and matrix equations through the assignments.</i> <i>Will solve written tasks on systems of linear equations using the Gaussian algorithm and other methods.</i> <i>In writing, he/she will determine indefinite and definite integrals and solve differential equations as well as problems with their applications in graphic technology and visual communications.</i> <i>In written form, they will make mathematical models of problems from a real graphical environment using linear algebra methods and differential equations.</i> <i>At lectures or seminars, the student will present a seminar paper.</i> <i>At the oral exam, the student will interpret mathematical concepts from linear algebra and infinitesimal calculus.</i>							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
<i>B. P. DEMIDVIČ, Tasks and Solved Examples from Higher Mathematics with Application to Technical Sciences, Tehnička knjiga, Zagreb, 1978.</i>							
<i>W. H. Steeb, Problems And Solutions in Introductory And Advanced Matrix Calculus, Willi-Hans Steeb, 2006.</i>							
<i>. AYRES, Jr., E. MENDELSON, Shaum's Outline of Theory and Problems in</i>							

Differential and Integral Calculus, Mc Graw-Hill, Inc., USA, 1990.		
1.10. Supplementary literature		
1. J. Stewart, <i>Calculus</i> , Cengage Learning, 7-th edition, 2012.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Ivan Budimir Ph.D.	
Course title	Probability and statistics	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. Course objectives
<i>Students should interpret basic concepts from probability and statistics. The goals of the course are that students can apply probabilistic and statistical methods to graphic and multimedia phenomena, but also the world of sports as well as games of chance. Students should be able to recognize probabilistic regularities in graphic engineering, multimedia and visual communications, they should be able to calculate the probabilities of winnings in games of chance, and probabilities that appear in multimedia and visual communications. Students need to find and apply the laws of probability theory and distributions of random variables in the real context they are dealing with. Students should provide examples of the application of normal distribution in the graphic profession and other fields. Students should successfully perform descriptive statistical data processing, and conduct basic statistical tests on samples.</i>
1.2. Enrollment conditions
<i>Attended course Mathematics 1</i>
1.3. Expected learning outcomes
1. Determine the number of elements of finite sets using permutations, variations and combinations. 2. Choose a probabilistic method suitable for describing a corresponding random phenomenon in the fields of sports, graphic engineering and multimedia. 3. Calculate the probabilities of occurrence of random events in sports, graphic engineering, multimedia and graphic communications.

4. Solve selected problems using discrete distributions. 5. Solve selected problems using continuous distributions, with an emphasis on normal distribution. 6. Make a descriptive statistical analysis of the selected sample.							
1.4. Course content							
1. Basic combinatorial principles. 2. Counting methods such as permutations, variations, and combinations with and without repetition with applications in graphics, multimedia, sports, and other fields. 3. Introduction to probability theory with basic definitions. 4. Probability spaces with examples from the world of sports, technology and multimedia. 5. Conditional probability and independence of events and a complete system of events. 6. Bayes' theorem, event trees and probability trees with applications to random phenomena from sports, games of chance, print and visual communications. 7. Definition of random variables and their division into discrete and continuous random variables. 8. Binomial, Poisson and geometric distributions and their applications in graphic engineering and visual communications, sports and games of chance. 9. Definition of continuous distribution over density function and distribution function. 10. Basic numerical parameters of random variables. 11. Exponential and normal distribution with applications. 12. Laws of large numbers and Central limit theorems with applications. 13. Introduction to descriptive and mathematical statistics. 14. Basic tests of hypotheses about unknown parameters. 15. Descriptive statistical analysis of samples in the field of graphic engineering, multimedia and visual communications.							
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Attendance at lectures and exercises is mandatory. Students will be given tasks that they will solve independently, which will be evaluated in lectures or through the e-learning system. Minimum attendance at 50% of lectures and 50% of seminars.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay	X	Research	X
Project	X	Continuous knowledge assessment	X	Report		Practical work	
Portfolio							

1.8. Assessment and evaluation of student work during classes and at the final exam.		
Assessment: <i>Seminar paper-10% presentation of seminar paper within lectures and seminars.</i> <i>Activities in class – 10% problem solving, solving short quizzes, participation in the teaching process.</i> <i>Research – 10% statistical analysis of the selected sample.</i> <i>Projects – 10% creation of project tasks that will be evaluated in lectures or through the e-learning system</i> <i>Written exam – 60% written exam or within the framework of continuous examination of knowledge through colloquiums.</i> <i>The essay is designed to raise the acquired grade.</i> <i>The oral exam is designed to raise the acquired grade.</i> Evaluation: <i>1. In writing, the student will solve a combinatorial problem using permutations, variations and combinations.</i> <i>2. The student will choose a probabilistic method suitable for describing a corresponding random phenomenon in the field of sports, graphic engineering and multimedia, which will be expressed in writing.</i> <i>3. They will calculate in writing the probabilities of the occurrence of random events, and will design and solve a project assignment from the world of sports or graphic engineering, multimedia and graphic communications.</i> <i>4. The student will solve selected problems in writing using discrete distributions.</i> <i>5. Demonstrate in writing the solution of selected problems by means of continuous distributions, with an emphasis on normal distribution, and design and solve the same through a project task.</i> <i>6. They will make a descriptive statistical analysis of the selected sample, which they will submit as a result of the research.</i>		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Ivan Budimir, Probability and Statistics. With applications in graphic technology. Teaching materials for the web. 2013.</i>		
<i>Neven Elezović, Probability and Statistics, Element, Zagreb, 2018.</i>		
<i>Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists , 3. Edition, E lsevier Inc. , Berkeley, 2004.</i>		
1.10. Supplementary literature		
<i>1. Murray R. Spiegel, John Schiller, R. Alu Srinivasan, Schaum's Outline of probability and statistics, 4. Edition, McGraw Hill, 2012.</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	asst. prof. Vladimir Cviljušac, Ph.D.	
Course title	Digital image processing	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	3 ECTS
	Number of hours (L+E+S)	1 + 2 + 0

COURSE DESCRIPTION
1.1. Course objectives
<i>Students will be able to explain different formats and representations of digital images as well as compression methods (both lossless and lossy). They will understand the theoretical foundations of digital image processing, including signal and noise theory, as well as interpolation and image reconstruction methods. Additionally, they will be capable of applying a multispectral camera for digital image acquisition, including equipment setup, calibration, and the capturing process. Ultimately, students will be able to analyze digital images using computational tools and methods for sampling, quantization, and image filtering.</i>
1.2. Enrollment conditions
<i>None</i>
1.3. Expected learning outcomes
<i>Explain different formats and representations of digital images, as well as image compression methods. Explain the theoretical foundations of digital image processing. Apply a multispectral camera for digital image acquisition. Use computational tools for digital image processing.</i>
1.4. Course content
1. Introduction to digital image processing 2. Light and color, sources of light 3. Formats and representations of digital images 4. Image compression methods 5. Multispectral imaging systems 6. Basics of working with multispectral systems 7. Spectral characteristics of signals 8. Signals and noise in digital images 9. Interpolation and image reconstruction methods 10. Theoretical foundations of digital image processing 11. Computational tools for digital image analysis

12. <i>Sampling and quantization methods</i> 13. <i>Digital image filtering</i> 14. <i>Application of artificial intelligence in digital image processing</i> 15. <i>Interpretation of results</i>							
1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. <i>Student obligations</i>							
<i>The student must regularly attend classes and successfully complete individual assignments.</i> <i>Requirement for taking the exam: a minimum of 50% attendance in classes and 80% completion of exercises.</i>							
1.7. <i>Student work monitoring</i>							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam	X	Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
Grading: <i>Written exam – 40% or through continuous assessment (midterms)</i> <i>Midterm 1 – 20%</i> <i>Midterm 2 – 20%</i> <i>Project assignment (exercises) – 60%</i> Evaluation: <i>Written exam with theoretical questions.</i> <i>Written exam with theoretical questions.</i> <i>Practical exercises and work on the project assignment.</i> <i>Practical exercises and work on the project assignment.</i>							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title		Number of copies		Number of students			

<i>Image and Video Compression for Multimedia Engineering: Fundamentals, Algorithms, and Standards, Second Edition (Image Processing Series) (2nd Edition), Yun-Qing Shi, Huifang Sun, 2008.</i>		
<i>Tinku Acharya, Ajoy K. Ray: Image Processing Principles and Applications, Wiley, 2005.</i>		
1.10. Supplementary literature 1. <i>Wilhelm Burger, Mark J. Burge: Principles of Digital Image Processing - Fundamental Techniques, Springer-Verlag London Limited, 2009.</i> 2. <i>H. J.Trussell, M. J.Vrhel: Fundamentals of Digital Imaging; Cambridge University Press, 2008.</i> 3. <i>Chris Solomon, Toby Breckon: Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab; John Wiley & Sons, Ltd, 2011.</i> 4. <i>Joanne Dyer, Giovanni Verri, John Cupitt: Multispectral Imaging in Reflectance and Photo-induced Luminescence modes: A User Manual; The British Museum, 2013.</i> 5. <i>Michel A. Van Hove, Everyday physics : colors, light and optical illusions, New Jersey : World Scientific, 2022</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
<i>Student survey, self-evaluation form</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Asst. Prof. Filip Cvitić, PhD	
Course title	Fundamental Principles of Graphic Design	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Elective</i>	
Year	I.	
ECTS credit and teaching method	ECTS credits	2
	Number of hours (L+E+S)	1+0+1

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to equip students with an understanding of the fundamental principles of design, the ability to identify and apply basic design processes, and to recognize and categorize digital products, distinguishing between them. Students will learn about design principles for user experiences across different platforms and what to consider when working on each of them through examples of other products. Students will go through all the necessary steps for creating a digital product in a specific industry, identifying the</i>

<i>design process from research and ideation to the final product. Through a seminar paper, students will apply design principles to a chosen product.</i>								
1.2. Enrollment conditions								
1.3. Expected learning outcomes								
1. Demonstrate the basic principles of design. 2. Describe redesigns that enhance user experience and product functionality based on selected products. 3. Present professional information clearly and effectively to other participants. 4. Draw conclusions on ethical decisions in the design of digital products.								
1.4. Course content								
Introduction to Design Principles of Graphic Design Principles of Digital Design Typography Design Introduction to User Interface and User Experience Design User Experience Examples Digital Product Design Analysis User Research and Analysis User Interface Testing Methods Responsive Design and Adaptability								
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_			
1.6. Student obligations								
<i>The student must complete all exercises, prepare exam documentation, and give a final presentation of their project.</i>								
1.7. Student work monitoring								
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work		
Written exam		Oral exam		Essay		Research	X	
Project		Continuous knowledge assessment		Report		Practical work	X	
Portfolio								
1.8. Assessment and evaluation of student work during classes and at the final exam.								
Grading:								

• Demonstration of design principles theory: 27% • Identifying strengths and weaknesses: 15% • Application of acquired skills in work: 35% • Presentation of seminar paper: 15% • Class attendance: 8% Evaluation: 1. Demonstrate basic design principles in the seminar paper. 2. Describe redesigns that enhance user experience and product functionality based on selected products in the seminar paper. 3. Present professional information clearly and effectively to other participants in the seminar paper. 4. Draw conclusions on ethical decisions in the design of digital products in the seminar paper.		
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Yablonski, Laws of UX: Using Psychology to Design Better Products & Services, 2024</i>	<i>1</i>	
<i>Park, Introduction to Design Thinking for UX Beginners: 5 Steps to Creating a Digital Experience That Engages Users with UX Design, UI Design, and User Research. Start Building Your UX Careerme think Revisited, 2023</i>	<i>1</i>	
1.10. <i>Supplementary literature</i> Shaoqiang, Book Design: From the Printing Basics to the Most Impressive Designs, 2022 Lorenz, Flexible Visual Systems, 2021 Cvitić, Učiniti svoje proizvode vidljivima, 2017		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey, self-evaluation form, etc..</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. prof. Davor Donevski, PhD	
Course title	Machines in Postpress Processes	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
	ECTS credits	4

ECTS credit and teaching method	Number of hours (L+E+S)	2+0+1
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COURSE DESCRIPTION							
1.1. Course objectives							
After completing the course, the student will be able to choose machines with suitable technical characteristics for the planned production in terms of materials used in processes, required work operations and capacities. Student will be able to plan the technological process for selected graphic arts products – choose machines for required work operations, estimate the overall production process time from the time required to complete individual processes and the number of products being produced. Student will be able to identify products which cannot be produced with available machines considering their technical characteristics and product requirements.							
1.2. Enrollment conditions							
Completed course Engineering Graphics							
1.3. Expected learning outcomes							
Explain the purpose of work operations executed on machines. Compare machines with respect to their technical characteristics. Choose machines with suitable technical characteristics considering the planned production requirements. Plan the technological process (work operations, required machines and time) for selected products.							
1.4. Course content							
1. Machine elements 2. Technical characteristics of machines 3. Machines for separation of materials 4. Machines for shaping of materials 5. Machines for joining of materials 6. Machines for auxiliary operations 7. Machines for grouping of products 8. Lines of machines							
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
- Successfully completed independent tasks (reports)							
1.7. Student work monitoring							
Attendance	X	Activity in classes		Seminar paper		Experimental work	
Written exam	X	Oral exam		Essay		Research	

Project		Continuous knowledge assessment		Report	X	Practical work	
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
<i>Assessment:</i> Written exam: 70% Report: 20% Attendance: 10%							
<i>Evaluation:</i> 1.Explain the purpose of work operations in written form. (written exam) 2. Compare the machines in terms of their technical characteristics in written form. (report) 3. Choose the machines which meet the production requirements in written form. (report) 4. Plan the technological process for selected products in written form. (report)							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title		Number of copies		Number of students			
Helmut Kipphan, „7 Print Finishing Processes“, Handbook of Print Media, Springer, 2001 Chapter available at: https://link.springer.com/chapter/10.1007/978-3-540-29900-4_7				70			
1.10. <i>Supplementary literature</i> V. Potisk, Grafička dorada, Školska knjiga, Zagreb, 1997.							
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>							
Student survey							

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. prof. Davor Donevski, PhD	
Course title	Packaging Technologies	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION							
1.1. Course objectives							
After completing the course, the student will be able to classify packaging machines with respect to their purpose and characteristics. The student will be able to choose packaging machines considering the packaging product requirements. Student will be able to check the characteristics of a given flexible or cardboard packaging line and adapt the existing standard style of packaging to the line requirements. Student will be able to choose the packaging solution with accompanying elements which fit the characteristics of control systems installed on the packaging line.							
1.2. Enrollment conditions							
1.3. Expected learning outcomes							
Classify the packaging machines with respect to general type and purpose, automation level, motion, layout and product flow, package orientation and speed. Adjust the standard types of flexible packaging to packaging machine characteristics. Adjust the standard types of cardboard packaging to packaging machine characteristics. Adjust the packaging to meet the requirements of the control systems installed on the packaging line. Present the analysis of adjusting the packaging to machine requirements.							
1.4. Course content							
1. Classification of packaging machines. 2. Packaging line loading. 3. Machines for flexible packaging. 4. Types of flexible packaging with respect to types of packaging machines. 5. Machines for cardboard packaging. 6. Types of cardboard packaging with respect to types of packaging machines. 7. Machines for conveying, buffering and accumulating. 8. Control systems on packaging lines.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
- Successfully completed independent tasks.							
1.7. Student work monitoring							
Attendance	X	Activity in classes		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment		Report	X	Practical work	X

Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
<i>Assessment:</i> Project: 70% Practical work: 20% Attendance: 10%							
<i>Evaluation:</i> 1. Classify the packaging machines in written form. (independent task) 2. Present the packaging solution adjusted to packaging line requirements in written form. (project) 3. In exercise classes, present packaging solutions adjusted to packaging line requirements. (presentation of independent task)							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
<i>Title</i>		<i>Number of copies</i>		<i>Number of students</i>			
<i>Henry, J. R., Packaging machinery handbook, John R. Henry, 2012</i>		<i>1</i>					
1.10. <i>Supplementary literature</i> <i>Emblem, A., Emblem, H., Packaging technology, Woodhead Publishing, 2012</i>							
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>							
<i>Student survey</i>							

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assist. Prof. Katarina Itrić Ivanda, PhD	
Course title	Mechanics and wave phenomena	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	5
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to apply fundamental knowledge from fluid mechanics, statics of rigid bodies, electromagnetism, as well as geometric and wave optics in the analysis of technical and technological processes in graphic technology. In the context of hydrostatics and hydrodynamics, students will acquire</i>

<i>knowledge that they will later apply in the characterization of printing inks and various fluids used in the graphic industry. Fundamental knowledge of geometric and wave optics, along with the mechanisms of optical interaction of light with materials, will enable students to understand the principles of operation of various optical devices used in quality control. Through laboratory exercises, students will independently or in pairs develop critical thinking and data analysis skills, applying theoretical knowledge in practice and enhancing experimental methods and technical skills.</i>							
1.2. Enrollment conditions							
1.3. Expected learning outcomes							
1. Analyze the statics of rigid bodies using examples from graphic technology. 2. Examine the static and dynamic properties of specific fluids. 3. Explain the basic principles of electromagnetism with examples from graphic technology. 4. Interpret the principles of geometric and physical optics in simple optical systems. 5. Compare sources of radiation based on the mechanisms of light generation. 6. Analyze the interactions of light and objects based on simple physical models.							
1.4. Course content							
1. Fundamentals of rigid body mechanics 2. Statics of rigid bodies 3. Hydrostatics of fluids 4. Hydrodynamics of fluids 5. Electrostatics and electrodynamics 6. Photoelectric effect 7. Geometric optics 8. Physical optics 9. Sources of electromagnetic radiation 10. Interaction of light and matter							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork		☐ Independent tasks ☒ Multimedia and network ☒ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Attendance at 75 % of classes.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	X
Written exam	X	Oral exam		Essay		Research	

Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Laboratory exercises – 50% Written exam – 40 % or through continuous knowledge assessment (short tests after each of the 10 planned teaching units, each unit contributing 4 % to the final grade). Active participation in class – 10 % Evaluation: 1. In written form, analyze the statics of rigid bodies using examples from graphic technology in the continuous knowledge assessment or in a written exam. 2. Examine the static and dynamic properties of specific fluids within the laboratory exercises. 3. In written form, explain the basic principles of electromagnetism with examples from graphic technology in the continuous knowledge assessment or in a written exam. 4. In written form, interpret the principles of geometric and physical optics in simple optical systems as part of the laboratory report. 5. In written form, compare sources of radiation based on the mechanisms of light generation in the continuous knowledge assessment or in a written exam. 6. In written form, analyze the interactions of light and objects based on simple physical models as part of the laboratory report.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Kulišić, P. <i>Mehanika i toplina : udžbenik fizike za studente elektrotehničkog fakulteta, Zagreb : Školska knjiga, 1995.</i>		4					
Kulišić, P.; Bistričić, L.; Horvat, D.; Narančić, Z.; Petković, T.; Pevec, D. <i>Riješeni zadaci iz mehanike i topline : udžbenik fizike za studente fakulteta elektrotehnike i računarstva, Zagreb : Školska knjiga, 2007.</i>		2					
Henč-Bartolić, Višnja, Predavanja i auditorne vježbe iz fizike lasera, Zagreb : Element, 2010.		2					
Nieto-Vesperinas, M. Scattering and diffraction in physical optics, London : World Scientific Publishing, 2006.		1					
P. Kulišić i V. Lopac, Elektromagnetske pojave i struktura tvari, Školska knjiga, Zagreb, 2003.		3					

V. Lopac i ostali: Riješeni zadaci iz elektromagnetskih pojava i strukture tvari, Školska knjiga, Zagreb, 2003.	2	
V. Henč-Bartolić i P. Kulišić: Valovi i optika, Školska knjiga, Zagreb, 2004	2	
1.10. Supplementary literature		
<i>H.D. Young i R. A. Freedman: University Physics With Modern Physics, Addison-Wesley, 2012.</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
<i>Student survey, self-evaluation form.</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Sonja Jamnicki Hanzer, PhD	
Course title	Polymeric Graphic Materials	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION
1.12. Course objectives
The aim of the course is to provide students with knowledge of polymers and polymeric materials used in graphic technology and flexible packaging. Students will learn the basics of polymerization, the types of polymers and the properties and applications of elastomers, duromers, elastomers and natural polymer materials. They acquire knowledge of different types of flexible packaging, including single and multi-layer materials, and their application in the packaging industry. Particular attention is paid to cellulose-based raw materials, natural and synthetic polymers, their specific properties and production processes. Students also acquire knowledge of techniques for surface treatment of polymers for printing and solutions such as biodegradable and edible packaging.
1.1. Enrollment conditions
<i>It is recommended that students complete courses on basic science concepts (physics, chemistry) prior to enrollment and that this course is taken after acquiring basic knowledge of cellulose-based printing substrates.</i>
1.2. Expected learning outcomes

1. Explain the basic concepts of polymerization and polymeric materials. 2. Compare the properties of polyplastics (plastomers and duromers), elastomers, polymer films and cellulose-based materials with an analysis of their application in graphic technology and the flexible packaging industry. 3. Describe the processing methods for polymers and the techniques for producing multilayer flexible packaging. 4. Explain the appropriate methods of surface preparation (treatment) of polymeric materials for printing. 5. Discuss the properties of natural polymer materials, biodegradable polymers and innovative solutions for the production of flexible packaging. 6. Identify the advantages and disadvantages of different materials in flexible laminates considering their physical and chemical properties and end uses.		
1.3. Course content 1. Introduction to polymeric materials and flexible packaging (definitions: Monomer, mer, polymer, polymerization, polymeric material, flexible packaging) 2. Polymerization processes and polymer classification (classification by type and method of mer-bonding, supramolecular organization of macromolecules) 3. Basic properties of polyplastics: plastomers (thermoplastics) and duromers 4. Processing and production of polymeric materials (preparation and processing methods, specific processing techniques for flexible packaging) 5. Key properties of the most commonly used plastomers (PE, PP, PS, PET, PVC) and their application in graphic technology and the packaging industry 6. Elastomers (rubber and latex) and Thermoplastic Elastomers 7. Natural polymeric materials (cellulose, nanocellulose, starch, lignin, natural resins) 8. Bioplastics and sustainable graphic products 9. Innovative solutions for the production of sustainable packaging, including edible packaging 10. Synthetic papers 11. Adhesives in graphic technology 12. Mono-layer and multi-layer materials (duplex, triplex) for flexible packaging (properties and applications of mono-layer and multi-layer films) 13. Specific physical and chemical properties and the role of materials in flexible laminates (advantages and limitations) 14. Production of multilayer flexible packaging: Coextrusion, lamination, metallization of polymer films 15. Preparation of polymeric materials for printing (corona, plasma and flame treatments)		
1.4. Types of Teaching Methods	☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other
1.5. Student obligations		
Attendance of at least 50% of the lectures and 80% of the seminars is required for participation in the examination.		
1.6. Student work monitoring		

Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							

1.7. Assessment and evaluation of student work during classes and at the final exam.

Grading:

Project assignment as part of seminars – 10%
 Compulsory seminar paper – 15%
 Written examination – 60% or by continuous assessment (midterms)
 Midterm exam 1 – 30%
 Midterm exam 2 – 30%
 Online quizzes – 10%
 Class attendance (over 50%) – 5%

Learning Outcome Evaluation:

1. As part of the written exam and/or midterms, students will explain basic concepts of polymerization and polymeric materials.
2. As as part of the written exam and/or midterms, students will compare the properties of polyplastics (plastomers and duromers), elastomers, polymer films and cellulose-based materials, with an analysis of their application in graphic technology and flexible packaging industries.
3. As part of the written exam and/or midterms, students describe polymer processing methods and techniques for the production of multilayer flexible packaging.
4. As part of the written exam and/or midterms, students will explain suitable methods for surface preparation (treatment) of polymeric materials for printing.
5. As part of the seminar paper, students discuss the properties of natural polymeric materials, biodegradable polymers and innovative solutions for the production of flexible packaging.
6. As part of the seminar paper, students identify the advantages and disadvantages of different materials in flexible laminates, taking into account their physical and chemical properties and end applications.

1.8. Mandatory literature and number of copies available in relation to the number of students currently attending the course

Title	Number of copies	Number of students
Z. Janović, Polimerizacije i polimeri, Zagreb, HKDI, Zagreb, 1997.	1	
Prica Miljana, Adamović Savka: Grafički materijali - 3. izd. - Novi Sad : Fakultet tehničkih nauka, 2021 (Novi Sad : FTN, Grafički centar GRID).	1	

Andričić, Branka. "Prirodni polimerni materijali (Priručnik)." Udžbenici sveučilišta u Splitu, Split (2009).	Available online	
Ambalaža za pakiranje namirnica, Ivan Vujković, Kata Galić, Martin Vereš, Zagreb : Tectus, 2007.	1	
Analiza ambalažnog materijala, Kata Galić, Nada Ciković, Katarina Berković, Zagreb : Hinus, 2000.	1	
Printing on polymers : fundamentals and applications; edited by Joanna Izdebska, Sabu Thomas; Boston, MA : Elsevier, 2016.,	1	
Dunn, Thomas. Manufacturing flexible packaging: materials, machinery, and techniques. William Andrew, 2014. https://www.sciencedirect.com/book/9780323264365/manufacturing-flexible-packaging	Available online	
Breaking the packaging , Mitja Brgant, Lesce: [s. n.], 2022.	2	
Production and applications of cellulose nanomaterials, Compiled and edited by Michael T. Postek, Robert J. Moon, Alan W. Rudie and Michael A. Bilodeau., Peachtree Corners, GA : TAPPI Press, 2013.	1	
1.9. Supplementary literature 1. Katarina Gerić, Miljana Prica, Rastko Milošević: „Grafički materijali: praktikum za vežbe“, Novi sad: Fakultet tehničkih nauka, 2018., ISBN 9788660220341 2. Lavoine, N., Desloges, I., Dufresne, A., & Bras, J. (2012). Microfibrillated cellulose - its barrier properties and applications in cellulosic materials: a review. <i>Carbohydrate polymers</i>, 90(2), 735–764. https://doi.org/10.1016/j.carbpol.2012.05.026 3. <i>Nanomaterials for food packaging : materials, processing technologies and safety issues</i>, edited by Miguel Ângelo Cerqueira ... [et al.], Amsterdam : Elsevier, 2018. 4. Yu, J., Xu, S., Liu, B., Wang, H., Qiao, F., Ren, X., & Wei, Q. (2023). PLA bioplastic production: From monomer to the polymer. <i>European Polymer Journal</i>, 193, 112076. 5. Dietrich, K., Dumont, M. J., Del Rio, L. F., & Orsat, V. (2017). Producing PHAs in the bioeconomy—Towards a sustainable bioplastic. <i>Sustainable production and consumption</i>, 9, 58-70.		
1.10. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, Self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Sonja Jamnicki Hanzer, PhD	
Course title	Printing Inks	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
The aim of the course is to introduce students to the production, composition, and basic properties of printing inks, as well as their proper use in graphic technology. Students learn about the specific properties of printing inks for different printing techniques and acquire basic and practical skills in the selection of printing inks for different substrates in order to achieve the desired print quality according to the intended use of the end product. In addition, they acquire skills in carrying out laboratory tests with printing inks, with a focus on assessing the quality and stability of prints on substrates. Students develop skills in identifying and solving issues related to the use of inks that are not compatible with the chosen substrate or printing technology.
1.2. <i>Enrollment conditions</i>
Completed the course <i>Fibrous Printing Substrates</i> .
1.3. <i>Expected learning outcomes</i>
1. Explain the properties of printing ink components and their role in ink composition. 2. Relate the basic and rheological properties of printing inks to predict their behavior during the printing and finishing processes. 3. Compare the composition and properties of inks as a function of printing technique. 4. Identify possible causes of printing problems caused by the use of unsuitable inks and/or substrates. 5. Recommend printing inks according to printing technique, type of substrate and intended use of the graphic product. 6. Independently carry out laboratory tests with inks to assess their suitability for printing as well as tests on the stability and durability of the prints on the substrate.
1.4. <i>Course content</i>
1. Components of printing inks: Colorants (pigments, dyes) and fillers 2. Components of printing inks: Vehicles (oils, resins, solvents) and additives for printing inks 3. Composition of the different types of vehicles and their influence on the drying properties and general characteristics of printing inks 4. General and rheological properties of printing inks – consistency, viscosity, flow behavior, tackiness, thixotropy

5. Laboratory tests on the viscosity and tackiness of printing inks 6. Mechanisms of drying and curing of printing inks 7. Analysis of the drying speed of printing inks on the substrate 8. Identification of possible problems with ink's incompatibility depending on the type of substrate (ink blocking and picking) – Performance of laboratory tests 9. Production of printing inks 10. Properties and specifics of inks for each printing process (letterpress printing, offset printing, gravure printing, screen printing, inkjet printing) 11. Creation of standardized laboratory test prints, ink transfer test – absorption capacity of the substrate for a specific printing ink 12. Determination of transparency and colorimetric values of process offset inks 13. Mechanical resistance of laboratory prints – Performance of standard tests for rub and scratch resistance 14. Resistance of laboratory prints to water and solvents – Performance of the wet rub test 15. Formulations of printing inks for food packaging – Compliance with legal regulations.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☐ Mentorship ☒ Other	
1.6. Student obligations							
The prerequisite for taking the examination is attendance of at least 50% of the lectures, 80% of the practical exercises and passing the compulsory test of the practical exercises.							
1.7. Student work monitoring							
Attendance	X	Activity in classes		Seminar paper		Experimental work	X
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
<u>Grading:</u> Project assignment as part of the exercises – 7% Mandatory exercise exam – 15% Written exam – 60% or through continuous assessment (midterms) Midterm exam 1 – 30% Midterm exam 2 – 30% Online quizzes – 10% Class attendance (over 50%) – 8%							
Learning Outcome Evaluation:							

1. As part of the written exam and/or midterms, students will explain the properties of printing ink components and their role in ink composition. 2. As part of the written exam and/or midterms, students will link the basic and rheological properties of printing inks to predict their behavior in printing and finishing processes. 3. As part of the written exam and/or midterms, students will compare the composition and properties of printing inks depending on the printing technique. 4. As part of laboratory exercises, students will identify potential causes of printing problems that can be attributed to the use of inadequate printing inks and/or substrates. 5. As part of laboratory exercises, students will recommend printing inks depending on the printing technique, the type of substrate and the end use of the graphic product. 6. As part of laboratory exercises, students will independently conduct laboratory tests of printing inks to assess their suitability for printing and to test the stability and durability of the prints on the substrate.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
Title	Number of copies	Number of students
<i>The Printing Ink Manual, Fifth Edition, R. H. Leach, R. J. Pierce (Eds.), Springer, Dordrecht, 2008.</i>	1	
<i>Ronald E Todd, Printing inks : Formulation principles, manufacture and quality control testing procedures, Pira International, 1994</i>	1	
<i>Prca Miljana, Adamović Savka: Grafički materijali - 3. izd. - Novi Sad : Fakultet tehničkih nauka, 2021 (Novi Sad : FTN, Grafički centar GRID).</i>	1	
<i>C. H. Williams, The Printer's Ink Handbook, Mclean Hunter Ltd, Hertfordshire, 1992.</i>	1	
<i>Abd El-Rahman Elsayed Saad, A., Aydemir, C., Ayhan Özsoy, S., & Yenidoğan, S. (2021). Drying methods of the printing inks. Journal of Graphic Engineering and Design, 12(2), 29–37. https://doi.org/10.24867/JGED-2021-2-029</i>	Available online	
<i>Siegwerk (2019): Know-How: Printing inks for food packaging; Dostupno na: https://ink-safety-portal.siegwerk.com/</i>	Available online	
1.10. Supplementary literature		
1. Flint Group (2016.) Food Packaging: A Guide to Best Practices for Print, dostupno na: https://www.flintgrp.com/media/4100/food-packaging-brochure_nw_september_2016-copy.pdf		

2. Norden (2014): Food contact materials and articles: Printing Inks, http://norden.diva-portal.org/smash/get/diva2:702311/FULLTEXT01.pdf
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies
Student Survey, Self-Evaluation Form

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Asst. prof. Denis Jurečić, PhD	
Course title	Codes in Packaging	
Study programme	Undergraduate university study programme Graphic technology	
Course status	elective	
Year	II.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+2+0

COURSE DESCRIPTION
1.1. Course objectives
The aim of the course is to equip students with the skills to independently design modern packaging labeling methods using various types of codes. Throughout this course, students will acquire fundamental knowledge about codes and coding in the field of packaging. They will gain insights that will enable them to categorize the functions and meanings of codes on packaging, such as protective, informational, and storage-transportation functions. The course will allow them to recognize and classify barcodes, QR codes, 2D and 3D codes, as well as RFID and infrared packaging coding systems. By mastering the course content, students will be able to compare the advantages and disadvantages of technological processes, software tools, and machines and devices used for printing codes and applying them to packaging in the packaging process.
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Identify modern packaging labeling methods using codes 2. Establish the advantages and disadvantages of codes on packaging (protective, informational, storage, and transport); 3. Apply different types of packaging for barcodes, QR codes, 2D and 3D codes, RFID, and infrared packaging codes; 4. Design methods for the quick recognition of different codes on packaging;

5. Utilize tools for code creation, machines and devices for printing and applying codes in the form of labels on boxes in the packaging process, and connect them into a complete technological process;							
1.4. Course content							
1. Modern methods of identifying codes in packaging. 2. Basic concepts, codes, and encoding. 3. Functions and significance of codes; protective, informational, storage, and transport. 4. Classification of codes; barcodes, or EAN codes. Printers, labels, and stickers. 5. QR codes, 2D and 3D models. The coding process. 6. RFID system. Identification through radio frequency. Remote transmission and reception of data using RFID tags - transmitters. 7. Infrared packaging system. Ultra-hidden system of pictorial and textual information on packaging. 8. Visibility, readability, and recognizability of codes on packaging. Technology for creating and printing codes. Errors in the coding system.							
1.5. Types of Teaching Methods				X Lectures ☐ Seminars and workshops X Exercises ☐ Online education ☐ Fieldwork		X Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship X Other_	
1.6. Student obligations							
Mandatory attendance at lectures and exercises, as well as active participation in online activities in the Merlin system. The conditions for access to the exam are 70% attendance in class and 70% attendance in online activities. Completion of independent work.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
ASSESSMENT:							
1. Independent (project) work - 60% 2. Presentation of the work - 25% 3. Online activity (Merlin) - 5% 4. Attendance in class (lectures, exercises, online) - 10%							
EVALUATION:							

1. In written form, explain the basic knowledge of packaging and coding, and define various types of codes on packaging by type, format, shape, and other parameters. 2. In written form and within the framework of exercises, students elaborate on their knowledge of different approaches and technologically develop codes, solve problems related to their printing, and plan new application methods for various packaging forms. 3. Within the framework of exercises, students independently apply their knowledge for detecting various types of codes with different packaging materials and, through their active participation in discussions, develop creative knowledge for generating new constructive design ideas and solutions for codes in the packaging industry. 4. Within the framework of exercises and the project assignment, students create and present their works. They argue and explain the final packaging products with applied codes, compare and comment on their own and others' works with the intention of recognizing future errors and improvements. 5. In the framework of the project assignment, students design new codes and solutions in the packaging industry. They evaluate and connect work processes, materials, and codes into a complete packaging product.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Collins, D. J., Whipple N. N., Upotreba crtičnog kôda, Upute i preporuke, Edac, Zagreb, 1997.	1	
Encyclopedia of Packaging Technology, John Wiley & Sons, Inc., New York , 1997	1	
<i>EAN priručnik</i> , Hrvatska gospodarska komora CRO-EAN, Zagreb, 1992	Available online.	
Clara B. Knopf; 3D Packaging: A Creative Guide to Design & Innovation	Available online.	
1.10. Supplementary literature		
1. D. Jurečić; Istraživanje čvrstoće ambalaže od valovitog kartona u kondicioniranim uvjetima, doktorski rad 2. A. Rodin; Ambalaža, distribucija i mjesto prodaje; Udruženje propangadista SR Hrvatske; Zagreb; 1984. 3. A. Rodin; <i>Ambalaža kao element marketinga</i>; Grafičar; Ludbreg; 1977. 4. Bauer, K., <i>Ambalaža je nezamisliva bez piktograma i ideograma</i>, Ambalaža br. 9, Tectus, Zagreb, 1998., str. 29. 5. Grabarić, Ž., <i>Generiranje linijskih kôdova u boji i neke mogućnosti korištenja u informacijskim sustavima</i>, magistarski rad, Fakultet organizacije i informatike, Varaždin, 1996. 6. Rodin, A., <i>Uloga EAN-KODA u sistemu distribucije proizvoda-primjena na ambalaži, paletama i kontejnerima</i>, Jugoslavensko savjetovanje, Zagreb, 1987.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
1. Student survey		
2. Self-evaluation form		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Asst. prof. Denis Jurečić, Ph.D.	
Course title	Packaging	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to educate and familiarize students with modern industrial packaging production in finishing departments, which includes the creation of stamping tools, selection of methods and production of die-cuts, as well as systems for shaping finished boxes. Students will be able to categorize the functions and tasks of packaging, differentiate between the concepts of packaging and packing, and define the classification of packaging from various perspectives. The course will enable them to recognize different packaging materials, identify their differences, and adapt them for specific types of packaging. Students will also become acquainted with technological processes, software tools, and machines and devices used to construct die-cuts and graphically design the surfaces of various packaging shapes.</i>
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Define contemporary industrial packaging production and processing methods. 2. Classify the functions and tasks of packaging (protective, informational, storage, and transportation). 3. Identify packaging materials and classify their durability (mechanical, chemical, biological, and optical). 4. Construct packaging shapes and calculate their cut sizes. 5. Connect tools for cutting, machines for die-cutting, gluing, and forming boxes into a complete technological process.
1.4. Course content
1. What is packaging, the division of packaging, primary and secondary packaging. The difference between the terms packing and packaging. The development of packaging from the beginning of civilization to the present day. 2. The functions of packaging; protective, informational, storage, transportation. Barcodes, EAN, and QR codes; their role.

3. Types of materials for packaging production (cardboard, plastic, glass, metal, wood, textile, laminate). Disposal of packaging and the recyclability of individual materials.

4. Standards in packaging production. Types of packaging and their manufacturability. Requirements regarding the quality of materials. Durability (mechanical, chemical, biological, optical), impermeability (mechanical), conductivity (electrical and optical), density (of materials).

5. Properties of materials from the perspective of packaging production (newsprint, chrome substitute, parchment paper, crepe paper, silk paper, waxed paper, shren paper, kraftliner, testliner, gray cardboard, cellophane). Plastics (PE, PP, PVC, PVA, PS, PA, PET), laminates.

6. Box die-cutting, methods of making boxes (circular cutter, slotter, punch). Preparation processes for materials: impregnation, layering, coating.

7. Tools for die-cutting and the materials from which they are made (knives; movement of knives through translation and rotation) machines for die-cutting (circular cutters; types of boxes and methods of making boxes using circular cutters and die-cutting machines - technology.

8. Slotters; types of boxes and methods of making boxes using slotters, errors on slotters and ways to correct them.

9. Punches; divisions of punches, technology operations on punches. Combinations of various types of punches from the perspective of technology and tool specifics. Punching with single-piece and multi-piece adjustable and non-adjustable tools.

10. Materials for tool manufacturing and their production. Technology for tool production: holders for steel strips made from blind printing materials, holders for steel strips made from machined steel blocks; holders for steel strips made from polyurethane; holders for steel strips made from plywood; speed of tool production, quality of tools and their techno-economic viability.

11. Die-cutting saws, servo-feed saws, laser cutting of plywood.

12. Box formation through gluing, sewing, and interlocking. Speeds of box production, quality of produced boxes. American boxes. Dutch boxes. Mistakes that occur during box production and their resolution."

1.5. Types of Teaching Methods

☒ Lectures
☐ Seminars and workshops
☒ Exercises
☐ Online education
☐ Fieldwork

☒ Independent tasks
☐ Multimedia and network
☐ Laboratory
☐ Mentorship
☒ Other_

1.6. Student obligations

Mandatory attendance at lectures and exercises, as well as active participation in online activities in the Merlin system. The requirements for exam eligibility are 70% attendance in classes and 70% participation in online activities.

1.7. Student work monitoring

Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	
Portfolio							

1.8. Assessment and evaluation of student work during classes and at the final exam.

ASSESSMENT:

1. Midterm Exam 1 - 15%
2. Midterm Exam 2 - 30%
3. Midterm Exam 3 - 35%
4. Written Exam - 80% (or midterms 1-3)
5. Oral Exam - 10%
6. Online Activity (Merlin) - 5%
7. Attendance in Classes (lectures, exercises, online) - 5%

EVALUATION:

1. In written form, explain the basic knowledge in the field of packaging and define various packaging products by type, format, shape, and material.
2. In written form and as part of the exercises, students elaborate on their knowledge of different approaches and technologically develop three different selected packaging forms (box, binder, bag), measuring and calculating the format and components of the packaging.
3. Within the exercises, students independently apply knowledge for the detection of packaging materials and connect packaging work processes into a cohesive graphic-packaging product.
4. As part of the exercises and project task, students create and provide reasoned justifications for the final packaging products with the aim of identifying and solving technological problems.
5. Within the project task, students shape new constructive design ideas and solutions in the packaging industry.

1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course

Title	Number of copies	Number of students
Stričević, N.: <i>Suvremena ambalaža 1</i>	Available online	
Stričević, N.: <i>Suvremena ambalaža 2</i>	Available online	
Rodin, A.: <i>Ambalaža od valovitog kartona</i>	Available online	
F. Hesse i H. J. Tenzer: <i>Verpackungsmittelaus Papier, Karton und Pappe</i>	Available online	
H. Kipphan, <i>Handbook of print media</i>	Available online	

Supplementary literature

1. D. Jurečić; Evaluacija elemenata vizualne informacije na grafičkoj opremi ambalaže, magistarski rad
2. D. Jurečić; Istraživanje čvrstoće ambalaže od valovitog kartona u kondicioniranim uvjetima, doktorski rad
3. Encyclopedia of Packaging Technology, John Wiley & Sons, Inc., New York, 1997
4. T. H. Tenzer; *Leitfaden der Papierverarbeitungstechnik*, VEB Fachbuchverlag, Leipzig, 1989
5. A. Rodin; Ambalaža, distribucija i mjesto prodaje; Udruženje propangadista SR Hrvatske; Zagreb; 1984.
6. A. Rodin; *Ambalaža kao element marketinga*; Grafičar; Ludbreg; 1977.
7. Babić, Darko; Jurečić, Denis; Lajić, Branka., Utjecaj veličine valova na čvrstoću vertikalne i horizontalne površine valovitog kartona // *Annals of DAAAM for 2006 & Proceedings* / Katalinić, Branko (ur.), Vienna: DAAAM International Vienna, 2006. 019-020
8. Babić, Darko; Lajić, Branka; Jurečić, Denis., Čvrstoća konstrukcije transportne kutije za voće i povrće // *MATRIB 2006: 11. Savjetovanje o materijalima, tehnologijama, trenju i trošenju*

9. Lajić, Branka; Babić, Darko; Jurečić, Denis., Ispitivanje čvrstoće transportne kutije od valovitog kartona u ovisnosti o materijalu i konstrukciji // *Proceedings of International conference on Computer Aided Design and Manufacturing CADAM 2006* /Obsiger, Boris (ur.). Rijeka: Zigo Rijeka, 2006. 55-57
V. Potisk, Grafička dorada, Školska knjiga, 1996

1.10. Methods for monitoring the quality of acquired knowledge, skills, and competencies

1. Student Survey

2. Self-Evaluation Form

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Vanda Jurković PhD in Art	
Course title	Art in Visual Media	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	I.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+0+1

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
The goal of the course is to collect relevant information, facts, data and terms for the purpose of making a design decision, i.e. performing an artistic arrangement of a graphic product. Insight into elements of visual structure and ideas will be gained, students will be able to analyze and interpret data. Through knowledge about the segments of making design decisions, about trends in the visual world, students will acquire basic knowledge for communication on the topic of visibility. The goal is to master concepts, create ideas and create your own interpretation. They will independently perform a simple visual project. Students will be able to compare solutions, see advantages and disadvantages in visual solutions.
1.2. <i>Enrollment conditions</i>
1. Analyze shapes from the field of visibility 2. Understand the basics of visibility and their use in business practice and assess which solutions are of good quality and which are inadequacies 3. Collect material from the field of the contemporary world of visibility 4. Interpret research results through written work and presentation. 5. Evaluate results and potential design flaws or improvements 6. Finally, apply theoretical knowledge to your own practical work
1.3. <i>Expected learning outcomes</i>

1. Art or formal-aesthetic analysis of selected visual media 2. Unity of form and function, level of media load 3. Analysis of a certain medium on the market and author's independence 4. Making your own solution, the concept of making decisions about individual phases (survey, examination, subsequent examination) 5. Making design decisions in segments of individual realizations - from idea to realization (drawing, printing, TV, Internet) 6. Analysis of message syntax and semantics, signaling, size and contrast 7. Analysis of possible effects (survey, examination of clarity among consumers), analysis of the scope of investment, cost of funds and the range of acceptability of solutions, the range of possible consumers 8. Design elements that make up style, unity, recognition (for serial design) 9. Visuality in public media (posters) 10. Visuality in daily newspapers, magazines 11. Visuality on TV, Internet 12. Concept of art (number of colors, drawing or photo, typographic sign, simplicity or burden of form) in relation to possible consumers 13. Types of author's idea: perceptive, technical through measurement 14. Type of author's idea: conceptual 15. Type of author's idea: expressive								
1.4. Course content								
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other 49 % teaching online			
1.6. Student obligations								
Mandatory attendance of lectures and completed independent project assignment. Completing tasks on time. Mandatory minimum 70% attendance at classes.								
1.7. Student work monitoring								
Attendance	X	Activity in classes		Seminar paper	X	Experimental work		
Written exam		Oral exam		Essay		Research		
Project		Continuous knowledge assessment		Report		Practical work		
Portfolio	X							
1.8. Assessment and evaluation of student work during classes and at the final exam.								
Independent research, project assignment and work presentation - 90% Attendance at classes - 10% Evaluation:								

1. As part of the exercises, students will present the collected material 2. Students will present the basic concepts and ideas of the course 3. Students will submit a written paper		
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>R. Arnheim: Umetnost i vizualno opažanje, Univerzitet umetnosti u Beogradu, Beograd 1981.</i>	1	
<i>A. Hashimoto & M. Clayton: Visual Design Fundamentals, A Digital Approach, Third Editions, Charles River Media, USA, 2009.</i>	1	
<i>G. Ambrose & P. Harris: The Fundamentals of Graphic Design, Ava Academia, 2009</i>	1	
1.10. <i>Supplementary literature</i> Books and catalogs about visual arts		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey, self-evaluation form</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Katarina Knjaz, Senior Lecturer	
Course title	Physical Education and Health I	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	1
	Number of hours (L+E+S)	0+30+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>

The goal of the course Physical Education and Health is to raise awareness of the importance of daily physical exercise, to maintain previously acquired and adopt new motor skills, and to influence anthropometric characteristics, motor and functional abilities, as well as the cognitive and conative dimensions of personality. Additionally, the course aims to improve health and work capacity, meet the need for movement, and equip students with the ability to use and spend their free time rationally and meaningfully. The course seeks to impact students' health and normal bio-psycho-social development, as well as educate them on the importance of attending classes, participating in sports or other forms of recreational physical activities throughout life. It also emphasizes the importance of proper and balanced nutrition as part of lifelong learning and general culture.							
1.2. Enrollment conditions							
No prior knowledge is required. The course is enrolled by all students regardless of their previously acquired motor skills and abilities.							
1.3. Expected learning outcomes							
Demonstrate and explain the correct execution of new elements of a particular kinesiology activity. Present technical and/or tactical elements of a particular kinesiology activity. Demonstrate and explain stretching exercises for a specific kinesiology activity. Demonstrate multiple specific warm-up exercises for a particular kinesiology activity. Demonstrate and explain strength and endurance exercises aimed at preventing musculoskeletal health issues. Recommend kinesiology activities to peers and explain the benefits of physical exercise.							
1.4. Course content							
As part of the course schedule, students, under the supervision of the course instructor or an external associate, can participate in various kinesiology activities offered during the current academic year. The activities are adjusted each year based on available resources and working conditions. The most common activities students can participate in include: basketball, futsal, volleyball, rowing, badminton, hiking tours, group fitness programs, archery, bowling...							
1.5. Types of Teaching Methods				☐ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork		☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
By regularly attending classes (with a minimum attendance of 80% of the exercises) and actively participating in the lessons, the student will successfully fulfill the course requirements. The student is required to attend classes in appropriate sports clothing and footwear. There is no exam.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	

Project		Continuous knowledge assessment		Report		Practical work	
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title		Number of copies		Number of students			
1.10. <i>Supplementary literature</i>							
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>							
Student survey, self-evaluation form, etc..							

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Katarina Knjaz, Senior Lecturer	
Course title	Physical Education and Health II	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	1
	Number of hours (L+E+S)	0+30+0

COURSE DESCRIPTION
1.1. Course objectives
The goal of the course Physical Education and Health is to raise awareness of the importance of daily physical exercise, to maintain previously acquired and adopt new motor skills, and to influence anthropometric characteristics, motor and functional abilities, as well as the cognitive and conative dimensions of personality. Additionally, the course aims to improve health and work capacity, meet the need for movement, and equip students with the ability to use and spend their free time rationally and meaningfully. The course seeks to impact students' health and normal bio-psycho-social development, as well as educate them on the importance of attending classes, participating in sports or other forms of recreational physical activities throughout life. It also emphasizes the importance of proper and balanced nutrition as part of lifelong learning and general culture.

1.2. Enrollment conditions								
No prior knowledge is required. The course is enrolled by all students regardless of their previously acquired motor skills and abilities.								
1.3. Expected learning outcomes								
Demonstrate and explain the correct execution of new elements of a particular kinesiology activity. Present technical and/or tactical elements of a particular kinesiology activity. Demonstrate and explain stretching exercises for a specific kinesiology activity. Demonstrate multiple specific warm-up exercises for a particular kinesiology activity. Demonstrate and explain strength and endurance exercises aimed at preventing musculoskeletal health issues. Recommend kinesiology activities to peers and explain the benefits of physical exercise.								
1.4. Course content								
As part of the course schedule, students, under the supervision of the course instructor or an external associate, can participate in various kinesiology activities offered during the current academic year. The activities are adjusted each year based on available resources and working conditions. The most common activities students can participate in include: basketball, futsal, volleyball, rowing, badminton, hiking tours, group fitness programs, archery, bowling...								
1.5. Types of Teaching Methods				☐ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_			
1.6. Student obligations								
By regularly attending classes (with a minimum attendance of 80% of the exercises) and actively participating in the lessons, the student will successfully fulfill the course requirements. The student is required to attend classes in appropriate sports clothing and footwear. There is no exam.								
1.7. Student work monitoring								
Attendance	X	Activity in classes	X	Seminar paper		Experimental work		
Written exam		Oral exam		Essay		Research		
Project		Continuous knowledge assessment		Report		Practical work		
Portfolio								
1.8. Assessment and evaluation of student work during classes and at the final exam.								

1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
1.10. <i>Supplementary literature</i>		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey, self-evaluation form, etc..</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Katarina Knjaz, Senior Lecturer	
Course title	Physical Education and Health III	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	1
	Number of hours (L+E+S)	0+30+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The goal of the course Physical Education and Health is to raise awareness of the importance of daily physical exercise, to maintain previously acquired and adopt new motor skills, and to influence anthropometric characteristics, motor and functional abilities, as well as the cognitive and conative dimensions of personality. Additionally, the course aims to improve health and work capacity, meet the need for movement, and equip students with the ability to use and spend their free time rationally and meaningfully. The course seeks to impact students' health and normal bio-psycho-social development, as well as educate them on the importance of attending classes, participating in sports or other forms of recreational physical activities throughout life. It also emphasizes the importance of proper and balanced nutrition as part of lifelong learning and general culture.</i>
1.2. <i>Enrollment conditions</i>
<i>No prior knowledge is required. The course is enrolled by all students regardless of their previously acquired motor skills and abilities.</i>
1.3. <i>Expected learning outcomes</i>
<i>Demonstrate and explain the correct execution of new elements of a particular kinesiology activity. Present technical and/or tactical elements of a particular kinesiology activity. Demonstrate and explain stretching exercises for a specific kinesiology activity.</i>

<i>Demonstrate multiple specific warm-up exercises for a particular kinesiology activity.</i> <i>Demonstrate and explain strength and endurance exercises aimed at preventing musculoskeletal health issues.</i> <i>Recommend kinesiology activities to peers and explain the benefits of physical exercise.</i>								
1.4. Course content								
<i>As part of the course schedule, students, under the supervision of the course instructor or an external associate, can participate in various kinesiology activities offered during the current academic year. The activities are adjusted each year based on available resources and working conditions. The most common activities students can participate in include: basketball, futsal, volleyball, rowing, badminton, hiking tours, group fitness programs, archery, bowling...</i>								
1.5. Types of Teaching Methods				☐ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_			
1.6. Student obligations								
<i>By regularly attending classes (with a minimum attendance of 80% of the exercises) and actively participating in the lessons, the student will successfully fulfill the course requirements. The student is required to attend classes in appropriate sports clothing and footwear. There is no exam.</i>								
1.7. Student work monitoring (mark with X for the appropriate method)								
Attendance	X	Activity in classes	X	Seminar paper		Experimental work		
Written exam		Oral exam		Essay		Research		
Project		Continuous knowledge assessment		Report		Practical work		
Portfolio								
1.8. Assessment and evaluation of student work during classes and at the final exam.								
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course								
Title		Number of copies		Number of students				
1.10. Supplementary literature								
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies								
Student survey, self-evaluation form, etc..								

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Katarina Knjaz, Senior Lecturer	
Course title	Physical Education and Health IV	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	1
	Number of hours (L+E+S)	0+30+0

COURSE DESCRIPTION		
1.1. Course objectives		
The goal of the course Physical Education and Health is to raise awareness of the importance of daily physical exercise, to maintain previously acquired and adopt new motor skills, and to influence anthropometric characteristics, motor and functional abilities, as well as the cognitive and conative dimensions of personality. Additionally, the course aims to improve health and work capacity, meet the need for movement, and equip students with the ability to use and spend their free time rationally and meaningfully. The course seeks to impact students' health and normal bio-psycho-social development, as well as educate them on the importance of attending classes, participating in sports or other forms of recreational physical activities throughout life. It also emphasizes the importance of proper and balanced nutrition as part of lifelong learning and general culture.		
1.2. Enrollment conditions		
No prior knowledge is required. The course is enrolled by all students regardless of their previously acquired motor skills and abilities.		
1.3. Expected learning outcomes		
Demonstrate and explain the correct execution of new elements of a particular kinesiology activity. Present technical and/or tactical elements of a particular kinesiology activity. Demonstrate and explain stretching exercises for a specific kinesiology activity. Demonstrate multiple specific warm-up exercises for a particular kinesiology activity. Demonstrate and explain strength and endurance exercises aimed at preventing musculoskeletal health issues. Recommend kinesiology activities to peers and explain the benefits of physical exercise.		
1.4. Course content		
As part of the course schedule, students, under the supervision of the course instructor or an external associate, can participate in various kinesiology activities offered during the current academic year. The activities are adjusted each year based on available resources and working conditions. The most common activities students can participate in include: basketball, futsal, volleyball, rowing, badminton, hiking tours, group fitness programs, archery, bowling...		
1.5. Types of Teaching Methods	☐ Lectures	☐ Independent tasks

				☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_
1.6. Student obligations					
By regularly attending classes (with a minimum attendance of 80% of the exercises) and actively participating in the lessons, the student will successfully fulfill the course requirements. The student is required to attend classes in appropriate sports clothing and footwear. There is no exam.					
1.7. Student work monitoring (mark with X for the appropriate method)					
Attendance	X	Activity in classes	X	Seminar paper	Experimental work
Written exam		Oral exam		Essay	Research
Project		Continuous knowledge assessment		Report	Practical work
Portfolio					
1.8. Assessment and evaluation of student work during classes and at the final exam.					
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course					
Title		Number of copies		Number of students	
1.10. Supplementary literature					
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies					
Student survey, self-evaluation form, etc..					

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Katarina Knjaz, Senior Lecturer	
Course title	Physical Education and Health V	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	1
	Number of hours (L+E+S)	0+30+0

COURSE DESCRIPTION		
1.1. Course objectives		
The objectives of the course Physical Education and Health V is to raise awareness of the importance of daily physical exercise, to maintain previously acquired and adopt new motor skills, and to influence anthropometric characteristics, motor and functional abilities, as well as the cognitive and conative dimensions of personality. Additionally, the course aims to improve health and work capacity, meet the need for movement, and equip students with the ability to use and spend their free time rationally and meaningfully. The objective of the course is to impact the health and normal bio-psycho-social development of students, as well as to enable student-athletes to continue their sports careers by participating in university competitions.		
1.2. Enrollment conditions		
The prerequisite for enrolling in the course is participation in sports sections during the first two years of the undergraduate university program, as well as participation in university competitions.		
1.3. Expected learning outcomes		
Demonstrate and explain the correct execution of new elements of a particular kinesiology activity. Present the technical and/or tactical elements of a particular kinesiology activity. Apply acquired motor skills in situational conditions (competitions). Demonstrate and explain stretching exercises for a specific kinesiology activity. Demonstrate multiple specific warm-up exercises for a particular kinesiology activity. Demonstrate and explain strength and endurance exercises for the purpose of preventing musculoskeletal health issues.		
1.4. Course content		
As part of the course schedule, students, under the supervision of the course instructor or an external associate, can engage in various kinesiology activities offered during the current academic year. The activities are adjusted each year based on available resources and working conditions. The most common sports activities organized as sports sections include: futsal, basketball, volleyball, handball, rowing, table tennis, certain athletic disciplines, swimming...		
1.5. Types of Teaching Methods	☐ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_
1.6. Student obligations		
Polaganja ispita nema. Redovitim sudjelovanjem u trenažnom procesu i sudjelovanjem na sveučilišnim natjecanjima student će uspješno odraditi obavezu prema kolegiju.		
1.7. Student work monitoring		

Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project		Continuous knowledge assessment		Report		Practical work	
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title		Number of copies		Number of students			
1.10. <i>Supplementary literature</i>							
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>							
Student survey, self-evaluation form, etc..							

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Rahela Kulčar, PhD	
Course title	Fundamentals of Colorimetry	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The goal of the course is to familiarize students with the fundamental concepts of colorimetry and its importance in the graphic industry. Students will master basic methods of color measurement and develop the ability to analyze and interpret spectral data. Special attention will be given to the application of colorimetry in the printing industry, where students will develop skills for quality control and consistency of color in printed materials. The course will also explain the importance of color standardization in the graphic industry and help students develop the ability for critical analysis and evaluation of measurement results.</i>

1.2. Enrollment conditions							
None							
1.3. Expected learning outcomes							
1. Analyse factors necessary for quantitative color evaluation. 2. Identify deficits in color perception. 3. Based on visual assessments and instrumental measurements, comment on the psychophysical properties of color. 4. Categorize color measurement devices according to desired data and substrate type. 5. Conduct instrumental measurements and graphically present the results. 6. Connect instrumental and visual results of color evaluation.							
1.4. Course content							
1. Basic Concepts and Principles of Colorimetry 2. Standard Observer as a Key Concept in Colorimetry; Calculation of Tristimulus Values 3. Chromatic Coordinates and Chromatic Diagram (CIExy) 4. Uniform Color Space, CIELAB; Concept and Application of the CIELAB System; Advantages of a Uniform Color Space 5. Light and Its Interaction with Materials; Spectral Properties of Light and Materials 6. Color Rendering; CRI Index; Standard Types of Lighting (A, F, D50, D65...) 7. Metamerism and Metamerism Index 8. Color Variability (Color Inconstancy) 9. Instruments for Color Measurement (Colorimeters, Spectrophotometers); Types and Functions of Measuring Instruments; Geometry of Measuring Devices 10. Influence of Material Characteristics on Color Measurement Results. Color variability (Color Inconstancy). 11. Methods of Analyzing Spectral Data; Evaluation and Interpretation of Spectral Measurements 12. Color Systems for Describing Colors (Munsell, NCS System, Pantone...); Application and Importance of Different Color Description Systems.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Mandatory attendance at lectures and laboratory exercises. Students complete exercises every other week with additional homework assignments. Prerequisite for exam participation: minimum 70% attendance at lectures and completed exercises.							
1.7. Student work monitoring							
Attendance	x	Activity in classes		Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay		Research	

Project	x	Continuous knowledge assessment		Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment:							
<i>Project Assignment within Exercises – 20%</i>							
<i>Written Exam – 60% or through Continuous Assessment (Colloquium)</i>							
<i>1st Colloquium – 30%</i>							
<i>2nd Colloquium – 30%</i>							
<i>Project Assignment – 20%</i>							
Evaluation:							
1. <i>In written form, explain key terms and concepts of colorimetry.</i> 2. <i>During exercises, students will conduct the Farnsworth-Munsell 100 Hue Test to identify color perception deficiencies and comment on the results.</i> 3. <i>In seminars, students will carry out research investigating one or more factors that affect color perception and argue their findings based on practical work conducted.</i> 4. <i>During exercises, students will select color measurement devices based on the type of substrate and the data that best analyze the print.</i> 5. <i>In exercises and the project assignment, students will measure color using appropriate devices and present the results graphically.</i> 6. <i>In exercises and the project assignment, students will compare visual and instrumental measurement results of different prints and explain the differences obtained.</i>							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Billmeyer and Saltzman’s Principles of Color Technology /Roy S. Berns		3					
Interdisciplinarnost barve : 1. del: V znanosti / [skupina avtorjev Dušan Božič ... [et al.] ; glavna urednika Slava Jeler, Marko Kumar].		2					
1.10. Supplementary literature							
Teaching material prepared by the course teacher and available online.							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey, Self-Evaluation form, etc.							

GENERAL INFORMATION		
Course leader	Prof. Sanja Mahović Poljaček, PhD	
Course title	Creative techniques in graphic reproduction	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to provide students with knowledge in the field of designing and production of products for specific purposes, especially in the creative technique of screen printing. Based on the knowledge acquired in the field of materials and work processes, students will be able to plan the use and propose individual materials according to their application. By mastering the course, students will be able to independently create a simple graphic product, conceptualise, adapt and integrate design elements using basic tools in graphic prepress, create appropriate graphic films and printing plates, propose materials for reproduction in screen printing and create new products for specific purposes. This course structure provides a comprehensive understanding of the creative application of screen printing and combines theoretical knowledge with practical application that enables students to develop skills and creativity in graphic reproduction.</i>
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Classify products and materials according to their application in screen printing. 2. Correctly use the graphic tools of pre-press to design a simple graphic product. 3. Plan the production of films, printing plates and other elements for reproduction. 4. Independently create products for reproduction using suitable materials. 5. Anticipate possible difficulties in reproduction when using differently produced films, printing plates and materials. 6. Designing of the simple graphic products that can be reproduced by screen printing.
1.4. Course content
1. Introduction to screen printing, history and development of screen printing. 2. Application of screen printing in the graphic arts. 3. Production and properties of printing plates, methods for producing reproductions. 4. Creative possibilities of screen printing. 5. Design principles and graphic preparation for screen printing. 6. Production of films and adaptation of motifs for reproduction. 7. Basic principles and planning of the reproduction process. 8. Process for making printing plates. 9. Preparation and mixing of printing inks.

6. As part of practical exercises, students will create simple graphic products that can be reproduced using screen printing.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Sefar AG, Handbook for Screen Printers, Hrvatska Udruga Sitotiskara, Zagreb (1999)	2	
Gojo M., Mahović Poljaček S., Osnove tiskovnih formi, Sveučilište u Zagrebu Grafički fakultet (2013)	10	
Stromquist A., Simple Screenprinting: Basic Techniques & Creative Project, Lark Crafts 1st, First Printing edition (2005)	10	
Kipphan H. Handbook of Print Media. Springer, Berlin, Heidelberg (2001). ISBN 978-3-540-67326-2	10	
1.10. Supplementary literature		
1. Mahović Poljaček S. CtP tehnologije - digitalno vođeni postupci izrade tiskovnih formi, Sveučilište u Zagrebu Grafički fakultet (2021)		
1.11. 2. Brad Faine, The New Guide to Screenprinting, Headline (1989).		
1.12. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Sanja Mahović Poljaček, PhD, Assoc. Prof. Tomislav Cigula, PhD, Asst. Prof. Tamara Tomašegović, PhD	
Course title	<i>Transfer and properties of an image on printing plates</i>	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION		
1.1. <i>Course objectives</i>		
The course aims to introduce students to the image transfer in a digital environment onto the surface of printing plates. Students will be able to plan the reproduction process by relating the parameters of graphic prepress with production of printing plates, to recognize the characteristics of files needed for the reproduction process, classify printing plates according to production principles, and compare different systems of printing plate production. Students will be able to choose appropriate methods for printing plate analysis, relate the parameters of the plate production to its characteristics, calculate and present parameters in the production of printing plates.		
1.2. <i>Enrollment conditions</i>		
1.3. <i>Expected learning outcomes</i>		
1. Integrate elements of graphic prepress in a digital environment by adjusting the image for transfer to the printing plate. 2. Apply the functioning principles of different types of printing plates in the process of their production and application. 3. Identify errors on printing plates, i.e., printing plates that do not have adequate properties and could cause problems in the graphic reproduction process. 4. Calculate the energy needed for exposure and the number of printing plates needed to reproduce the product. 5. Use devices for quality control and measurements on printing plates. 6. Choose an optimal type of printing plate for the reproduction of a specific graphic product.		
1.4. <i>Course content</i>		
1. Workflow in conventional and digital environment. 2. Dynamic workflow in a digital environment. 3. Integration of graphic prepress elements. 4. Key elements in the production of printing plates, computer - devices - materials. 5. Properties, structure and materials on printing plates for different reproduction techniques. 6. Mechanisms of image transfer and formation of image on the surface of various printing plates (exposure, engraving, ablation, ink-jet). 7. The influence of different process parameters on image transfer and the formation of image on the surface of different printing plates. 8. Methods for characterization and control of the image and its formation on printing plates. 9. Standardization of the reproduction process. 10. Calculation of the energy used for exposure and the number of printing plates required for reproduction of the printed product. 11. Measurements of basic parameters and quality control of printing plates.		
1.5. <i>Types of Teaching Methods</i>	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☐ Mentorship ☐ Other
1.6. <i>Student obligations</i>		

Minimum of 50% class attendance, completed seminars and exercises, handed in report on independent tasks.							
1.7. Student work monitoring (mark with X for the appropriate method)							
Attendance	x	Activity in classes		Seminar paper		Experimental work	x
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous knowledge assessment	x	Report	x	Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: Attendance at classes - 10% Written exam/continuous knowledge assessment – 55% Oral exam - 15% Report on the analysis of printing plate characteristics - 20% Evaluation: 1. As part of the exercises, students will integrate the elements of graphic prepress in the digital environment by adjusting the image for transfer to the printing plate. 2. In written form, students will apply the principles of functioning of different types of printing plates in the process of their production and application. 3. As part of the exercises, students will identify errors on printing plates, i.e., printing plates that do not have optimal properties and could cause problems in the graphic reproduction process. 4. In written form, students will present the results of the energy consumption task during the plate production and present the process parameters in the production of printing plates for a specific graphic product. 5. As part of the exercises, students will perform and report quality control of a specific printing plate. 6. As part of the oral exam, students will choose optimal printing plates for the reproduction of given graphic products.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Mahović Poljaček S. CtP tehnologije - digitalno vođeni postupci izrade tiskovnih formi, Sveučilište u Zagrebu Grafički fakultet (2021)		5					
Adams Richard M., Romano F., Computer to Plate: Automating the Printing Industry, Graphic Arts Technical Foundation, USA (1996)		2					
Kipphan H., Handbook of Print Media, Springer, Berlin (2001)							
1.10. Supplementary literature							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							

Student survey, self-evaluation form.

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Igor Majnarić, PhD.	
Course title	<i>Special effects in printing</i>	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>Students will obtain degrees in applied technologies and materials utilized in the graphic industry to create functional and visual effects on printed media. The course covers various printing methods for substrates such as plastics, ceramics, glass, metals, and textiles. It includes instruction on screen printing, pad printing, relief printing, sheet metal printing, bronzing, and retro book printing. Students will learn to print on flat and spherical surfaces, create embossed effects, segmentally de-cut, and print metalized surfaces. Practical classes will cover preparing printing consumables, including substrates, inks, and varnishes, and comparing prints using visual and optical measurement methods.</i>
1.2. <i>Enrollment conditions</i>
<i>It is recommended that you have a good understanding of conventional printing machines and the basics of densitometric and colorimetric measuring devices before starting the course.</i>
1.3. <i>Expected learning outcomes</i>
<i>To compare construction variants of printing machines that can achieve a graphic product's specific purpose (added value) (Screen printing, Pad printing, Steel-relief printing, Sheet metal printing, Book printing, Letterset, hybrid printing)</i> <i>Assess the impact of individual production parameters on the realization of prints with special effects.</i> <i>Evaluate adequate consumables for the needs of printing with special effects.</i>

4. Analyze reproduced prints with additional special effects using gloss measurement, densitometric and colorimetric measurement methods		
1.4. Course content		
1. Introduction to printing techniques to enhance prints' aesthetic and functional qualities. This section will cover the relevant terminology, concepts, and classification of decorative printing effects. 2. Book Printing: Retro Style. Learn about the principles of book printing machines and methods for preparing printing forms. 3. Finishing Effects in Book Printing: This section will cover tools for finishing effects, principles of segmental cutting, grooving, perforating, and procedures for numbering graphic products. 4. Metalized Surface Printing in Book Printing: Learn about foil printing using hot and cold processes, bronzing, and thermography, as well as achieving duplex and iris effects in printing. 5. Letterset Printing: Principles of operating letterset machines and methods for achieving duplex and iris effects on monochrome machines. 6. Sheet Metal Printing: This section will cover printing on metal printing substrates, such as packaging. Learn about the principles of operation of limo printing machines and machines for applying functional varnishes. 7. Steel Relief and Intaglio-Printing Relief Patterns: Understand the principles of operation of machines for steel relief printing and the making of Matrice and Patrice printing forms. 8. Screen Printing: Understand the basics of screen printing, procedures for selecting frames and meshes, and straining the screen printing meshes. 9. Stencil Creation and Maintenance in Screen Printing: This section will cover stencil creation and maintenance, mechanical stencil application procedures, and photochemical stencil creation procedures. 10. Screen Printing Machines: Explore the designs of screen printing machines. 11. Inks, Drying Mechanisms, and Construction of the Dryer in Screen Printing: This section will cover inks for screen printing, drying mechanisms, and dryer construction. 12. Introduction to Pad Printing: Understand the basics of pad printing and the procedures for pad and cliché selection. 13. Pad Printing Machines: Learn about pad printing machine constructions and single-color and multi-color printing procedures. 14. DI Printing Technologies: This section will explore printing procedures on machines containing units for generating printing forms.		
1.5. Types of Teaching Methods	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☒ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other
1.6. Student obligations		
<i>Students perform the exercise weekly under teacher supervision, verifying the completed content and evidention through the e-learning system. The exam conditions are as follows: minimum attendance at 50% of classes and 80% of exercises.</i>		

1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Practical work within exercises (20%), Written exam – 70% or as part of continuous assessment (Colloquium 1 – 35%, Colloquium 2 – 35%), Attendance at classes - 10%							
1. In written and/or oral form, compare construction variants of printing machines intended for the realization of special decorative and functional effects (screen printing, pad printing, steel-relief printing, letterpress printing, book printing, letterset printing, hybrid printing)							
2. In written and/or oral form and as part of exercises, evaluate the impact of individual parameters on the realization of prints with a special effect.							
3. As part of the exercises, students will determine adequate consumables for printing with special effects.							
4. As part of the exercises, students will evaluate reproduced prints with special effects using gloss, densitometric, and colorimetric measurements.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Handbook for screen printers, Sefar AG, (Translation by Kristina Bedić), Croatian Association of Screen Printing, Zagreb, 1999. ISBN 953-98499-0-X		15		70			
H. Kipphan, Hand Book of Print Media, Springer, Berlin, 2001. ISBN 3-540-67326-1		1		70			
1.10. Supplementary literature							
S. Hoff, Screen Printing: Contemporary Approach, Delmar Publisher, 1997.							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey, self-evaluation form							

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Prof. Igor Majnarić, PhD.

Course title	<i>Fundamentals of digital printing</i>	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>Students will gain hands-on experience and essential degrees in computer-to-press and computer-to-print printing technologies. They will analyze all relevant NIP printing technologies, including their fundamental working principles, to gain a practical understanding. The course will focus on the design features of digital printing machines that can print from web and sheets, whose web is crucial for creating a quality print. Students will identify and solve problems caused by the interaction of printing substrates, printing inks (toners), and other factors found in the working environment (digital printing press). During the class, students will create documents by computer and print imprints using different digital techniques, after which they will compare them with each other, applying various measurement methods to evaluate the quality of reproduction. The evaluation will be performed using advanced image analysis methods, with a standard comparison based on densitometric, colorimetric, and spectrophotometric measurement methods. The final goal of the course is to train students to work independently on electrophotographic and inkjet machines.</i>
1.2. <i>Enrollment conditions</i>
<i>Attended the Fundamentals of Colorimetry course</i>
1.3. <i>Expected learning outcomes</i>
<i>1. Describe digital printing techniques.</i> <i>2. Prepare digital files for printing on digital printing machines.</i> <i>3. Choose graphic materials and digital printing machines for a high-quality multi-colored graphic product.</i> <i>4. Analyze the obtained digital prints</i> <i>5. Compare the similarities and differences of the realized digital prints with the standards.</i>
1.4. <i>Course content</i>
<i>1. Introduction to digital printing. Emphasizing the importance of understanding the principles of digital printing for a comprehensive knowledge. Exploring the terminology and concepts. Classification of basic techniques of digital printing.</i> <i>2. Electrophotographic printing. Introduction to electrophotography. Charging procedures and image generation.</i>

3. Electrophotographic printing. Image development procedures. Types of toners. 4. Electrophotographic printing. Direct and indirect image transfer procedure. Toner fixing and cleaning procedures. 5. Electrophotographic printing, constructions of electrophotographic machines, In-line finishing machines and devices, and special effects in electrophotography. 6. Basics of Inkjet printing. Principles of work. Printing substrates and Inkjet printing inks. 7. Inkjet printing procedures using the principle of dripping on demand (thermal Inkjet printing) 8. Inkjet printing procedures using the principle of dripping on demand (piezo Inkjet printing and electrostatic Inkjet). 9. Inkjet printing processes use the principle of continuous dripping and hybrid Inkjet. 10. Ionography and electrography. Principles of operation of ionographic and electrographic machines. 11. Magnetography. Principles of operation of magnetographic machines. 12. Thermography. Principles of operation of thermographic machines based on the principle of direct transfer and thermal sublimation. 13. NIP photo and x-ray. Principles of operation of NIP photographic and x-graphic machines.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☒ Fieldwork		☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Compulsory attendance of lectures and exercises. Students perform the exercise every week under the supervision of the contractor with verification of the completed content and records through the e-learning system. The exam conditions are as follows: minimum attendance at 50% of classes and 80% of exercises.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay		Research	
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Practical work within exercises (20%), Written exam – 70% or within the framework of continuous assessment (Colloquium 1 – 35%, Colloquium 2 – 35%), Attendance at classes - 10%							
Evaluation: 1. In written and oral form, explain basic knowledge in the field of digital printing (Electrography, Inkjet, magnetography, Ionography, Electrography, Photography, Thermography, X-graphy) 2. As part of the exercises, students will prepare digital files for printing.							

3. As part of the exercises, students will choose graphic materials and printing techniques to create a quality graphic product. 4. As part of the exercises, students will analyze the obtained digital prints. 5. As part of the exercises, students will compare the similarities and differences of digital prints about the standard.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Osnove digitalnog tiska, Grafički fakultet Zagreb, Zagreb 2015. (ISBN 978-953-7644-13-0)</i>	10	
1.10. Supplementary literature G. A. Nathmann, <i>Nonimpact Printing</i> , Graphic Arts Technical Foundation, Pittsburgh, 1989, H. Kipphan et al., <i>Handbook of Print Media</i> , Springer, Berlin, 2001., G. Goldman, <i>The World of Printers</i> , Piong, OCE Printing Systems, 2004.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form,		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	prof. Lidija Mandić, PhD	
Course title	Color management	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to acquire knowledge about the characteristics of the devices involved in the graphic reproduction process, which will enable them to be monitored and adapted to future technologies. Through this course, students will acquire basic knowledge about device characterization methods and distinguish between different algorithms for color transformation, and will be able to compare the advantages and disadvantages of using different approaches. By mastering the course, the student will be able to independently connect profiles within the workflow and thus enable the quality of reproduction within graphic production.</i>

1.2. Enrollment conditions								
Attended Graphic Prepress course								
1.3. Expected learning outcomes								
1. Understand the parameters when creating a device profile 2. Select the appropriate test cards when characterizing the device 3. Connect the devices in the workflow 4. Select profiles								
1.4. Course content								
1. Basics of the process of recording, processing and image formation 2. Measuring devices used to create profiles 3. Characteristics of the monitor 4. Characteristics of reflective media 5. Densitometric encoding 6. Color management system 7. Phenomena related to the experience of color 8. Calibration and characterization of input devices 9. Methods for device characterization 10. Calibration and characterization of the monitor 11. Calibration and characterization of output devices 12. Color range 13. Gamut mapping 14. Workflow of the color management system								
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship 30 ☐ Other_			
1.6. Student obligations								
1.7. Student work monitoring								
Attendance		Activity in classes		Seminar paper	x	Experimental work		
Written exam	x	Oral exam		Essay		Research		
Project		Continuous knowledge assessment	x	Report		Practical work		
Portfolio								
1.8. Assessment and evaluation of student work during classes and at the final exam.								
Assessment:								
Written exam-60% or as part of continuous assessment (colloquium)								

<i>Colloquium 1 – 30%</i> <i>Colloquium 2 – 30 %</i> <i>Seminar 40%</i>		
<i>Evaluation</i> <i>1. Evaluation In written form, through a colloquium, the student will explain basic knowledge in the field of color management systems</i> <i>2. In written form, through a colloquium, students justify their knowledge of different approaches to creating an ICC profile</i> <i>3. During the seminar, students create a workflow between input and output devices</i> <i>4. In written form student will select profiles</i>		
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Sharma, Understanding Color Management, Thomson, 2004	2	
P. Green (editor), <i>Color Management: Understanding and Using ICC Profiles</i> , John Wiley & Sons, Ltd, 2010.	1	
1.10. <i>Supplementary literature</i> P.Green, L. Macdonald, Color engineering: Achiving Device idependent color, Wiley, 2003 Tom Ashe: Color Management & Quality Output: Working with Color from Camera to Display to Print: (The Digital Imaging Masters Series), Routledge, 2014.		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey, self-evaluation form,</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Lidija Mandić, PhD	
Course title	Fundamentals of 3D modeling	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>elective</i>	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION		
1.1. Course objectives		
Upon completion of the course, the student can apply his knowledge of 3D modeling techniques in practical tasks. The student will be able to collect and interpret relevant data in order to classify different 3D modeling methods. The student can use software tools for 3D modeling, choose appropriate techniques for certain tasks and check the accuracy and precision of the model. Also, he is able to carry out a complete modeling process and design a simple object, while understanding the basic principles of work and practices in the industry.		
1.2. Enrollment conditions		
none		
1.3. Expected learning outcomes		
1. Explain the differences between different 3D modeling methods 2. Use tools to create simple objects 3. Use tools to create an image or video 4. Predict the steps for designing a simple object		
1.4. Course content		
1. Introduction to 3D modeling (basics of 3d modeling, applications in different industries, software overview) 2. Basic modeling methods (polygonal modeling methods, difference between polygonal, NURBS and CAD modeling, practical examples of simple models). 3. The working environment of the software for 3D modeling (overview of the interface and basic tools, navigation in the 3D space, settings and adjustments of the working environment). 4. Polygonal modeling - basic objects (creating basic geometric shapes, modifying and combining basic objects, using extruding, cutting and joining tools) 5. Polygonal modeling – (modifiers and deformations). 6. NURBS modeling (basics of NURBS curves and surfaces, applications and advantages of NURBS modeling). 7. Texturing and UV mapping (basics of texturing 3D models, UV mapping and unwrapping). 8. Materials and shading (creation and application of materials, basics of shading and light effects). 9. Light and lighting (types of light in a 3D environment, lighting settings and adjustments). 10. Basics of animation (introduction to animating 3D models, key frames and basic animations). 11. Rigging and skeletons (basics of rigging and creation of skeletons for animation, application of skeletons to 3D models). 12. Digital sculpting 13. Rendering and post-production (basics of rendering 3D scenes, rendering settings)		
1.5. Types of Teaching Methods	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_
1.6. Student obligations		
Project assignment/colloquium within lab exercises		
1.7. Student work monitoring		

Attendance	x	Activity in classes		Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project		Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
<i>Evaluation</i> <i>Colloquium within exercises - 35%</i> <i>Written exam – 60% or as part of continuous assessment (colloquiums)</i> <i>Lecture colloquium – 30%</i> <i>Lecture colloquium – 30%</i> <i>Attendance at classes - 5%</i> <i>Evaluation:</i> <i>1. Explain in writing the differences between different 3D modeling methods</i> <i>2. In the exercises, use tools to create simple objects</i> <i>3. As part of the exercises, use the tools to create images or videos independently</i> <i>4. As part of the exercises and the practical task, students should predict the steps for the design of a simple object</i>							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
„Virtualna okruženja - Interaktivna 3D grafika i njene primjene“; Igor S. Pandžić, Tomislav Pejša, Krešimir Matković, Hrvoje Benko, Aleksandra Čereković, Maja Matijašević, Zagreb, Element, 2011		10		n			
1.10. Supplementary literature „Learning Blender: A Hands-On Guide to Creating 3D Animated Characters“; Oliver Villar; Addison-Wesley Professional, 2nd edition, 2017. „Digital Modeling“; William Vaughan; New Riders Pub; 1st edition; 2012							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey, self-evaluation form, etc..							

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Asst. prof. Marko Maričević, Ph.D.

Course title	Additive manufacturing techniques	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Elective</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>To equip students with the understanding and application of fundamental principles and processes of additive manufacturing (3D printing). Upon completion of the course, students will be able to use various software tools for preparing and optimizing 3D models, as well as operate different types of 3D printers. Students will develop skills in solving technical issues during the 3D printing process, apply finishing techniques, and evaluate the quality of finished 3D printed models. The course also encourages the development of independence and responsibility through project planning and execution, as well as exploring innovations and future trends.</i>
1.2. <i>Enrollment conditions</i>
1.3. <i>Expected learning outcomes</i>
1. <i>Explain the basic principles and technologies of additive manufacturing (3D printing) and their application in the graphic industry.</i> 2. <i>Apply software tools to prepare and optimize 3D models for additive manufacturing.</i> 3. <i>Create simple projects using material deposition technology and stereolithography.</i> 4. <i>Assess the quality of 3D printed models.</i> 5. <i>Identify technical problems arising during the manufacturing process.</i> 6. <i>Plan appropriate additive manufacturing and finishing processes for 3D models.</i>
1.4. <i>Course content</i>
1. <i>Introduction to 3D printing – basic concepts, history, and development of 3D printing, and its application in the graphic industry.</i> 2. <i>3D printing technologies – overview of major 3D printing technologies, including FDM, SLA, and SLS, and their advantages and disadvantages.</i> 3. <i>Materials for 3D printing – familiarization with various materials used in 3D printing such as polymers, metals, and resins, and their applications.</i> 4. <i>3D modeling and print preparation software – introduction to tools for 3D modeling and print preparation, including programs like Blender, Autodesk Fusion 360, and Autodesk Netfabb.</i> 5. <i>Preparing 3D models for printing – process of preparing 3D models for printing, including model optimization and generating digital files.</i> 6. <i>3D printer parameters and management – basic parameters of 3D printers, including calibration and optimization of production parameters.</i> 7. <i>Finishing techniques – various finishing techniques used to improve the quality and finish of 3D printed models.</i> 8. <i>Technical problems and troubleshooting – identification and resolution of technical problems that arise during the 3D printing process.</i>

9. <i>Evaluation of 3D printed model quality – methods for evaluating the quality of 3D printed models, including measurement of surface finish accuracy and mechanical properties.</i> 10. <i>3D printing process planning – planning and executing simple 3D printing projects, including teamwork and collaboration.</i> 11. <i>Innovations in 3D printing – analysis of the latest innovations in 3D printing technologies, including new materials and printing techniques.</i> 12. <i>Future trends in 3D printing – exploration and analysis of future trends in 3D printing, and critical thinking about technological development.</i> 13. <i>Application of 3D printing in industry – case studies and examples of the application of 3D printing in various industries.</i>							
1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. <i>Student obligations</i>							
<i>Compulsory attendance of lectures and exercises, preparation of a seminar paper. Condition for taking the exam: minimum attendance at 50% of classes and completed 50% of exercises. Written seminar paper and created project assignment.</i>							
1.7. <i>Student work monitoring</i>							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	x
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
Grading: <i>Seminars: 30%</i> <i>Exercises: 20%</i> <i>Project assignment: 20%</i> <i>Continuous knowledge assessment: 30%</i> Evaluation: <i>In written form, during continuous knowledge assessment, explain the basic principles and technologies of additive manufacturing (3D printing) and their application in the graphic industry.</i> <i>During exercises, apply software tools for preparing and optimizing 3D models for additive manufacturing.</i> <i>In the seminar paper, create a simple project using material deposition and stereolithography technologies.</i> <i>In the exercise report, assess the quality of 3D printed models.</i>							

5. <i>In written form, during continuous knowledge assessment, identify technical problems in the production process.</i> 6. <i>In the project assignment report, plan appropriate additive manufacturing and finishing processes for 3D models.</i>		
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>3D printing / John Jordan.</i>	<i>1</i>	
<i>3D printing will rock the world / John Hornick.</i>	<i>1</i>	
<i>VezaFabricated : The new world of 3D printing / Hod Lipson, Melba Kurman.</i>	<i>1</i>	
<i>The 3D printing handbook : technologies, design and applications / Ben Redwood, Filemon Schoeffer, Brian Garret.</i>	<i>1</i>	
1.10. <i>Supplementary literature</i>		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey, self-evaluation form.</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Mile Matijević, PhD	
Course title	Colors, Tones, and Perception	
Study programme	Undergraduate university study programme Graphic technology	
Course status	elective	
Year	I.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The objective of the course "Colors, Tones, and Perception" is to equip students with the ability to understand the perception of colors and tones in print and digital media. Students will acquire knowledge of the</i>

<i>physiological and psychological aspects of color perception, as well as the impact of colors and tones on visual impression and communication. The course will cover techniques for color reproduction and optimization. Students will explore how different color spaces and techniques function in media and how to adapt designs for the desired effect. The course includes the study of visual effects and perceptual phenomena in various contexts.</i>							
1.2. Enrollment conditions							
1.3. Expected learning outcomes							
1. Explain the basic principles of color and tone perception, including physiological and psychological aspects. 2. Choose color spaces and calibration techniques for optimizing colors in print and digital media. 3. Analyze the impact of different color spaces on color reproduction in print and digital media. 4. Evaluate the quality of color reproduction in print and digital media based on aesthetic and technical criteria. 5. Recommend creative design projects using various color and tone reproduction techniques.							
1.4. Course content							
1. Basic theoretical knowledge of color and tone perception. History of research and physiological processes. 2. Basics of the physics of light and color. Wavelength, light spectrum, and interaction with materials. 3. Psychology of color perception. The impact of colors on emotions and behavior. 4. Perception of brightness and contrast. Application in design and visual communication. 5. Color reproduction in print and digital media. Techniques, challenges, and optimization. 6. Color calibration and management. Ensuring consistency across different media. 7. Optical illusions and visual effects. Impact on color perception and application in design. 8. Colors and cultural symbolism. The meanings of colors in different cultures and their application in design. 9. Application of color psychology in marketing and design. Strategies for using colors to influence consumer behavior.							
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
<i>Active participation in classes and online activities. Study scientific and professional literature, analyze and evaluate professional texts, and connect acquired knowledge. Register a seminar paper topic according to instructions on the course’s online pages. Create and present a seminar paper. Participate in the evaluation of seminar papers according to instructions on the course’s online pages and revise personal seminar papers based on received evaluations. Complete the final online self-evaluation form.</i>							
1.7. Student work monitoring (mark with X for the appropriate method)							
Attendance	x	Activity in classes	x	Seminar paper	x	Experimental work	

Written exam		Oral exam		Essay		Research	x
Project	x	Continuous knowledge assessment		Report		Practical work	
Portfolio		Final self-evaluation	x				

1.8. Assessment and evaluation of student work during classes and at the final exam.

Each activity is assigned a certain number of points. All points are recorded in an online evaluation and competency development system.

The following activities are evaluated:

1. Participation in lectures, seminar paper topic registration, and justification (20%)
2. Seminar paper (50%)
3. Seminar paper presentation (10%)
4. Online activity and quality of seminar paper analysis and evaluation (20%)

Each student analyzes and evaluates the seminar paper topics and justifications and participates in the evaluation of presentations according to clearly defined criteria. Students also evaluate peer work based on clearly defined criteria. The evaluation of all segments is conducted by comparing each student’s analysis and evaluation with the teacher’s. A higher agreement between student and teacher evaluations results in more points for the student.

Evaluation:

1. Through lectures and seminars, explain the basic principles of color and tone perception, including physiological and psychological aspects
2. In the seminar paper, choose color spaces and calibration techniques for optimizing colors in print and digital media.
3. In the seminar paper, analyze the impact of different color spaces on color reproduction in print and digital media.
4. Through lectures and seminars, evaluate the quality of color reproduction in print and digital media based on aesthetic and technical criteria
5. In the seminar, recommend creative design projects using various color and tone reproduction techniques.

1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
Title	Number of copies	Number of students
Kuehni R. G., „Color: An Introduction to Practice and Principles“, 2013	1	
Best J., „Colour Design: Theories and Applications“, 2012	1	

1.10. Supplementary literature

Kastan D.,Farthing S., „On Color“, 2018

1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies

Student Survey, Initial and Final self-evaluation

GENERAL INFORMATION		
Course leader	Assoc.Prof.Mile Matijević, PhD	
Course title	Publishing	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The objective of this course is to equip students with the ability to apply key processes in publishing, with a special emphasis on technical preparation, design, and the organization of publishing activities. Students will gain extensive knowledge in manuscript preparation for publication and distribution, including understanding different recording formats, layout techniques, and content adaptation for print and various media. The course will enable students to understand the relationship between graphic solutions, printing techniques, recording formats, production costs, and the final price of the product. Students will develop the ability to analyze the possibilities and limitations of various printing and digital techniques to effectively prepare and publish materials in different formats. The course also includes an introduction to the basic legal aspects of publishing, including an overview of editorial and proofreading work and their quality assessment in the context of the publishing process.</i>
1.2. <i>Enrollment conditions</i>
1.3. <i>Expected learning outcomes</i>
1. <i>Explain the key processes of preparing publications..</i> 2. <i>Apply appropriate software tools in publishing.</i> 3. <i>Evaluate the quality of publications based on aesthetic and technical criteria.</i> 4. <i>Evaluate the impact of layout, formats, and content processing on the final appearance of a publication.</i> 5. <i>Connect different design techniques and formats.</i> 6. <i>Recommend graphic design solutions for creating functional publications.</i>
1.4. <i>Course content</i>
1. <i>Basic theoretical knowledge in publishing. History and development, basic concepts in the creation and distribution of publications.</i> 2. <i>Processes of publication preparation. Phases of work in publishing, including tools and software for technical preparation, layout techniques, and page design.</i> 3. <i>Formats for publication. Standard recording formats, format adaptation for various media, compatibility, and format conversion in the publication process.</i> 4. <i>Publication techniques. Different approaches to publishing, emphasizing the advantages and limitations of various techniques in the context of publication production.</i>

5. <i>Design solutions and publication processes. Analysis of design solutions in publishing, choosing appropriate techniques for optimal realization of publications.</i> 6. <i>Preparation for publication. Adapting graphic solutions, optimizing content, and visual elements.</i> 7. <i>Legal aspects of publishing. Basic rules and regulations related to publishing, including copyright, licensing, and other key legal aspects of publication.</i> 8. <i>Practical exercises and project assignments. Creation of publications, applying knowledge in projects, presentation, and defense of tasks.</i>							
1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. <i>Student obligations</i>							
<i>Active participation in classes and online activities. Study scientific and professional literature, analyze and evaluate professional texts, and apply this knowledge in practical work, presenting it during project presentations. Propose and register a plan for practical or seminar work topics according to instructions on the course’s online pages. Create and present seminar work. Participate in the evaluation of practical and seminar works according to instructions on the course’s online pages, and revise personal seminar work based on received evaluations. Complete the final online self-evaluation form.</i>							
1.7. <i>Student work monitoring</i>							
Attendance	x	Activity in classes	x	Seminar paper	x	Experimental work	
Written exam		Oral exam		Essay		Research	x
Project	x	Continuous knowledge assessment	x	Report		Practical work	
Portfolio		Final self-evaluation	x				
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
<i>To align the actual workload with the allocated ECTS credits, each activity is assigned a certain number of points. All points are recorded in an online evaluation system.</i>							
<i>The following activities are evaluated:</i>							
1. <i>Participation in lectures and exercises (10%)</i> 2. <i>Submission and presentation of seminar work (30%)</i> 3. <i>Submission of project task(s) (30%)</i> 4. <i>Online activity and quality of seminar paper reviews (30%)</i>							
<i>Each student analyzes and evaluates the submissions and justifications of seminar paper topics and participates in the evaluation of presentations according to clearly defined criteria. Students also evaluate peer work according to clearly defined criteria. The evaluation of all segments is conducted by comparing the results of each student’s analysis and evaluation with those of the teacher. A higher agreement between student and teacher evaluations results in more points for the student.</i>							
<i>Evaluation:</i>							

1. <i>Through lectures and exercises, explain the key processes of preparing publications.</i> 2. <i>In exercises and project tasks, apply appropriate software tools in publishing</i> 3. <i>In exercises and the seminar paper, evaluate evaluate the quality of publications based on aesthetic and technical criteria.</i> 4. <i>During practical lessons, evaluate the impact of layout, formats, and content processing on the final appearance of a publication.</i> 5. <i>Through lectures, exercises, and project tasks, connect different design techniques and formats.</i> 6. <i>In practical lessons, recommend graphic design solutions for creating functional publications.</i>		
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Johansson K., Lundberg P., Ryberg R., „A guide to graphic print production“, Third edition, 2011</i>	0	
<i>Gatter M., „Getting it Right in Print: Digital Prepress for Graphic Designers“, 2005</i>	1	
1.10. <i>Supplementary literature</i> <i>Gatter M., „Production for print“, 2010</i> <i>„Graphic Design and Print Production Fundamentals“, 2015</i>		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student Survey, Initial and Final self-evaluation</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	assoc.prof. PhD Miroslav Mikota, PhD	
Course title	Fundamentals of Photography	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+1+1

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The aim of the course is to enable students to acquire fundamental knowledge in the field of photography media and photographic images, as well as their application in visual communications and multimedia systems. Students will become familiar with photographic systems and techniques for creating photographic</i>

<i>images through the phases of individual photographic systems, techniques for forming the syntax of photographic images, the basics of semantics, and fundamental ways of achieving and presenting photographic images. The course will cover the basics of working with cameras and photographic equipment, the fundamentals of using light and lighting, as well as the processing and realization of photographic images that are created as a standalone medium or through other media using various photographic systems.</i>		
1.2. Enrollment conditions		
1.3. Expected learning outcomes		
1. Describe the historical development of photographic techniques and styles and their impact on contemporary practice. 2. Explain the basic concepts related to the syntax and semantics of photographic images, as well as their formation and use. 3. Describe different methods of technical, semantic, and syntactic formation of photographic images. 4. Evaluate the factors that can influence the quality of photographic images and their syntax. 5. Distinguish the fundamental principles of using various technical, syntactic, and semantic laws for different photographic subjects and methods of capturing, realizing, and presenting images. 6. Independently present photographic images through photography as a standalone medium or other media.		
1.4. Course content		
1. Introduction to photography, overview of the development of photographic systems, techniques, and styles. 2. Basic equipment for shooting; classifications of cameras according to system, type of viewfinder, exposure element determination methods, focusing methods, format, resolution of digital cameras; classifications of lenses by focal length, aperture, purpose; selection of basic equipment for shooting. 3. Additional equipment for shooting; filters; equipment for macro photography; equipment for photographic reproduction and digitization; light meters; color meters; flash units; other additional equipment. 4. Shooting with a camera; preparing the camera for shooting, setting parameters for general and spectral sensitivity according to the photographic system; framing; determining exposure elements; focusing; shooting positions. 5. Light and lighting; natural light; working with available light; artificial continuous lighting and flash lighting; basic lighting schemes. 6. Basics of processing and realization in different photographic systems. 7. Basic techniques for achieving photographic syntax. 8. Fundamentals of achieving photographic semantics through photographic technique and syntax. 9. Approach to capturing basic photographic subjects. 10. Basics of realization and presentation of photographic images through photography as a standalone medium and other media.		
1.5. Types of Teaching Methods	☒ Lectures ☒ Seminars and workshops ☒ Exercises	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory

				☒ Online education ☐ Fieldwork	☐ Mentorship ☐ Other_		
1.6. Student obligations							
Mandatory attendance at lectures, exercises, and seminars. Students complete exercises independently each week, with a review of each student's final solutions recorded through the e-learning system. Requirement to access the exam: a minimum attendance of 30% of classes and 80% of exercises completed.							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper	x	Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio	x						
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Project assignments within exercises and seminars 40% Written and oral exam – in the form of continuous assessment or final at the end of the semester – 60% Evaluation: 1. Explain the historical development of photographic techniques and styles in written or oral form. 2. In written or oral form, students describe basic concepts - syntax, technical, and semantic knowledge of the fundamentals of photography. 3. In exercises, students demonstrate knowledge of different approaches to photographic subjects through practical photography. 4. In the project assignment, students assess factors that may affect image quality. 5. In the continuous knowledge assessment and seminars, students will distinguish the basic principles of using various technical, syntactic, and semantic laws for different photographic subjects and methods of capturing, realizing, and presenting images. 6. In the project assignment, students create a portfolio of their work and independently present photographic images through photography as a standalone medium or other media.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Miroslav Mikota, Kreacija fotografijom, 2000.		4					
Kelby Scott, The digital photography book, 2006		1					
Focal encyclopedia of photography, 4th Edition, Michael R. Peres Copyright 2007		2					
1.10. Supplementary literature							
"Fotografija: Povijest i temelji" - John Szarkowski "Understanding Exposure: How to Shoot Great Photographs with Any Camera" - Bryan Peterson							

"The Photographer's Eye: Composition and Design for Better Digital Photos" - Michael Freeman "Light Science and Magic: An Introduction to Photographic Lighting" - Fil Hunter, Steven Biver, Paul Fuqua "Digital Photography Complete Course" - David Taylor "The Art of Photography: A Personal Approach to Artistic Expression" - Bruce Barnbaum "Portrait Photography: From Snapshots to Great Shots" - Erik Valind "The Landscape Photography Workshop" - Ross Hoddinott, Mark Bauer "The Digital Photographer's Guide to Light Modifiers" - Lindsay Adler "Photoshop for Photographers" - Martin Evening
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies
Student survey, self-evaluation form, etc..

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Diana Milčić, PhD, Assoc. prof. Tomislav Cigula, PhD	
Course title	Project planning in graphic technology	
Study programme	Undergraduate university study programme Graphic technology	
Course status	elective	
Year	II.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+0+2

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of this course is to enable students to identify needs and plan projects for production of various graphic media. By mastering this course, students will be able to assess the necessary resources (material, technological and human), as well as plan the time sequence and control points in the project of graphic media production. Students will improve their ability to work in a team and work ethic by performing individual and team tasks. Additionally, they will improve presentation skills by presenting a project planning for production of defined graphic media.</i>
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Explain project elements and project planning processes. 2. Identify the elements of graphic media production.

3. Plan the project of graphic media production. 4. Demonstrate teamwork. 5. Present project planning results to team members and non- team members.								
1.4. Course content								
1. The project and its elements. 2. Project life cycle. 3. Project planning. 4. Elements of a defined graphic medium. 5. Project management methodologies. 6. Project management techniques. 7. Project management tools. 8. Structure of the seminar work and search of sources.								
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_			
1.6. Student obligations								
Min 50% class attendance, reports of independent assignments submitted, team seminar presented								
1.7. Student work monitoring								
Attendance	x	Activity in classes		Seminar paper		Experimental work		
Written exam	x	Oral exam	x	Essay		Research		
Project	x	Continuous knowledge assessment	x	Report	x	Practical work		
Portfolio								
1.8. Assessment and evaluation of student work during classes and at the final exam.								
Assessment: Attendance at classes - 10% Written exam/continuous knowledge check – 30% Oral exam - 10% Report of an individual task (project implementation planning) – 30% Presentation of the team seminar (planning, implementation and analysis of the production of given graphic media) - 20% Evaluation: 1. In writing form, students will explain the project elements and project planning. 2. In the form of an individual task and the preparation of a team seminar, students will identify the elements of graphic media production								

3. In the form of an individual task and the preparation of a team seminar, students will plan a project for graphic media production. 4. As part of the team seminar work, students will prove their ability to work in a team 5. As part of the team seminar work, students will prove their ability to present professional data.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Association for Project Management, Introduction to Project Planning, 2008</i>	<i>Available in open access</i>	
<i>Project planning manual, Wildlife Management Series, 2001</i>	<i>Available in open access</i>	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Diana Milčić, PhD.	
Course title	Quality control	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The goal of the course is to apply basic and professional knowledge in the field of quality control in the graphic industry. Students will be able to estimate quality costs to improve quality and reduce production process costs. Students will be trained to select and apply basic tools and quality control methods in solving engineering problems in the graphic production process.</i> <i>Also, students will be able to analyze the results of checking the stages of graphic reproduction and conclude the effectiveness and ability of individual stages as well as the entire reproduction process.</i>
1.2. Enrollment conditions

1.3. Expected learning outcomes							
1. Interpret basic concepts from the field of quality.							
2. Interpret the costs of quality.							
3. Apply seven basic quality control tools.							
4. To compare statistical methods of quality control and analyze the obtained data.							
5. Use international and national standards in the field of graphic production.							
6. Choose quality control methods and tools and calculate the efficiency and capability of the reproduction process.							
1.4. Course content							
1. Basic concepts of quality control, quality assurance and quality management. Types of characteristics, concepts of control, testing and measurement.							
2. Costs in different stages of product development and in the production process.							
3. Seven basic quality control tools. Statistical quality control: advantages and disadvantages.							
4. Sampling plans: sampling risks, selection of a sampling plan (reception).							
5. Control charts: use and selection.							
6. International and national standards in the field of graphic production.							
7. Process capability.							
8. Data analysis and calculation of the capabilities of the phases of the graphic reproduction process - independent tasks.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Minimum 50% attendance at lectures and exercises.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment:							
Activity in class: 25%							
Written exam: 60% or as part of continuous assessment: 1st colloquium 30% + 2nd colloquium 30%							
Oral exam: 10%							

Class attendance: 5%

Evaluation:

- 1. In written form, interpret basic concepts from the field of quality control*
- 2. Interpret quality costs in written form*
- 3. In writing, apply the basics of quality control tools on a given example.*
- 4. As part of the exercises, create an analysis of the given data using the chosen statistical method*
- 5. Interpret standards in the field of graphic production in written form.*
- 6. As part of the exercises, calculate and submit a conclusion on the calculation of the ability of the graphic reproduction process, as well as compliance with international/national standards.*

1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Juran, Grynja: Planiranje i analiza kvalitete, MATE, Zagreb, 1999.</i>	<i>1</i>	
<i>Kondić: Kvaliteta i metode poboljšanja, Zrinski, Čakovec, 2004.</i>	<i>1</i>	

1.10. Supplementary literature

1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies

Student survey, self-evaluation form

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. prof. Petar Mišević, PhD	
Course title	Intellectual property	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory or elective</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION
<i>1.1. Course objectives</i>
<i>The aim of this course is to equip students with the knowledge and skills necessary to understand and apply intellectual property concepts in the context of the graphic industry. Students will gain knowledge about the</i>

basics of copyright and related rights, and their role in the protection and commercialization of products. Through practical examples and interdisciplinary approaches, students will learn to identify market opportunities, explain the potential of innovations, develop ethical and professional strategies for managing intellectual property, and acquire skills in licensing and technology transfer in both academic and industrial contexts.

1.2. Enrollment conditions

1.3. Expected learning outcomes

- 1. Explain the fundamental aspects of intellectual property, including patents, trademarks, copyrights, trade marks, industrial design, and trade secrets.*
- 2. Analyze intellectual property issues specific to the graphic industry and propose strategies for managing them.*
- 3. Apply strategies for the protection and commercialization of intellectual property in the graphic industry.*
- 4. Recognize ethical dilemmas related to intellectual property and critically reflect on them.*
- 5. Demonstrate the basic aspects of negotiation and licensing related to intellectual property in a graphic context.*

1.4. Course content

- 1. Introduction to Intellectual Property: History, significance, and basic concepts of intellectual property.*
- 2. Intellectual Property Basics: Different types of intellectual property – patents, trademarks, copyrights, trade marks, industrial design, and trade secrets.*
- 3. Patents in Graphic Engineering: The importance of patents, the application process, and their role in protecting innovations.*
- 4. Copyright in the Digital Age: How copyright affects software tools, simulations, and digital technologies in the industry.*
- 5. Trademarks and Branding: The importance of branding in graphic products and technologies, and how to protect brands through trademarks.*
- 6. Industrial Design in the Graphic Industry: Significance and protection of the aesthetic aspects of products.*
- 7. Trade Secrets and Business Confidentiality: Protection of business information, technologies, and knowledge in the industrial sector.*
- 8. Intellectual Property Management: Strategies, practices, and tools for efficient management of intellectual property in companies.*
- 9. Innovations in Graphic Engineering: The innovation process, its importance, and how to foster innovation in the graphic industry.*
- 10. Technology Commercialization: Turning innovations into commercial products or processes.*
- 11. Intellectual Property and Collaboration: The importance of collaboration between the academic and industrial sectors, and how intellectual property can impact partnerships.*
- 12. Ethics, Intellectual Property, and Innovation: Moral and ethical aspects in the context of intellectual property and innovations in the industry.*
- 13. Global Aspects of Intellectual Property: Differences in intellectual property approaches and regulations worldwide, and their impact on the graphic industry.*
- 14. Legal Disputes and Intellectual Property Misuse: Analysis of real cases, legal consequences, and how to avoid them.*
- 15. Practical Workshops and Case Studies: Analysis of real cases, workshops, and projects related to intellectual property and innovations in graphic engineering.*

1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other			
1.6. <i>Student obligations</i>								
Class attendance: 70% or more Completed seminar paper								
1.7. <i>Student work monitoring</i>								
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work		
Written exam	X	Oral exam	X	Essay		Research	X	
Project		Continuous knowledge assessment	X	Report		Practical work		
Portfolio								
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>								
Grading: Class attendance: 10% Written exam: 50% Seminar paper: 40% Evaluation: <i>In written form, explain the fundamental aspects of intellectual property, including patents, trademarks, copyrights, trade marks, industrial design, and trade secrets.</i> <i>In the seminar paper, analyze intellectual property issues specific to the graphic industry and propose strategies for managing them.</i> <i>In the seminar paper, apply strategies for the protection and commercialization of intellectual property in the graphic industry.</i> <i>In the seminar paper, recognize ethical dilemmas related to intellectual property and be able to critically reflect on them.</i>								
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>								
Title		Number of copies		Number of students				
Sveučilišni udžbenik: Upravljanje intelektualnim vlasništvom u organizaciji, autori: Matanovac-Vučković, R., Mišević, P., Kanceljak, . I., Izdavač: HGK i Sveučilište Sjever, Zagreb, 2023.		15						

on o autorskom pravu i srodnim pravima: NN broj 111/2021	5	
DIREKTIVA (EU) 2019/790 EUROPSKOG PARLAMENTA I VIJEĆA od 17. travnja 2019. o autorskom i srodnim pravima na jedinstvenom digitalnom tržištu i izmjeni direktiva 96/9/EZ i 2001/29/EZ	5	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form, etc..		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Nikola Mrvac, PhD, asst. prof. Martina Hajdek	
Course title	Presentation of information	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	4 ECTS
	Number of hours (L+E+S)	2+0+2

COURSE DESCRIPTION
1.1. Course objectives
<i>The goal of this course is to train students to create visually effective and technically correct presentations adapted to the specific needs of the audience. Students will learn to apply the basic principles of visual transmission of information, use modern tools and techniques for creating presentations, and adjust the content depending on the context and audience profile. The course also encourages critical analysis of the effectiveness of presentations and the application of ethical principles in the collection, processing and presentation of information, which ensures transparency, accuracy and professionalism in communication.</i>
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. Apply the basic principles of visual transmission of information in the creation of presentations. 2. Use tools and techniques necessary for effective presentation of information. 3. Make different types of presentations adapted to the specific needs of the audience and context. 4. Analyze the effectiveness of presentations.

5. Apply ethical principles in the collection, processing and presentation of information.							
1.4. Course content							
1. Introduction to information presentation 2. Theoretical foundations of visual communication 3. Presentation design: Planning and structuring 4. Tools and software for presentation 5. Data visualization for clear information transfer 6. Typography and readability in presentations 7. Use of colors and visual identity 8. Photos and visuals in presentations 9. Interactivity and audience engagement 10. Presentations for web and digital platforms 11. Evaluation and feedback on presentations 12. Ethics in the presentation of information							
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☒ Mentorship ☐ Other_	
1.6. Student obligations							
Attendance at classes - 80%. Design and report the topic of the seminar paper in accordance with the instructions on the online pages of the course. Create and present a seminar paper.							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper	x	Experimental work	
Written exam		Oral exam		Essay		Research	x
Project		Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: Seminar paper – 40% Presentation of the seminar work - 40% Continuous knowledge check – 20%							
Valuation:							

<i>As part of the seminar work, apply the basic principles of visual information transfer in the creation of presentations.</i> <i>As part of the presentation of the seminar work, use the tools and techniques necessary for the effective presentation of information</i> <i>As part of the seminar work, make different types of presentations adapted to the specific needs of the audience and context.</i> <i>Analyze the effectiveness of presentations in writing.</i> <i>As part of the seminar work, apply ethical principles in the collection, processing and presentation of information.</i>		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>The visual display of quantitative information / Edward R. Tufte, Cheshire, Conn. : Graphics Press, 2001.</i>		
<i>Najbolji prezenter : tehnika, stil i strategija najpoznatijega američkog trenera govornišva / Jerry Weissman ; [prevoditelji Jagoda Poropat Darrer, Davor Meštrović].</i>		
Infogram Resources	https://infogram.com/	
1.10. Supplementary literature		
<i>Information visualization : perception for design / Colin Ware, 2013.</i>		
<i>Prezentacijom do uspjeha, Weissman Jerry, 2006.</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Nikola Mrvac, PhD	
Course title	Structuring of Print Media	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	4 ECTS
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION

1.1. Course objectives		
<i>The aim of this course is to enable students to understand and apply printing technologies and production processes in the graphic industry. Students will learn to distinguish the suitability of different printing technologies for specific graphic products, explain the entire production process and apply theoretical knowledge in the creation of practical printing projects. The course will also cover the standardization of material consumption and the demonstration of the flow of the production process depending on the type of product.</i>		
1.2. Enrollment conditions		
1.3. Expected learning outcomes		
1. Differentiate the suitability of certain technologies for printing certain graphic products. 2. Explain the production process of creating a graphic product 3. Demonstrate the flow of the printing production process depending on the type of graphic product. 4. Show the arrangement of pages for individual printed sheets and determine the lines of cut, binding and folding of the printed sheet. 5. Standardize the consumption of materials and labor in the printing production process for a specific graphic product. 6. Plan the elaboration of the technical technological process for printing		
1.4. Course content		
1. Introduction to printing processes, general printing technology 2. Elaboration of the printing production process 3. The flow of the printing production process depending on: the type of graphic product, the shape of the graphic product, the complexity of the graphic product and the available means of work 4. Description (snapshot) of the graphic product 5. Criteria for selecting a printing technique 6. Criterion for selecting the order of paper for the production of individual graphic products or parts of these products 7. Analysis of the consumption of basic materials in accordance with the conditions of printing production 8. Standards of printing machines; criteria for choosing printing machines for printing individual parts of a graphic product 9. Placing the graphic product on the sheet and designing the assembly sheet 10. Determination of cut lines, connections and bending 11. Labor standards 12. Standards of material consumption 13. Calculation of required quantities of materials 14. Sustainability in printing 15. Trends in science and technology affecting printing production		
1.5. Types of Teaching Methods	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education	☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☒ Mentorship ☐ Other

				☐ Fieldwork			
1.6. Student obligations							
Attendance at classes - 80%							
Create and present project tasks.							
1.7. Student work monitoring (mark with X for the appropriate method)							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	x
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: 1. Project assignment – 45% 2. Project assignment – 45% Continuous knowledge check - 10% Valuation: As part of the project tasks, distinguish the suitability of certain technologies for printing certain graphic products. In oral form, explain the production process of creating a graphic product As part of the project tasks, demonstrate the flow of the printing production process depending on the type of graphic product. As part of the project tasks, show the arrangement of pages for individual printed sheets and determine the lines of cut, binding and folding of the printed sheet. As part of the project tasks, to standardize the consumption of materials and labor in the printing production process for a specific graphic product. As part of the project tasks, plan the elaboration of the technical technological process for printing.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Suvremeni ofsetni tisak / Stanislav Bolanča, 1991.							
1.10. Supplementary literature							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey							

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Daria Mustić, PhD	
Course title	Communication Science	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	II	
ECTS credit and teaching method	ECTS credits	3 ECTS
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
By the end of the course, students will be able to distinguish fundamental theories and models of interpersonal communication and recognize them in social interactions. They will be able to apply effective communication techniques in various social and professional contexts, analyze communication relationships, and overcome communication barriers. The ultimate goal is to assess their own communication skills, develop strategies for improvement, and create plans for conflict resolution and teamwork enhancement.
1.2. <i>Enrollment conditions</i>
None
1.3. <i>Expected learning outcomes</i>
Distinguish fundamental theories and models of interpersonal communication. Explain key concepts such as verbal and non-verbal communication, listening, and feedback. Apply effective communication techniques in various social and professional contexts. Analyze interactions in real-life situations and identify communication barriers. Evaluate personal communication skills and develop strategies for their improvement. Compare plans for conflict resolution and improving teamwork through effective communication.
1.4. <i>Course content</i>
1. Introduction to interpersonal communication: Definitions, importance, and key components. 2. Theories of interpersonal communication: Overview and application of major theories. 3. Verbal communication: Language expressions, tone, and communication style. 4. Non-verbal communication: Types, interpretation, and application of non-verbal cues. 5. Feedback: Giving and receiving feedback. 6. Active listening: Techniques and their importance. 7. Perception in communication: The impact of perception on communication processes and personal image. 8. Communication barriers: Identifying and overcoming obstacles in communication. 9. Emotional intelligence in communication: Understanding and managing emotions.

10. Assertive communication: Definition, importance, and techniques of assertive communication.							
11. Team communication: Team dynamics and the role of communication.							
12. Conflict and conflict resolution: Strategies for managing and resolving conflicts.							
13. Communication in the digital age: The impact of technology and artificial intelligence on interpersonal communication.							
14. Ethics in communication: Ethical issues and responsibilities in communication.							
15. Self-assessment and development of communication skills: Tools and techniques for self-assessment and improvement.							
1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork		☐ Independent tasks ☒ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. <i>Student obligations</i>							
Students must regularly attend classes and complete exercises. Minimum attendance is 50% for lectures and 80% for exercises.							
1.7. <i>Student work monitoring</i>							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam	X	Oral exam	X	Essay	X	Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio	X						
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
Grading: Written exam – 60% or continuous assessment through colloquiums Colloquium 1 – 30% Colloquium 2 – 30% Exercise tasks – 20% Case study analysis and essay – 20%							
Evaluation: A written exam with essay-type theoretical questions. A written exam with essay-type theoretical questions and group presentations. Practical exercises and simulations, active discussion in exercises regarding communication performance. Case study analysis and reflective essays. Portfolio with personal reflections and development plans. Comparison and presentation of a plan for conflict resolution and improving team dynamics.							

1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
Title	Number of copies	Number of students
Leinert Novosel, S. (2015). Komunikacijski kompas (2nd expanded edition). Plejada, Zagreb. Makovčić, J. (2021). Komunikacijski umjetnik: izvedbene tehnike u javnom nastupu. V.B.Z., Zagreb.		
1.10. Supplementary literature Sullivan, J. (2017). Simply said: communicating better at work and beyond. Wiley, Hoboken. Bovee, C.L., & Thill, J.V. (2012). Suvremena poslovna komunikacija. Mate, Zagreb. Reardon, K.K. (1998). Interpersonalna komunikacija: gdje se misli susreću. Alinea, Zagreb.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Asst. Prof. Zoran Najdanović, PhD	
Course title	Fundamentals of entrepreneurship	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION
1.1. Course objectives
<i>The course "Basics of Entrepreneurship" provides students with fundamental knowledge about the opportunities and challenges that entrepreneurs face in the global market. Students will be introduced to key entrepreneurial principles, strategies, and practices. The program covers the development of business plans, financing and investment in projects, legal aspects of business, as well as marketing and distribution of products and services. The course also emphasizes the importance of sustainability and social responsibility in entrepreneurial initiatives.</i>
1.2. Enrollment conditions

1.3. Expected learning outcomes							
<i>Explain the basic concepts of entrepreneurship, including terminology such as business models, development strategies, and risk management.</i>							
<i>Differentiate tools for developing and optimizing business processes.</i>							
<i>Conclude on the development of business ideas.</i>							
<i>Explain financial planning, cost assessment, and return on investment analysis in companies.</i>							
<i>Adapt communication to the dynamics of teamwork in an entrepreneurial environment.</i>							
<i>Present business ideas and projects to various stakeholders</i>							
1.4. Course content							
1. Introduction to Entrepreneurship: Overview of the history of entrepreneurship, its importance, and its role in society.							
2. Basics of Entrepreneurship: Understanding the fundamental concept of entrepreneurship, the development of startups, and innovative strategies.							
3. Technology and Digital Transformation: How digital technologies impact the graphic industry in multimedia and the opportunities they present for entrepreneurs.							
4. Entrepreneurial Financing: Methods of financing entrepreneurial projects, the role of accelerators and incubators, and sources of funding for startups.							
5. Product Development: Market research and segmentation, analysis of segments according to specified variables, targeting selected segments, and positioning users.							
6. Marketing and Sales: Understanding market trends, sales strategies, and marketing channels.							
7. Team Management and Leadership: The importance of teamwork, communication skills, and leadership in managing a successful entrepreneurial project.							
8. Risks and Challenges in Entrepreneurship: Analysis of potential challenges, internal and external risks faced by entrepreneurs.							
9. Case Studies and Practical Examples: Overview of successful entrepreneurial projects in multimedia and analysis of key factors for their success.							
10. Forecasting Future Trends, Technological Innovations, and Market Opportunities.							
1.5. Types of Teaching Methods				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
<i>Actively participate in classes and online activities.</i>							
<i>Prepare a seminar paper in accordance with the guidelines and assigned literature.</i>							
<i>Supplement and revise the seminar paper according to reviews.</i>							
<i>Participate in a joint project for creating a collection of seminar papers and a collection of presentations.</i>							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	X
Written exam		Oral exam		Essay		Research	

Project		Continuous knowledge assessment	X	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Attendance – 5%							
Class Activity – 5%							
Preparation of Seminar Paper – 90%							
Assessment:							
1. Explain the basic concepts of entrepreneurship in the form of a seminar paper, including terminology such as business models, development strategies, and risk management. 2. Differentiate tools for developing and optimizing business processes in the form of a seminar paper. 3. Conclude on the development of business ideas in the form of a seminar paper. 4. Explain financial planning, cost assessment, and return on investment analysis in companies in the form of a seminar paper. 5. Adapt communication to the dynamics of teamwork in an entrepreneurial environment in the form of a seminar paper. 6. Present business ideas and projects to various stakeholders in the form of a seminar paper.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Osnove prava društava / Pravni fakultet, 2024., Siniša Petrović, Petar Ceronja							
Osnove poduzetništva / Školska knjiga / 2020. Damir Ribić, Nikolina Pleša Puljić							
1.10. Supplementary literature							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey, self-evaluation form, etc..							

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Ana Nemec, MA
Course title	English for graphic engineers
Study programme	Undergraduate university study programme Graphic technology
Course status	Elective
Year	I.
	ECTS credits
	2

ECTS credit and teaching method	Number of hours (L+E+S)	1+0+2
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COURSE DESCRIPTION	
1.1. <i>Course objectives</i>	
The course objectives are to provide students the insight into the differences between the general language and the language for specific purposes and to raise their awareness of the importance of English as the international language of science and technology. There is no workplace, especially a high-profile one, in which a person is not required to master English at a high level, therefore the students are intensively drilled in their oral and written competence in the English language, which includes, among other things, the development of techniques for reading expert and scientific texts with characteristic structures and grammatical forms. Students will learn the basic and most common professional terms from the field of technology and will recognize the special features of linguistic structures and textual features in the language of their future profession, while at the same time expanding their general vocabulary. An extremely important language skill is the ability to paraphrase words, phrases, parts of sentences and entire sentences. In addition, the students will constantly revise and deepen knowledge of grammar, especially patterns that are often used in expert and scientific discourse. Students are continuously encouraged to be independent in their education and work in English.	
1.2. <i>Enrollment conditions</i>	
1.3. <i>Expected learning outcomes</i>	
1. Extract key information from the text. 2. Summarize the content of the processed text using acquired concepts and structures. 3. Apply structures characteristic for the English language (gerunds, phrasal verbs, collocations...). 4. Explain concepts, words and patterns. 5. Apply acquired professional terms, as well as general vocabulary in concrete situations at the level of speech and writing.	
1.4. <i>Course content</i>	
1. <i>A brief history of printing I</i> 2. <i>A brief history of printing II</i> 3. <i>The printing process I</i> 4. <i>The printing process II</i> 5. <i>Vocabulary and grammar</i> 6. <i>Printing techniques I</i> 7. <i>Printing techniques II</i> 8. <i>Vocabulary and grammar</i> 9. <i>Colours and colour model</i> 10. <i>Materials in graphic technology I</i> 11. <i>Materials in graphic technology II</i> 12. <i>Printing substrates, inks, pigments and dyes I</i>	

13. <i>Printing substrates; inks, pigments and dyes II</i>							
14. <i>Vocabulary and grammar</i>							
15. <i>Revision</i>							
1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. <i>Student obligations</i>							
Attending lectures and seminars; essay paper submitted							
1.7. <i>Student work monitoring</i>							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay	x	Research	
Project		Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
Regular class attendance (20% of grade), activity in class (20% of grade); submission of homework, essays and summaries (20%); exam (40%)							
1. As part of the seminar work, extract key information from the text.							
2. In the framework of the seminar work, summarize the content of the processed text using the adopted concepts and structures.							
3. As part of the seminar work, apply structures characteristic of the English language (gerunds, phrasal verbs, collocations...).							
4. Explain terms, words and patterns as part of class activities.							
5. In the framework of the seminar work, apply the adopted terminology in English, as well as the general lexicon in concrete situations at the level of speech and writing.							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title		Number of copies		Number of students			
Perfect English grammar		Unlimited, the source is available online					
British Council Learn English		Unlimited, the source is available online					

Oxford Learner's Dictionary	Unlimited, the source is available online	
Thesaurus	Unlimited, the source is available online	
Kipphan, Helmut: Handbook of print media : technologies and production methods	2 selected chapters and excerpts will be included in the teaching materials	
<i>1.10. Supplementary literature</i>		
<i>1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
Student survey		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Ana Nemec, MA	
Course title	German for graphic engineers	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	2
	Number of hours (L+E+S)	1+0+2

COURSE DESCRIPTION
<i>1.1. Course objectives</i>
With respect to the special features of German as a foreign language, the primary objective of the course is to emphasize the importance of German as the language of a homeland of numerous artistic directions and design schools whose influence on today's design is immeasurable. When working on texts, students will encounter professional terms in the field of graphic design and multimedia and thus learn to distinguish between general language and language for specific purposes. They

will be drilled in oral and written competence in the German language. Since grammar is the backbone of every language, we will continuously work on revising and deepening the knowledge of grammar. The ultimate objective is to encourage students to become independent and confident in the use of German language.		
1.2. <i>Enrollment conditions</i>		
1.3. <i>Expected learning outcomes</i>		
1. Extract key information from the text. 2. Summarize the content of textual and audio-visual sources by using acquired concepts and structures. 3. Translate concepts, words and structures into Croatian. 4. Use the acquired terminology and general vocabulary in concrete situations at the level of speech and writing.		
1.4. <i>Course content</i>		
1. Gutenberg and the brief history of printing I 2. Gutenberg and the brief history of printing II 3. Vocabulary and grammar 4. Printing I 5. Printing II 6. Vocabulary and grammar 7. Printing techniques I 8. Printing techniques II 9. Vocabulary and grammar 10. Revision 11. Typesetting 12. Art print 13. Printing industry in Germany 14. Vocabulary and grammar 15. Revision		
1.5. <i>Types of Teaching Methods)</i>	☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other
1.6. <i>Student obligations</i>		
Regular class attendance (20% of grade), activity in class (20% of grade); submission of homework, essays and summaries (20%); exam (40%)		
1.7. <i>Student work monitoring</i>		

Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay	x	Research	
Project		Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Regular class attendance (20% of grade), activity in class (40% of grade); passing the exam (40%)							
1. As part of the seminar work, extract key information from the text.							
2. In the framework of seminar work and class activities, summarize in writing and orally the content of textual and audio-visual sources with the help of adopted concepts and structures.							
3. As part of the seminar work, translate concepts, words and structures into Croatian.							
4. In the framework of seminar work and class activities, apply the adopted terminology and general lexicon in concrete situations at the level of speech and writing.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Deutsche Grammatik		Unlimited, the source is available online					
Deutsche Welle		Unlimited, the source is available online					
DWDS		Unlimited, the source is available online					
Kipphan, Helmut: Handbuch der Printmedien		1 selected chapters and excerpts will be included in the teaching materials					
1.10. Supplementary literature							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey							

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	prof. Klaudio Pap, PhD.	
Course title	Graphic programming languages	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The goal of this course is to equip students with the understanding and application of graphic programming within coordinate systems, using stack-oriented graphic languages such as PostScript. Students will acquire skills in absolute and relative programming of lines and paths, creating and manipulating graphic shapes across multiple layers, and controlling the final shape and line joins. The course also covers programming of Bezier curves, coordinate system transformations, object fill control, memory management, and programmatic manipulation of text, fonts, and graphic shapes within different color spaces. The course aims to enable students to execute graphic solutions using graphic programming languages.</i>
1.2. Enrollment conditions
<i>CAttended courses: Digital Multimedia, Computing and Fundamental of Programming</i>
1.3. Expected learning outcomes
1. Differentiate coordinate system transformations from the deformation of graphic shapes 2. Construct programs for lines, curves, arcs, and other types of vector paths 3. Use conditional statements, loops, arrays, and functions in a graphic programming language 4. Design programmatic graphic elements in various color systems and graphic states 5. Apply memory usage optimization through programmatic control of stack memory in printing devices 6. Apply programmatic control over fonts and text
1.4. Course content
1. Graphic and Print Coordinate Spaces: Definition and understanding of graphic and print coordinate spaces, as well as programming the coordinate grid. 2. Graphic Page and Measurement Units: Concept of a graphic page, associated measurement units, and their application in programming. 3. Stack-Oriented Graphic Languages: Rules for writing commands and parameters in a stack-oriented graphic language, with a focus on the PostScript language. 4. Line and Path Programming: Absolute and relative programming of lines and paths, closing paths, and filling them.

4. In exercises, design graphical program elements in different color systems and graphical states. 5. In exercises, apply memory usage optimization through program control of stack memory in output devices. 6. In exercises, apply program control of fonts and text.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
V. Žiljak, K. Pap, POSTSCRIPT PROGRAMIRANJE GRAFIKE, FS, Zagreb, 1998. /2004. Tiskovno izdanje: ISBN: 953 - 199 – 000, Elektr. izdanje: http://free-zg.htnet.hr/kpap/		
Adobe Systems: „PostScript Language Reference Manual”, Addison-Wesley, 1985		
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form, etc..		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	prof. Klaudio Pap PhD., Assoc. prof. Maja Rudolf, PhD	
Course title	Digital multimedia	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.23. Course objectives
The aim of this course is to provide students with fundamental knowledge and skills necessary for understanding and applying digital multimedia. Through the study of the basic components of digital text, image, sound, video, and animation, students will acquire key concepts such as the em square, vector and raster graphics, Bezier curves, as well as digital transformations and filtering. Additionally, students will gain an understanding of digital image processing, histogram analysis, and the integration of multimedia elements into web content through the use of basic HTML and CSS elements.

1.24. Enrollment conditions							
1.25. Expected learning outcomes							
1. Classify the basic components of digital multimedia 2. Distinguish between vector, pixel, and raster image formats 3. Use different types of encoding for digital information in various digital media 4. Utilize graphic tools for basic editing and integration of digital multimedia content 5. Differentiate between various color digitization systems in a digital multimedia environment 6. Use software tools for basic digital transformations and filtering of digital images							
1.26. Course content							
1. Introduction to Digital Multimedia: Overview of the basic components of digital multimedia and their significance in modern media. 2. Em square, digital baseline and font as an ordered set of em squares. 3. Digital image: Basics and Types: Definitions of vector, pixel, and raster images; differences between them and their applications. 4. Bezier curves and vector graphics 5. Digital vector path 6. Digital image elements 7. Digital transformations and image filtering 8. Use of histograms in redistributing n-channel encoded grayscale in digital images. 9. Digital rasterization and color digitization 10. Basic techniques for integrating text, images, sound, video, and animation into multimedia content. 11. Defining basic HTML elements and attributes for creating multimedia web content. 12. Basic set of CSS commands and their application in presenting multimedia content on the web.							
1.27. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☒ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.28. Student obligations							
Attendance at 70% of the classes.							
1.29. Student work monitoring							
Attendance	X	Activity in classes		Seminar paper		Experimental work	
Written exam		Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.30. Assessment and evaluation of student work during classes and at the final exam.							

Grading: Written exam – 60% or through continuous assessment (colloquium). Colloquium 1 – 30% Colloquium 2 – 30% Class participation – 40% Evaluation: 1. In written form as part of continuous assessment or in a written exam, classify the basic components of digital multimedia. 2. In written form, differentiate between vector, pixel, and raster image formats. 3. In exercises, use various types of encoding for digital information across different digital media. 4. In exercises, use graphic tools for basic processing and integration of digital multimedia content. 5. In written form as part of continuous assessment or in a written exam, differentiate between various color digitization systems in a digital multimedia environment. 6. In exercises, use software tools for basic digital transformations and filtering of digital images.		
1.31. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>ed. John G. Webster, Multimedia Encyclopedia of Electrical and Electronics Engineering, V 37, 1999, Multimedia, 1999</i>		
<i>Jesse S. Jin, Changsheng Xu, Min Xu, The Era of Interactive Media, ISBN 978-1-4614-3500 6, 2013., Springer</i>		
<i>V. Žiljak, K. Pap, POSTSCRIPT PROGRAMIRANJE GRAFIKE, FS, Zagreb, 1998. /2004. Tiskovno izdanje: ISBN: 953 - 199 – 000</i>		
<i>ed. John G. Webster, Multimedia Encyclopedia of Electrical and Electronics Engineering, V 37, 1999, Multimedia, 1999</i>		
1.32. Supplementary literature		
1.33. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form, etc..		

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Assoc. Prof. Suzana Pasanec Preprotić, PhD
Course title	Book prototype design

Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>elective</i>	
Year	II.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+2+0

COURSE DESCRIPTION		
1.1. Course objectives		
<i>By acquiring basic knowledge about the types and formats of books, as well as developing the essential practical skills required for their creation, students will be able to design and produce their own books. Familiarising themselves with the characteristics of materials, tools, and software required for book production, students apply fundamental aesthetic principles in the design of books through practical work, considering their content and purpose. Students are encouraged to present and realise their own ideas, and through short discussions related to their project assignments, they enhance their engineering, social, and communication skills while critically comparing the main advantages and disadvantages of books.</i>		
1.2. Enrollment conditions		
No conditions.		
1.3. Expected learning outcomes		
1. Categories the basic book types, formats, and bookbinding forms. 2. Analyse the fundamental parameters and aesthetic principles necessary for planning, designing, and producing books. 3. Use materials, tools, devices, and software for book production. 4. Argue the design of books. 5. Compare the main advantages and disadvantages of different book types.		
1.4. Course content		
1. The development, significance, and definition of the book today. 2. Distinguishing the basic book types, formats, and bookbinding forms. 3. Classification of books according to their content and purpose. 4. Analysis of the fundamental parameters of books. 5. Establishing the basic aesthetic principles in the book design process. 6. Materials, tools, devices, machines, and software for book production. 7. Planning, designing, and producing a book. 8. Advantages, challenges, and the future of traditional and contemporary book formats. 9. Characteristics of on-demand and personalised book production. 10. Basic concepts in book publishing		
1.5. Types of Teaching Methods	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other

				☐ Fieldwork			
1.6. Student obligations							
Mandatory attendance at lectures and exercises. Active participation in practical exercises. Creation and presentation of the project assignment. Exam access conditions: minimum attendance at 80 % of classes, positively graded project assignment.							
1.7. Student work monitoring							
Attendance	X	Activity in classes	X	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Project assignment – 65% Presentation of the project assignment – 15% Online activity – 10% Active class participation and practical exercise – 5% Attendance – 5% Attendance – 5% Evaluation: 1. As part of online activities, students recognise, explain, and categories the basic book types, formats, and binding forms. 2. In the framework of the project assignment student will analyse the fundamental parameters and aesthetic principles necessary for planning, designing, and producing books 3. In the framework of the project assignment, students must select and then use the materials, tools, devices, and software necessary for book production. 4. In their project presentation, students will comment on and argue the design of their book, 5. In their project presentation, students will outlining and explaining the advantages and disadvantages of different book types.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
H. Weston, Bookcraft, London, Library of Congress Cataloging, 2008.		1		50			
A. Golden, Making Handmade Books, New York, Lark Crafts, 2010.		1		50			
F. Hall, The Business of Digital Publishing, Taylor & Francis, 2022.		dostupno online		50			

J. Solić, Knjigoveštvo 1, Uvod i uvezi, Grafički obrazovni centar, Zagreb, 1973.	4	50
1.10. Supplementary literature 1. G. Tomić, <i>Elektroničko izdavaštvo - budućnost časopisa, diplomski rad, Zagreb, Grafički fakultet, 2012., (Mentor: N. Mrvac)</i> 2. S. Gašparić, G. Petković, S. Pasanec Preprotić, <i>Critical analysis of marketing in Croatian publishing, Acta graphica, 28 (2018), 3; 93-100.</i> 3. M. Horvat; <i>Ideja, projekt i izrada slikovnice "Karlina prva biblija,, – studija slučaja, 16th International Conference on Print, Design and Graphic Communication Blaž Baromić 2012 - Proceedings (str.585-598), 2012.</i> 5. J. Rodzvilla, <i>Project Managament for Book Publishing, London, Routledge, 2024.</i> 4. E. K. Smith, <i>How to make books, New York, Potter Craft, 2007.</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey and self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Suzana Pasanec Preprotić, PhD Prof. Maja Strgar Kurečić, PhD Prof. Igor Zjakić, PhD	
Course title	Introduction to Graphic Technology	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>compulsory</i>	
Year	I.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+0

COURSE DESCRIPTION
1.1. Course objectives
<i>Introducing students to the basic concepts and professional terminology in the field of graphic technology will enable them to understand and identify the production processes involved in creating various graphic products. By acquiring fundamental knowledge about the types and characteristics of different graphic products, materials, and media, students will be able to describe and define the basic parameters of graphic products for their production and/or presentation, as well as critically comment on the success of selected products. In addition to gaining basic knowledge and concepts within the diverse graphic industry, students are encouraged to explore their specific areas of interest, follow trends, and utilize scientific and professional literature.</i>

1.2. Enrollment conditions								
No conditions.								
1.3. Expected learning outcomes								
1. Explain the basic concepts in the field of the graphic industry. 2. Classify the basic products, materials, and media of the graphic industry. 3. Select production processes based on the type and purpose of the graphic product. 4. Create a description (snapshot) of the graphic product for the purpose of its production and/or presentation.								
1.4. Course content								
1. Reproduction process workflow and the role of graphic preparation. 2. Principle of color reproduction. 3. Differences in graphic preparation for print and preparation for the web. 4. Typical errors in graphic preparation - examples from practice. 5. Dividing of printing techniques and printing and digital media 6. Basic principles in conventional and digital printing techniques. 7. Basic of production process. 8. Principles of printing quality management. 9. Classification of graphic products, the role, and definition of finishing production. 10. Materials in graphic production. 11. Basic processes, tools, equipment, and machines in finishing graphic production. 12. Characteristics of graphic products and finishing processes concerning scale volume production.								
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other			
1.6. Student obligations								
Mandatory attendance at lectures. Active participation in online activities. Exam access conditions: minimum attendance at 70% of classes and the least completed 80% of online activities.								
1.7. Student work monitoring (mark with X for the appropriate method)								
Attendance	x	Activity in classes		Seminar paper		Experimental work		
Written exam	x	Oral exam		Essay		Research		
Project		Continuous knowledge assessment		Report		Practical work		
Portfolio								

1.8. Assessment and evaluation of student work during classes and at the final exam.		
Assessment: Test 1 - Prepress graphic production – 30% Test 2 – Main graphic production – 30% Test 3 – Postpress graphic production – 30% Written exam – 85% (or Test 1 + Test 2 + Test 3) Online activity – 10% Class attendance – 5% Evaluation: Online activities continuously assess student participation, understanding, and acquisition of basic concepts in graphic industry. Through online activities and in written form, students identify and classify basic products of the graphic industry. In written form, students explain and select appropriate production processes depending on the type of graphic product. In written form and through class participation, students make a description of the graphic product for the purpose of its production and/or presentation.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>R.Thompson, Graphics and Packaging Production, London, UK, Thames & Hudson, 2012.</i>	1	200
<i>H. Kipphan, Handbook Of Print Media, Berlin, Springer, 2001.</i>	dostupno online	200
<i>R. Hembree, The Complete Graphic Designer, Beverly, MA, US, Rockport Publishers, 2011.</i>	dostupno online	200
<i>I. Zjakić, Upravljanje kvalitetom ofsetnog tiska, Zagreb, Hrvatska sveučilišna naklada, 2011.</i>	23	200
<i>I.Zjakić, Tehničko uređivanje u procesu izrade knjige, Zagreb, Hrvatska sveučilišna naklada, 2013.</i>	13	200
1.10. Supplementary literature 1. M. Rešetar, <i>Papir proizvodnja, svojstva, primjena, Osijek, 2001.</i> 2. M. Enroth, <i>Tools for eco-efficiency in the printing industry, Royal Institut of Technology Stocholm, 2001.</i> 3. F. Mesaroš, <i>Tipografski priručnik, Zagreb, 1985.</i> 4. EduKon, <i>Abeceda za grafičare, Zagreb 2020.</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey and self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Suzana Pasanec Preprotić, PhD	
Course title	Bookbinding	
Study programme	Undergraduate university study programme Graphic technology	
Course status	compulsory	
Year	III.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>Students will learn the basic book types and bookbinding forms, how to classify books according to their purpose and content and will understand and be able to explain the technical-technological processes of bookbinding. They will be able to describe and assess the advantages and disadvantages of materials that have a direct impact on the quality of the final product, as well as calculate the consumption of graphic materials. By encouraging students to apply the acquired knowledge, they will be able to select compatible materials and appropriate tools, devices, and machines for the purpose of optimising the technical-technological process and workstations within the large-scale bookbinding production. Students will become familiar with the challenges of modern bookbinding production in the context of sustainable practices.</i>
1.2. Enrollment conditions
<i>Attended course Machines in Postpress Processes</i>
1.3. Expected learning outcomes
1. Distinguish bookbinding products according to type, form, purpose, and format. 2. Predict material compatibility and material consumption for the production of bookbinding products. 3. Plan production processes in large-scale production for the chosen bookbinding product. 4. Select tools and machines according to the production volume, technical-technological processes, and workstations in finishing (bookbinding) production. 5. Describe the challenges of modern bookbinding production with an emphasis on sustainable practices.
1.4. Course content
1. Aspects of bookbinding production today. 2. Significance of cutting, folding, and gathering processes. 3. Book types and bookbinding forms. Binding units. 4. Purpose and formats of books.

5. Materials in bookbinding.							
6. Packaging in bookbinding.							
7. Criteria for designing the bookbinding form and book type according to print volume.							
8. Differences between mass, serial and on-demand production of bookbinding products.							
9. Technological units in bookbinding.							
10. Sustainability in bookbinding production.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other	
1.6. Student obligations							
Mandatory attendance at lectures and exercises. Active participation in online activities. Exam access conditions: minimum attendance at 70% of classes, completed a minimum of 70% of online activities.							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment:							
Test 1 – 15%							
Test 2 – 30%							
Test 3 – 35%							
Written exam – 80% (or Test 1 + Test 2 + Test 3)							
Oral exam – 10%							
Online activity – 5%							
Attendance – 5%							
Evaluation:							
1. In written form and through online activities, students explain the differences between types, forms, purposes, and formats of bookbinding products.							
2. During practical exercises, students select compatible materials for the production of bookbinding products and calculate material consumption.							
3. In both written and oral forms, students connect production processes with the necessary tools and machines for the chosen bookbinding product.							

4. During practical exercises, students comment on the implementation of technical and technological processes with the aim of predicting job roles in post-press production. 5. By actively participating in discussions, students anticipate the challenges of modern bookbinding production, including sustainable practices in the graphic industry.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>T. Clark, Bookbinding with adhesives, McGraw-Hill Book Co, 1994.</i>	1	65
<i>H. Kipphan, Handbook of Print Media: Print finishing processes, Springer, Berlin, 2001.</i>	dostupno online	65
1.10. Supplementary literature 1. S. Pasanec Preprotić, M. Vukoje, G. Petković, M. Rožić, Sustainable approach to book designing concepts in bindery sector: An overview, <i>Proceedings - 11th International Symposium on Graphic Engineering and Design GRID 2022 / Vladić, Gojko (ur.). Novi Sad: University of Novi Sad, Faculty of Tehnical Science, Department of Graphic Engineering and Design, 2022. str. 629-645</i> 2. S. Pasanec Preprotić, D. Stančin, G. Petković, Projektiranje procesa u nakladničkom uvezu knjiga - Analiza radnog procesa. <i>Polytechnic and design</i>, 10 (2022), 4; 222-232. 3. T.J. Tedesco, <i>Binding, Finishing, Mailing</i>, GATF Press, Pittsburg, 1999. 4. G. Novak, <i>Grafični materijali</i>, Univerza v Ljubljani Naravoslovnotehniška fakulteta, Ljubljana, 2004. 5. S. Ebnesajjad, A.H. Landrock, <i>Adhesives Technology Handbook</i>, William Andrew, 2008. 6. <i>Framework for ISO/TC 130 Standards-Graphic Technology</i>, pg.1-23 7. A. W. Johnson, <i>Manual of Book Binding</i>, Thames and Hudson, 1981. 8. V. Potisk, <i>Grafička dorada -priručnik za grafičare</i>, Školska knjiga, 1996. 9. F. Mesaroš, <i>Tipografski priručnik</i>, Zagreb, 1981.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey and self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Suzana Pasanec Preprotić, PhD	
Course title	Box making techniques	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>elective</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+2+0

COURSE DESCRIPTION		
1.1. Course objectives		
<i>By acquiring fundamental knowledge about the types, characteristics, and materials of packaging boxes and special-purpose customised boxes, students will understand market needs and the importance of creating packaging that not only protects the product but also significantly contributes to its value and appeal. By becoming familiar with basic processes, tools, devices, and machines and by developing essential practical skills and techniques for creating special-purpose boxes, students will be able to design and create functional and aesthetically pleasing boxes. By recognizing the specific needs of the chosen product and brand for which a box needs to be created, they will be able to propose decorative techniques and additional creative elements to enhance the functionality of the box, as well as improve product protection and presentation.</i>		
1.2. Enrollment conditions		
No conditions.		
1.3. Expected learning outcomes		
1. Distinguish types of boxes and materials needed to produce packaging boxes and special-purpose customised boxes. 2. Describe the basic processes, tools, devices, and machines required for the box production, considering the volume of production. 3. Identify the specific needs of the chosen product to be packaged for the purpose of designing a customised box. 4. Apply cutting and assembly techniques in the special-purpose customised box production. 5. Argue the design of boxes. 6. Interpret the importance of decorative techniques, inner packaging adjustments, and other additional creative elements for enhancing functionality and improving product presentation.		
1.4. Course content		
1. Types of packaging boxes and special-purpose customised boxes. 2. Processes, tools, devices and machines. 3. Selection and characteristics of materials. 4. Brand and product understanding. 5. Cutting and assembly techniques. 6. Inner packaging adjustments – inserts, compartments and dividers. 7. The design process for special-purpose customised boxes. 8. Overview of decorative techniques for achieving a personalized and luxurious packaging appearance. 9. Enhancing functionality and improving product presentation. 10. Creativity and innovation - examples of best practices. 11. Advantages and disadvantages of on-demand production and short-run production.		
1.5. Types of Teaching Methods	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☒ Other
1.6. Student obligations		

Mandatory attendance at lectures and exercises. Active participation in practical exercises. Creation and presentation of the project assignment. Exam access conditions: minimum attendance at 80% of classes, positively graded project assignment.							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Project assignment – 65 % Presentation of the project assignment – 10 % Online activity – 10 % Active class participation and practical exercises – 10 % Attendance – 5 %. Evaluation: 1. As part of the online activities, students will distinguish and explain types of packaging boxes and the materials needed for their production. 2. In the online activities, as well as in the project assignment, students will describe and categorise the basic processes, tools, devices, and machines required for box production. 3. During practical exercises, students' knowledge, involvement, and ability to analyse the specific needs of the chosen products for which custom boxes are designing will be continuously assessed. 4. As part of the project assignment, students will apply demonstrated techniques for cutting and assembling to create their own box. 5. In their project presentation of packaging boxes, students will comment on and argument the design of the boxes and the success of their realisation. 6. In the online activities and project assignment, students will distinguish and explain decorative techniques, inner packaging adjustments, and other creative elements used to enhance the functionality and presentation of the selected product.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
M.R. Klimchuk, S.A. Krasovec, <i>Packaging Design: Successful Product Branding From Concept to Shelf</i> , New Jersey, J.Willey & Sons, 2012.		5		60			
A. Emblem, H. Emblem, <i>Packaging technology: fundamentals, materials and processes</i> , Cambridge, Woodhead publishing, 2012.		4		60			

<i>L. Roth, G.L. Wybenga, The Packaging Designer's Book of Patterns, Hoboken, Wiley, 2013.</i>	2	60
<i>S. Roncarelli, C. Ellicott, Packaging Essentials: 100 Design Principles for Creating Packages, Beverly, Rockport Publishers, 2010.</i>	available online	60
1.10. Supplementary literature 1. <i>T. Henry, The Accidental Creative: How to Be Brilliant at a Moment's Notice, New York, Portfolio Penguin, 2013.</i> 2. <i>R. Thompson, Graphics and Packaging Production, London, Thames & Hudson, 2012.</i> 3. <i>V.E. Sutanto, Packaging Your Crafts: Creative Ideas for Crafters, Artists, Bakers & More, NY, Union Square & Co, 2014.</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey and self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. prof. Ivana Plazonić, PhD	
Course title	Cellulose fibres preparation technologies	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	I.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+0

COURSE DESCRIPTION
1.1. Course objectives
<i>Explain the process of obtaining cellulose fibres. Differentiate the types of lignocellulosic raw materials for cellulose fibres isolation according to chemical composition and fibre length. Connect different types of lignocellulosic raw materials with the possibility of their use in the paper industry. Differentiate between the terms wood pulp, semi chemical and chemical pulp. Distinguish the procedures for cellulose fibres isolation from lignocellulosic raw materials. Explain the procedures for increasing the whiteness of isolated cellulose fibres.</i>
1.2. Enrollment conditions
-
1.3. Expected learning outcomes

1. Differentiate lignocellulosic raw materials and their parts from which cellulose fibres can be obtained. 2. Differentiate between the terms wood pulp, semi chemical and chemical pulp. 3. Explain the procedures for cellulose fibres isolation from raw materials. 4. Relate the origin of cellulose fibres to the use for a specific product of the paper industry.							
1.4. Course content							
1. Classification of fibres. Sources and types of cellulose fibres. 2. Classification, anatomical, macroscopic and microscopic structure of wood species. 3. Differences between deciduous and coniferous trees. Non-wood raw materials as sources of cellulose fibres. 4. Chemical composition of wood and non-wood raw materials. Cellulose. Hemicellulose. Lignin. Accessory substances. 5. Chemical, mechanical and chemical-mechanical method of obtaining cellulose. 6. Woodchips. 7. Wood pulp. 8. Semi chemical pulp. Processes of production. 9. Chemical pulp. Processes of production. 10. Bleaching of cellulose.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☐ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
Minimum attendance at 50% of the lectures. Written seminar paper on a defined topic.							
1.7. Student work monitoring							
Attendance	x	Activity in classes		Seminar paper	x	Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous knowledge assessment		Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: - lecture attendance – 10% - seminar paper (writing) – 10% - seminar paper (oral presentation) – 10% - written exam – 70% or as continuous knowledge assessment during lectures (colloquium) - colloquium 1 – 35% - colloquium 2 – 35%							

<i>Evaluation:</i> 1. In written form at the colloquium/written exam, students will justify their knowledge of different lignocellulosic raw materials and parts of their plants from which cellulose fibres can be obtained. 2. In written form at the colloquium/written exam, students will explain the differences between wood pulp, semi chemical pulp and chemical pulp. 3. In written form at the colloquium/written exam, students will explain different procedures for processing raw materials to get pulp. 4. In written form in the colloquium/written exam, students will connect the origin of cellulose fibres with their use for a specific product of the paper industry.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Kljajić, Filip: Tehnologija celuloze i drvenjače, Zagreb : Školska knjiga, 1984., XII, 155 str.</i>	12	
<i>Golubović, Adrijano: Tehnologija izrade i svojstva papira, Zagreb: Viša grafička škola, 1984.</i>	13	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form, etc..		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. prof. Ivana Plazonić, PhD Prof. Željka Barbarić-Mikočević, PhD	
Course title	Structural properties of organic compounds	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	I.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+0

COURSE DESCRIPTION
1.1. Course objectives
<i>Explain the importance of the structure of organic compounds. Classify organic compounds according to functional group. Name organic compounds according to the IUPAC naming rules. Draw the formation of molecular orbitals. Differentiate between addition and condensation polymers. Draw absorption and</i>

<i>reflection curves of certain coloured dyes. To associate the deterioration of paper with the hydrolysis of cellulose as the basic component of paper. Differentiate between drying and non-drying oils and their use in graphic paints.</i>							
1.2. Enrollment conditions							
-							
1.3. Expected learning outcomes							
1. Classify organic compounds according to functional group. 2. Name organic compounds. 3. Draw the organic compounds structures in different ways. 4. Distinguish between addition and condensation polymers. 5. Draw absorption and reflection curves of certain dyes. 6. Connect carbohydrates and oils with its application in graphic products.							
1.4. Course content							
1. Representing the structure of organic compounds. Formal charge. 2. Atomic orbitals. Molecular orbitals. 3. Hybridization of carbon atomic orbitals. 4. Electrons in delocalized π molecular orbitals. The reason for the stability of coloured organic compounds. 5. Dyes and pigments. Chemistry of coloured organic compounds. 6. Hydrocarbons and hydrocarbon derivatives. 7. Nomenclature. 8. Electrophilic addition reactions. Polyaddition. Polycondensation. 9. Addition polymers. Condensation polymers. 10. Carbohydrates. Cellulose and starch as components of paper. 11. Lipids. Oils in printing inks. Drying and non-drying oils							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☐ Exercises ☐ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
To attend at least 50% of the course lectures.							
1.7. Student work monitoring							
Attendance	x	Activity in classes		Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							

Assessment: - lecture attendance – 10% - written exam – 90% or as continuous knowledge assessment during lectures (colloquium) - colloquium 1 – 30% - colloquium 2 – 30% - colloquium 3 – 30%		
Evaluation of student work: 1. In a written form at colloquium/written exam the student will draw structural formulas of different organic compounds. 2. In a written form at colloquium/written exam the student will name organic compounds according to the IUPAC naming rules. 3. In a written form at colloquium/written exam the student will write the given electrophilic addition reactions. 4. In a written form at colloquium/written exam the student will list polymers. 5. In a written form at colloquium/written exam the student will draw absorption and reflection curves of certain dyes. 6. In a written form at colloquium/written exam the student will connect carbohydrates and oils with its use for a specific graphic product.		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
V. Tralić-Kulenović, B. Karaman, L. Fišer-Jakić, Uvod u organsku kemiju, Litograf, Zagreb, 2004	10	
Stanley H. Pine, Organska kemija, Školska knjiga, Zagreb, 1994	3	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form, etc..		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assoc. Prof. Tibor Skala, PhD; Assist. Prof. Marko Maričević, PhD	
Course title	Fundamentals of Computing and Programming	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	I.	
	ECTS credits	5

ECTS credit and teaching method	Number of hours (L+E+S)	2+2+0
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COURSE DESCRIPTION		
1.1. Course objectives		
<i>This course provides students with an introduction to concepts in computing, programming and their applications in digital media and multimedia applications. Students will acquire fundamental knowledge of computer system architecture, digital number systems, and Boolean algebra, as well as basic logic circuits such as AND, OR, and NOT, in the context of modern computer systems. Additionally, they will be introduced to key components of computer systems such as registers, buses, and various types of memory circuits and processors. The course covers the basics of operating systems, algorithms, and data structures, with a focus on learning programming through Python. Special attention is given to human-computer interaction and the fundamentals of multimedia technologies. The goal of the course is to equip students with an understanding of the key principles of computing and programming through practical tasks in Python, with an emphasis on applying the acquired knowledge to the creation of digital solutions and multimedia applications.</i>		
1.2. Enrollment conditions		
1.3. Expected learning outcomes		
1. Understand the fundamental concepts of computer architecture. 2. Apply Boolean algebra and digital number systems. 3. Apply basic programming skills through Python. 4. Differentiate between analog and digital media. 5. Develop basic human-computer interaction skills using multimedia technologies.		
1.4. Course content		
1. Introduction to Computer Architecture and Computer Science 2. Number Systems in Computing and Data Representation 3. Fundamentals of Boolean Algebra 4. Analog and Digital Technology 5. Human-Computer Interaction 6. Fundamentals of Digital Media 7. Basics of Algorithms and Data Structures 8. Introduction to Modular Programming and Code Structure 9. Introduction to Object-Oriented Programming 10. Development Environment in the Python Programming Language 11. Development of Interactive Applications		
1.5. Types of Teaching Methods	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education	☒ Independent tasks ☒ Multimedia and network ☒ Laboratory ☐ Mentorship ☐ Other_

				☐ Fieldwork			
1.6. Student obligations							
Mandatory attendance for both lectures and exercises. Exam eligibility requirements: a minimum of 50% attendance in classes and 50% completion of exercises. A project assignment must be completed.							
1.7. Student work monitoring (mark with X for the appropriate method)							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Grading: Exercises - 50% Project Assignment - 20% Continuous Knowledge Assessment - 30% Evaluation: - In written form during continuous knowledge assessment, explain the basic concepts of computer architecture. - In written form during continuous knowledge assessment, differentiate between analog and digital media and explain the basic characteristics of audio, video, and image digital formats. - During exercises, apply basic programming skills in Python to solve simple problems. - In written form during continuous knowledge assessment, differentiate between analog and digital media and explain the basic characteristics of digital formats. - During lab exercises and project assignment, develop basic human-computer interaction skills through interactive applications and multimedia technologies.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Paul Barry, Head First Python: A Learner's Guide to the Fundamentals of Python Programming, A Brain-Friendly Guide, O'Reilly Media, 2023.		0					
John L. Hennessy i David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann, 2023.		0					

Charles Petzold, Code: The Hidden Language of Computer Hardware and Software, Microsoft Press, 2023.	0	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Maja Strgar Kurečić, PhD Prof. Lidija Mandić, PhD	
Course title	Graphic Prepress	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of the course is to introduce students to the basic stages of the reproduction process and the role of graphic prepress production for print. Through this course, students will acquire basic knowledge about the principles of color reproduction and about the factors that affect the quality of reproduction in print and are related to graphic prepress. They will become familiar with measuring devices for quality control of print reproduction. As part of the exercises, students will learn to use the appropriate software for image editing, as well as for page design (Adobe Photoshop and Adobe InDesign). By mastering the course, students will be able to connect errors in print reproduction with possible causes in graphic prepress and how to remove these errors in the most efficient way. They will also know how to make graphic prepress for printing for simpler graphic products such as posters and brochures.</i>
1.2. Enrollment conditions
Attended Course Digital multimedia
1.3. Expected learning outcomes
1. Describe the basic stages of the reproduction process and the role of graphic prepress. 2. Explain the principle of color reproduction. 3. List the factors that affect the quality of print reproduction. 4. Apply appropriate software for image editing and page design. 5. Create a brochure using digital tools for graphic page design.

6. Connect errors in print reproduction with possible causes in graphic prepress.							
1.4. Course content							
1. The role of graphic prepress in the reproduction chain - Overview of the basic stages of the reproduction process (input/ processing/ output). Display of workflow with Color Management implementation. Elaboration and description of individual stages in the prepress, with an emphasis on the factors on which the quality of reproduction in print depends. 2. Basics about color - Experiencing color, describing color, metamerism. Subjective and objective characteristics of color. Color mixing - additive and subtractive synthesis. Complementary colors. Color spaces. 3. Color reproduction quality control - Colorimetry. Devices for measuring colors, characteristics, differences. Colorimetric difference. Standards and permitted deviations. 4. Color Management - Color transformations in the reproduction process. Problems. Color Management System - basic role. System components. Reference color space. Module with color matching algorithms. ICC profiles. The principle of color conversion in the Color Management system. The importance of calibration and characterization of devices that participate in the reproduction process. Proof print - soft proof, hard proof. 5. Reproduction processes - Input processes. Digitization. Input devices - scanner, digital camera. Factors on which input quality depends (resolution, bit depth, tonal range, color space, recording format ...) Image processing for different outputs - for display on a monitor (Internet, electronic devices), for print, for printing (newspaper, magazine, book, poster). Standards and requirements. 6. Raster systems - Principle of color reproduction - separation, rasterization. Types of rasters, moire. Amplitude and frequency modulation. Hybrid raster. Application. 7. Characteristics of color reproduction - Defining the parameters on which reproduction quality depends. Ink coverage. Trapping. Dot gain. Gray balance. Achromatic replacement - UCR, GCR, UCA. 8. Typical errors in graphic prepress for print							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
Mandatory attendance at lectures and exercises. Writing two colloquia. Project assignment made in the exercises.							
1.7. Student work monitoring							
Attendance		Activity in classes		Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							

Assessment: Written exam-60% or as part of continuous assessment (colloquium) Colloquium 1 – 30% Colloquium 2 – 30 % Project task 40% Evaluation: 1. In writing, students describe the basic stages of the reproduction process and the role of graphic prepress in print 2. In writing, students explain the principle of color reproduction 3. In writing, students list the factors that affect the quality of reproduction 4. As part of the exercises, students independently use software for digital image editing and page design 5. As part of the project assignment, students create a brochure using digital software for graphic page design 6. In written form, students link errors in reproduction with possible causes in graphic prepress		
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
Kipphan et al., <i>Handbook of Print Media</i> , Springer, Berlin, 2001.	1	
B. Fraser, C. Murphy, F. Bunting, <i>Real World Color Management</i> - 2 nd ed., Peachpit Press, Berkeley, 2005.	2	
P. Green, <i>Understanding Digital Color</i> - 2 nd ed., GATF Press, Pittsburgh, 1999.	1	
R. C. Gonzalez & R. E. Woods, <i>Digital Image Processing</i> - 3 rd ed., Upper Saddle River, NJ, USA: Prentice Hall, 2010.	1	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form		

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Assistant Professor Maja Stržić Jakovljević, PhD; Professor Branka Lozo, PhD
Course title	Fibrous printing substrates
Study programme	Undergraduate university study programme Graphic technology
Course status	Compulsory

Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION	
1.1. <i>Course objectives</i>	
The objectives of the proposed course include acquiring fundamental knowledge about the technological processes of production and the properties of fibrous printing substrates. Students will learn to independently conduct laboratory tests on various properties of these substrates and analyze the results. Additionally, the course will enable them to understand the technical characteristics of fibrous printing substrates in the graphic industry, recognize the impact of additives and coatings on their properties, and develop the ability to select appropriate substrates for specific graphic products, while fostering independence and responsibility in decision-making.	
1.2. <i>Enrolment conditions</i>	
Completed course Mechanics and wave phenomena.	
1.3. <i>Expected learning outcomes</i>	
<i>After finished course, students will be able to:</i> <i>1. Explain the properties of fibrous printing substrates that are defined during the technological production process.</i> <i>2. Apply laboratory methods for testing the properties of fibrous printing substrates.</i> <i>3. Analyze the results of laboratory tests on graphic materials, linking practical work with theoretical knowledge.</i> <i>4. Comment on the technical characteristics of fibrous printing substrates (paper/cardboard) used in the graphic industry.</i> <i>5. Interpret the impact of various additives to fibres and coatings in the production of fibrous printing substrates on their properties.</i> <i>6. Select a fibrous printing substrate (paper/cardboard) for a specific graphic product, considering the product requirements.</i>	
1.4. <i>Course content</i>	
<i>1. Historical overview of the production of fibrous printing substrates</i> <i>2. Fiber raw materials for the production of printing substrates</i> <i>3. Types and processing of cellulose</i> <i>4. Technological process of paper production on a paper machine, properties defined during this process</i> <i>5. Fiber additives in the production of fibrous printing substrates</i> <i>6. Cardboard and paperboard</i> <i>7. Finishing in the production of fibrous printing substrates, coatings</i> <i>8. Collection of used fibrous printing substrates, sorting, transport, and recycling</i> <i>9. Dimensional stability and moisture of fiber materials</i> <i>10. General and structural properties of fibrous printing substrates – determining thickness, grammage, surface mass, and specific volume</i> <i>11. Surface properties of fibrous printing substrates – Bekk smoothness, Bendtsen roughness, Cobb surface absorbency</i> <i>12. Mechanical properties of fibrous printing substrates – tensile, determining the number of double folds, tear resistance (Elmendorf), burst resistance (Mullen), Taber stiffness</i>	

13. Optical properties of paper – determining the degree of brightness, whiteness, opacity, and gloss							
14. Chemical properties of fibrous printing substrates – determining the pH of the paper surface, determining the content of fillers in paper							
15. Technical specifications of commercially available fibrous printing substrates							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☐ Mentorship ☐ Other	
1.6. Student obligations							
The requirements for passing the course are completed and positively graded laboratory exercises.							
1.7. Student work monitoring							
Attendance		Activity in classes	X	Seminar paper		Experimental work	X
Written exam	X	Oral exam	X	Essay		Research	
Project		Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Student grading: First written exam (lecture material) – 30% Second written exam (lecture material) – 30% Preparation and presentation of a project and seminar paper – 30% Homework assignments (Merlin) – 10%							
Student evaluation: <i>In written form, students explain methods of protection (damage prevention) for written and printed records.</i> <i>In written form, students explain the impact of microclimatic conditions on the durability of stored written and printed records.</i> <i>As part of the project, students develop a plan for processing documentation and selecting materials in the procedures for paper restoration of damaged written and printed records.</i> <i>In written form, students describe the properties of graphic materials that ensure greater durability of written and printed records and the preservation of written cultural heritage.</i> <i>In written form, students explain the importance of materials used for making acid-free protective boxes.</i> <i>In written form, students describe non-invasive methods for testing, processing, and restoring written and printed cultural heritage.</i>							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Holik, Herbert: „Handbook of Paper and Board“, Weinheim : Wiley-VHC, 2013.,		1					

ISBN 9783527331840, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2013.		
Katarina Gerić, Miljana Prica, Rastko Milošević: „Grafički materijali: praktikum za vežbe“, Novi sad: Fakultet tehničkih nauka, 2018., ISBN 9788660220341	1	
Novak, Gabrijela: „Papir, karton, lepenka“, Ljubljana: Naravoslovnohitiška fakulteta, Oddelek za tekstilstvo, 1998., ISBN 9616045091	1	
Rešetar, Mirko: „Papir : proizvodnja, svojstva, primjena“, Osijek: Društvo grafičkih inženjera i tehničara Osiječko - baranjske županije, 2001., ISBN 1539839408	1	
Golubović, Adriano: „Svojstva i ispitivanje papira“, Zagreb: Viša grafička škola, 1993.	1	
Golubović, Adriano: „Tehnologija izrade i svojstva papira“, Zagreb: Viša grafička škola, 1984.	1	
1.10. Supplementary literature		
1. Hubbe, M. A., and Gill, R. A. (2016). "Fillers for papermaking: A review of their properties, usage practices, and their mechanistic role," BioRes. 11(1), 2886-2963 https://bioresources.cnr.ncsu.edu/resources/fillers-for-papermaking-a-review-of-their-properties-usage-practices-and-their-mechanistic-role/		
2. Stjepan Horvatić – „Grafika 2 - Papiri i višebojni tisak“, Markulin, Zagreb ISBN13 9789537915001, 2012.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Assistant Professor Maja Strižić Jakovljević, PhD; Professor Branka Lozo, PhD	
Course title	Restoration of paper	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
The objectives of the proposed course include acquiring knowledge about methods of protection and prevention of damage to written and printed media, as well as techniques for preserving and extending their lifespan. Students will learn to recognize the impact of microclimatic conditions on the durability of records, select materials that ensure greater longevity, and use acid-free protective boxes to preserve valuable documents. The course also covers the acquisition of knowledge about non-invasive restoration methods and the evaluation of various protection methods, with an emphasis on the ethical and professional standards of the field through fieldwork.
1.2. <i>Enrolment conditions</i>
1.3. <i>Expected learning outcomes</i>
<i>After finished course, students will be able to:</i> <i>1. Identify methods of protection (damage prevention) for written and printed media (documents).</i> <i>2. Discuss the impact of microclimatic conditions on the durability of stored written and printed records.</i> <i>3. Explain the processing of documentation and the selection of materials in paper restoration procedures for damaged written and printed records.</i> <i>4. Select graphic materials that ensure greater durability of written and printed records and the preservation of written cultural heritage.</i> <i>5. Recognize materials used for making acid-free protective boxes.</i> <i>6. Identify non-invasive methods for testing, processing, and restoring written and printed cultural heritage.</i>
1.4. <i>Course content</i>
<i>1. Historical overview of paper production and bookbinding, importance of preserving written and printed cultural heritage</i> <i>2. Storage conditions for written and printed records</i> <i>3. Types of damage – chemical and mechanical damage to paper materials, written and printed cultural heritage</i> <i>4. Biological damage – humidity, mold, microorganisms, pests</i> <i>5. Lightfastness, durability, and resistance of printed materials on paper</i> <i>6. Impact of material selection on the durability of records</i> <i>7. Paper and bookbinding restoration and conservation</i> <i>8. Criteria for approaching restoration and documentation of incoming materials, photographic documentation of incoming materials, record of actions and procedures</i> <i>9. Restoration techniques</i> <i>10. Disassembly into individual sheets, dry and wet cleaning, washing, replacing missing parts, materials for replacement, handling of restored papers</i> <i>11. Materials for restoration and conservation of paper and bookbinding</i> <i>12. Materials for enhanced durability of written and printed records</i> <i>13. Building and room conditions for storage, conservation before and after restoration</i> <i>14. Conservation and storage. Preventive protection of written and printed cultural heritage. Disaster recovery.</i>

1.5. <i>Types of Teaching Methods</i>				☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☒ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☒ Mentorship ☐ Other	
1.6. <i>Student obligations</i>							
A requirement for taking the exam is at least 80% attendance and active participation in seminar classes.							
1.7. <i>Student work monitoring</i>							
Attendance	X	Activity in classes	X	Seminar paper	X	Experimental work	
Written exam	X	Oral exam	X	Essay		Research	X
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
Student grading: First written exam (lecture material) – 30% Second written exam (lecture material) – 30% Writing and presentation of a project and seminar paper – 30% Homework assignments (Merlin) – 10%							
Student evaluation: <i>In written form, students explain methods of protection (damage prevention) for written and printed records.</i> <i>In written form, students explain the impact of microclimatic conditions on the durability of stored written and printed records.</i> <i>As part of the project, students develop a plan for processing documentation and selecting materials in the procedures for paper restoration of damaged written and printed records.</i> <i>In written form, students describe the properties of graphic materials that ensure greater durability of written and printed records and the preservation of written cultural heritage.</i> <i>In written form, students explain the importance of materials used for making acid-free protective boxes.</i> <i>In written form, students describe non-invasive methods for testing, processing, and restoring written and printed cultural heritage.</i>							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title			Number of copies		Number of students		

<i>Vesna Milcic Trajbar: Zaštita starih novina na novim medijima, Zbornik referatov v dopolnilnega izobraževanja, Maribor 1/2002</i>	<i>Available online</i>	
<i>T. Mušnjak, Arhivi: Između digitalnih zapisa i ubrzanog propadanja gradiva na kiselom papiru, Arh. vjesn., god. 44, 2001</i>	<i>Available online</i>	
<i>Pilipović, Restauriranje zemljopisnih karata, Arh. vjesn., god. 41, 1998</i>		
<i>Library Damages Atlas, A tool for assessing damage, de Valk, Marijn, Vlaamse Erfgoedbibliotheken, Antwerpen, Belgium, 2018, ISBN 978-90-8228071-5</i>	<i>Available online</i>	
<i>Ageing and stabilisation of paper / edited by Matija Strlič, Jana Kolar, Impresum Ljubljana: National and University Library, 2005., ISBN 9616551035</i>	<i>Available online</i>	
1.10. Supplementary literature		
<i>Laszlo Ž., Dragojević A., Priručnik preventivne zaštite umjetnina na papiru, Crescat, Zagreb, 2010</i>		
<i>I. Kozjak, Spašavanje arhivskoga gradiva nakon katastrofa: nove mogućnosti Središnjeg laboratorija za prvu konzervaciju i restauraciju Hrvatskog državnog arhiva, Arh. vjesn., god. 53, 2010</i>		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Asst. Prof. Tamara Tomašegović, PhD
Course title	<i>Imposition of selected graphic products</i>
Study programme	Undergraduate university study programme Graphic technology
Course status	<i>Elective</i>

Year	<i>II.</i>	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	1+2+0

COURSE DESCRIPTION		
1.1. <i>Course objectives</i>		
The course aims to train students to independently create imposition for various types of graphic products. This involves differentiating elements on the imposition scheme and positioning them based on their purpose and application for specific reproduction technology or product type. After completing the course, students will be able to use software to create imposition schemes and select necessary control elements for printing plates, printing processes, and finishing operations. The course will enable students to independently implement imposition for graphic products consisting of multiple sections or parts, tailored to the requirements of the printing and finishing process.		
1.2. <i>Enrollment conditions</i>		
1.3. <i>Expected learning outcomes</i>		
1. Use software support to implement imposition for different types of graphic products. 2. Differentiate the elements on the imposition scheme with regard to their purpose, positioning and application in graphic reproduction processes. 3. Select the necessary control elements for the printing plate, printing process and finishing operations when creating the imposition scheme. 4. Adjust the arrangement of elements on the imposition scheme to specific reproduction technology, optimal consumption of printing plates and finishing operations.		
1.4. <i>Course content</i>		
1. Detailed introduction to imposition in a digital environment. 2. Possible output systems of the imposition process. 3. Defining the format of the printing plate and punch area. 4. Elements of the imposition scheme for different printing techniques/technologies. 5. Elements on the imposition scheme with regard to the type of graphic product. 6. Control elements for the printing plate on the imposition scheme. 7. Control elements for reproduction process and elements for finishing operations on the imposition scheme. 8. Creation of customized control elements. 9. Imposition for different types, i.e., parts of graphic products (flyer, cover, brochure, journal, book). 10. Adaptation of the imposition scheme to finishing operations and optimized consumption of printing plates. 11. Creation of an imposition for a graphic product composed of several parts.		
1.5. <i>Types of Teaching Methods</i>	☒ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other

1.6. Student obligations							
Compulsory attendance of lectures and exercises. Mandatory project assignment as part of exercises at the end of the semester. Condition for taking the exam: a positively graded project assignment (minimum 50% points from the project assignment), minimum 25% possible points obtained from class activities.							
1.7. Student work monitoring							
Attendance		Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam		Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment: Project task as part of exercises - 40% Written exam - 40% or continuous knowledge assessment (colloquium) - 40%: Colloquium 1 – 20% Colloquium 2 – 20% Activity in classes (lectures and exercises) – 20% Evaluation: 1. Within the framework of practical work on exercises and assigned project tasks, students independently use software support to implement impositions for graphic products. 2. In written form at lectures and colloquiums at lectures/written exam, students explain the purpose, positioning and application of various elements on the imposition scheme in the processes of graphic reproduction. 3. Within the framework of practical work during the exercises and assigned project task, students independently select and use the necessary control elements for the printing plates and reproduction process, as well as elements for finishing operations when creating the imposition scheme. 4. As part of the assigned project task, students adjust the layout of elements on the imposition scheme to reproduction technology, optimized consumption of printing plates and finishing operations for the selected graphic product.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
<i>Title</i>		<i>Number of copies</i>		<i>Number of students</i>			
KODAK Preps Imposition Software User Guide (available at https://workflowhelp.kodak.com/display/PREPS10/KODAK+Preps+Imposition+Software+User+Guide)		Open access					
Kipphan, H. (2001). Prepress. In: Kipphan, H. (eds) Handbook of Print Media.							

Springer, Berlin, Heidelberg. ISBN 978-3-540-67326-2		
Colins, W. (2015) Imposition. In <u>Graphic Design and Print Production Fundamentals</u> (available at https://opentextbc.ca/graphicdesign/chapter/5-6-imposition/) ISBN 978-1-989623-66-4	Open access	
1.10. Supplementary literature		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Asst. prof. Marina Vukoje, PhD	
Course title	Biological Factors in Graphic Technology	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	II.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+1+0

COURSE DESCRIPTION
1.1. Course objectives
<i>The aim of this course is to provide students with fundamental theoretical and practical knowledge of microbiology, with a focus on its application in graphic engineering as a tool for monitoring material analysis and degradation. Students will learn how to grow, inoculate, and classify microorganisms, apply microscopy and sterile techniques, and conduct simple microbiological tests. The course will also cover the role of microorganisms in the degradation of graphic materials and the control of contamination resulting from graphic processes. Additionally, it will explain the process of biodegradation and the impact of various environmental parameters on it, as well as its role in graphic engineering. Through laboratory exercises, students will develop the skills necessary to maintain microbiological cleanliness and quality of graphic products, particularly packaging.</i>
1.2. Enrollment conditions

1.3. Expected learning outcomes							
1. Explain basic concepts in microbiology. 2. Demonstrate sterile working techniques in the laboratory. 3. Perform basic techniques for culturing microorganisms. 4. Identify sources of microbiological contamination and material degradation. 5. Apply simple microbiological tests in graphic engineering. 6. Explain biodegradation processes and the impact of various parameters on biodegradation.							
1.4. Course content							
1. Basic theoretical knowledge in microbiology. Types of microorganisms. 2. Basics of microbiological work (sterile technique, safety). 3. Cultivation and inoculation of microorganisms. Media and conditions for microorganism growth. 4. Microscopy techniques. Identification of microorganisms. 5. Microbiological methods. Determination of bacterial count and contamination monitoring tests. Preparation of decimal dilutions. 6. Microorganisms as causes of material degradation. Prevention methods. 7. Microorganisms as a tool for controlling pollution caused by graphic processes. 8. Biodegradation of materials, dyes, and waste streams (paper, polymers). Impact of environmental factors on biodegradation efficiency. 9. Application of microbiological testing in graphic engineering. 10. Importance of microbiology in packaging technologies. Microbiological contamination and cleanliness.							
1.5. Types of Teaching Methods				☒ Lectures ☐ Seminars and workshops ☒ Exercises ☒ Online education ☐ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☐ Mentorship ☐ Other_____	
1.6. Student obligations							
Mandatory attendance of lectures and seminars. Exam eligibility requirement: a minimum attendance of 50% of classes and 90% of laboratory exercises and a written laboratory report.							
1.7. Student work monitoring							
Attendance	X	Activity in classes		Seminar paper	X	Experimental work	
Written exam	X	Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Grading: Written exam or two positively graded midterm exams – 50% Laboratory report – 30%							

<i>Class attendance – 10%</i> <i>Completion of assignments during the semester – 5 %</i> Evaluation: <i>In the written exam, students will explain the basic concepts of microbiology.</i> <i>During laboratory exercises, students will demonstrate the use of sterile working techniques.</i> <i>Under supervision, students will conduct microbiological tests in the laboratory, such as determining bacterial counts.</i> <i>In the written form, students will explain the sources of microbiological contamination and material degradation.</i> <i>During laboratory exercises, students will apply microbiological tests in graphic engineering.</i> <i>In the written exam, students will explain the processes of biodegradation and the impact of various parameters on the biodegradation process.</i>		
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>		
<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
<i>Sharma, P. D. Microbiology : a textbook for university students / P. D. Sharma. Meerut : Rastogi Publications, 2017. (NSK)</i>	1	
<i>Wistreich, George A. Microbiology laboratory : fundamentals and applications / George A. Wistreich. Upper Saddle River : Prentice Hall : Pearson Education, cop. 2003. (NSK)</i>	1	
<i>Smart packaging technologies for fast moving consumer goods / [editors] Joseph Kerry, Paul Butler. Chichester : Wiley, 2008. (odabrana poglavlja)</i>	2	
1.10. <i>Supplementary literature</i>		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
<i>Student survey, self-evaluation form, etc..</i>		

COURSE DESCRIPTION

GENERAL INFORMATION	
Course leader	Asst. prof. Marina Vukoje, PhD
Course title	Interaction of Graphic Materials
Study programme	Undergraduate university study programme Graphic technology

Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	3
	Number of hours (L+E+S)	2+0+1

COURSE DESCRIPTION		
1.1. Course objectives		
<i>The aim of this course is to provide students with basic technical knowledge to understand the concepts and theories of adhesion and their application in graphic technology. Students will become familiar with the formation of adhesive bonds, drying methods, thermodynamic properties of surfaces and interfaces, and compatibility between different materials. The course will cover surface treatment of materials to achieve effective adhesion and ensure the quality of adhesive bonds. Students will explain methods for determining the strength and stability of adhesive bonds and explore the application of adhesion in printing, bookbinding, material protection, and packaging.</i>		
1.2. Enrollment conditions		
Attended course Laboratory methods in graphic technology and Structural properties of organic compounds		
1.3. Expected learning outcomes		
7. Explain basic concepts related to adhesion, adhesion theories, and the formation of adhesive bonds. 8. Identify problems that may arise when forming adhesive bonds between different materials. 9. Describe various surface treatment methods for materials. 10. Comment on factors that may affect the stability of adhesive bonds. 11. Differentiate adhesion principles through specific examples such as paper-printing ink bonds, paper-glue, aluminum-printing ink, polyethylene-printing ink, and pressure-sensitive adhesive bonds.		
1.4. Course content		
11. Introduction to adhesion, general concepts, and definitions. Adhesion theory and basic properties. 12. Formation of adhesive bonds and drying methods. 13. Surface and interface theories. Thermodynamic properties of surfaces. 14. Surface compatibility and problems in forming adhesive bonds between different materials. 15. Surface treatment of materials (polymers, wood, glass, metal) to create bonds. 16. Methods for determining adhesive bonds. Determining the strength of adhesive bonds. 17. Determining the stability of adhesive bonds. 18. Adhesive bonds in graphic technology. Importance of adhesion and its application in printing, bookbinding, material protection, and packaging. 19. Achieving adhesion in paper-printing ink, paper-glue, aluminum-printing ink, polyethylene-printing ink, pressure-sensitive adhesive bonds, and others.		
1.5. Types of Teaching Methods	☒ Lectures ☒ Seminars and workshops ☐ Exercises ☒ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other ____

1.6. Student obligations							
Mandatory attendance of lectures and seminars. Exam eligibility requirement: a minimum attendance of 70% of classes and seminars, and a completed seminar report.							
1.7. Student work monitoring							
Attendance	X	Activity in classes		Seminar paper	X	Experimental work	
Written exam	X	Oral exam		Essay		Research	
Project	X	Continuous knowledge assessment	X	Report		Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Grading: Written exam or two positively graded midterm exams – 50% Project report – 30% Class attendance – 10% Completion of assignments during the semester – 10% Evaluation: 7. In written form, explain the basic concepts in the field of adhesion. 8. As part of the project task, based on case analysis, students will produce a report highlighting the problems that may arise when forming adhesive bonds between different materials. 9. In the written exam or project report, the student will describe methods for surface treatment of materials. 10. As part of the project task, based on case analysis, students will assess factors that may affect the stability of adhesive bonds. 11. In written and oral form, students will create and present a report as part of the project task, explaining the differences in forming bonds between paper-printing ink, paper-glue, aluminum-printing ink, polyethylene-printing ink, and pressure-sensitive adhesive bonds.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
Comyn, John; Adhesion science; Cambridge : Royal Society of Chemistry, 2021.		4					
Winkless, Laurie; Sticky : the secret science of surfaces; London : Bloomsbury sigma, 2022.		4					
Contact Angle, Wettability and Adhesion, Ed. K.L. Mittal, VSP, Utrecht, The Netherlands, 1993.		1					

1.10. Supplementary literature

Adhesive Bonding - Science, Technology, and Applications; Ed. Robert D. Adams; Woodhead Publishing, Elsevier, 2021. *(available in pdf form - online)*

Polymer Surfaces and Interfaces Characterization, Modification and Applications Ed. Stamm, M. Munro, Springer, 2008. *(available in pdf form - online)*

Handbook of Adhesion, Ed. D.E. Packham, John Wiley Sons, Ltd, Chichester, 2005. *(available in pdf form - online)*

1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies

Student survey, self-evaluation form, etc..

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Ivana Žiljak Stanimirović, PhD	
Course title	Typography	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Compulsory	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
The aim of this course is to acquaint the students with the historical, theoretical and practical aspects of typography, with an emphasis on the application of typography in design and visual communications, digital media, and printing press. Students will acquire knowledge about the classification of typography regarding to historical development and optical characteristics, learn how to select and apply appropriate typography in design to improve readability, aesthetics and functionality of multimedia and printed products. By mastering the course, the student will be able to apply the knowledge of solving the tasks of standardizing typefaces for use on different platforms, adding diacritical characters for the Croatian language, designing and realizing the author's individualized typeface, and fonts and pictograms for use in signage.
1.2. Enrollment conditions
1.3. Expected learning outcomes

1. Describe the development of typography through the classification of letters, recognize the partition into different letter categories and explain the terms and rules in typography and typographic measurement systems. 2. Analyze the anatomy of typography, identify parts of typefaces such as serif, x-height, baseline, spacing, typeface size, styles, typographic rules in design, multimedia and print. 3. Apply knowledge of the anatomy of typography through font redesign and editing of characteristic diacritical characters for the Croatian language within the selected typeface, as well as characters for international use, interpret advantages and disadvantages and optimize typographic solutions. 4. Use knowledge about planning, design and realization of individualized vector typographic solutions through the design of an author's designer or handwritten font in specialized programs and generate the font for use on different platforms. 5. Design specialized typographic characters, Pi fonts, pictograms and symbols for use in signaling and multimedia. 6. Categorize typography through personal analysis of digital fonts and summarizing knowledge about typographic standards in visual communications, design, print and multimedia.		
1.4. <i>Course content</i>		
1. Historical development of typography, development of typographic styles and their application throughout history. 2. Theory and terms in typography, typography in use, typographic principles and rules in typography. 3. Basics of character design, spacing between letters, lines and text in the graphic design. 4. Anatomy of typography, detailed study of the parts of letter characters and their function, definition of the rectangle - square position and letter lines. 5. <i>Bezier's</i> curve and vector graphics as the basis of letter character outline. 6. Introduction to the software package for creating a font, instructions for creating an individualized digital font through practical project tasks. 7. Analysis and creation of characteristic diacritical characters for the Croatian language within the selected script, as well as characters for international use. 8. Designing and creating a handwritten template for original individualized typography in the form of a handwritten or individualised design font. 9. Transformation of letter characters into digital form and template processing in graphics programs for image and text processing. 10. Creation of typographic solutions within the font creation program, alignment of thickness values, spacing, testing, generating and exporting font. 11. Presentation and application of font in graphic design. 12. Design and design <i>Pi</i> fonts, pictograms and symbols for use in signaling and multimedia. 13. New modern classification of typography, individualized selection, database creation through classification and font family. 14. Standardization in modern formats such as <i>TrueType</i> , <i>OpenType</i> , <i>ClearType</i> and variable fonts. 15. Design and use of typography on different platforms for application in design and visual communications, digital media, and printing press.		
1.5. <i>Types of Teaching Methods</i>	x Lectures x Seminars and workshops x Exercises x Online education ☐ Fieldwork	x Independent tasks x Multimedia and network ☐ Laboratory x Mentorship ☐ Other_
1.6. <i>Student obligations</i>		
Attending classes and regularly attending lectures, exercises and seminars.		

Practical work on exercises, presentation of project tasks. Independent preparation of seminar papers and presentations. Continuous monitoring of classes and application of theoretical knowledge through the implementation of project tasks. Students complete the exercise every week independently with a regular check of each student's final solutions, which is recorded through the e-learning system. Requirements for being introduced to the exam: minimum attendance at 70% of classes, completed exercises, seminar and presentation.							
1.7. Student work monitoring (mark with X for the appropriate method)							
Attendance	x	Activity in classes	x	Seminar paper	x	Experimental work	x
Written exam	x	Oral exam	x	Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Evaluation: Project tasks within exercises and presentation of project tasks: 30% Project assignment within the seminar, seminar paper and presentation: 30% Theoretical part of the material in the framework of continuous knowledge assessment: 30% Attendance and activity in class: 10% Evaluation: 1. In written or oral form, describe the development of typography through the classification of letters, recognize the partition into different type categories, and explain concepts and rules in typography and typographic measurement systems. 2. In written or oral form, students should analyze the anatomy of typography, identify parts of typefaces such as serifs, x-height, baseline, spacing, font size, styles, typographic rules in design, multimedia and print. 3. As part of the project assignment in the exercises, students should apply their knowledge of the anatomy of typography through the redesign of the font and edit the characteristic diacritical characters for the Croatian language within the selected script, as well as characters for international use, interpret the advantages and disadvantages and optimize typographic solutions. 4. As part of the exercises and the project assignment, students use their knowledge of planning, design and realization of individualized vector typographic solutions through the design of an author's designer or handwritten font in specialized programs and should generate the font for use on different platforms. 5. In the framework of the exercises and the project assignment, students design specialized typographic characters, Pi fonts, pictograms and symbols for use in signaling and multimedia. 6. As part of the seminar, students categorize typography through personal analysis of digital fonts and summarizing knowledge about typographic standards in visual communications, design, refraction, print and multimedia.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			

Franjo Mesaroš: „ <i>Tipografski Priručnik</i> “, Grafički obrazovni centar, Zagreb, 1985.	14	
Roberts, Raymond: „ <i>Typographic Design / Raymond Roberts</i> “, London: Ernest Benn Limited, cop. 1966.	1	
Lupton, Ellen: „ <i>Thinking with type: a critical guide for designers, writers, editors, & students / Ellen Lupton</i> “, New York: Princeton Architectural Press, cop. 2010., ISBN 9781568989693	3	
Williams, Jim: „ <i>Type matters! / Jim Williams</i> “, London: Merrell, 2012., ISBN 9781858945675	2	
1.10. Supplementary literature https://www.monotypefonts.com/		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Ivana Žiljak Stanimirović, PhD	
Course title	Packaging design	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	II.	
ECTS credit and teaching method	ECTS credits	4
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
The aim of the course is to train students for the design process in the development of packaging design. Students will acquire knowledge and competences in packaging design planning according to the given steps, from setting the project task, analysis, design, development of the solution to visualization of the prototype and finally presentation. By mastering the course, students will gain knowledge of how to design packaging as an independent product and they will use communication tools. Through this course, students will acquire knowledge and competences about conceptual thinking, <i>branding</i> , aesthetics and functionality of design and products, as well as practical skills in prototype design and working with relevant software tools for designing and visualizing packaging design. The goal is to provide knowledge and competence

through an iterative design process in creating a recognizable visual identity of packaging which sets the product apart from the competition, to include an interdisciplinary approach to related courses necessary for the sustainable development of packaging, and to courses which include implementation solutions for printing and packaging realization.		
1.2. <i>Enrollment conditions</i>		
1.3. <i>Expected learning outcomes</i>		
1. Describe the basics of packaging design and methodological approaches in the development of packaging design. 2. Analyze the selected product, compare competing products and adapt the design to the target group. 3. Distinguish the elements of graphic design, aesthetic and functional aspects through the selection of shape, typography, color, vector and raster graphics in the process of designing and preparing packaging. 4. Apply knowledge through designing packaging design from sketch to prototype creation, form elements of visual identity and graphic standards. 5. Demonstrate practical skills in making and visualizing prototypes, improve work with relevant software for design and prepress of packaging. 6. Present the project from research, analysis and concept to the design and visualization of the prototype and evaluate the design solutions.		
1.4. <i>Course content</i>		
1. Introduction to packaging design and basics of packaging design. 2. Getting to know the design process through the selection and definition of the project task. 3. Analysis of the selected product, a competitive product analysis, examination of the market and target groups. 4. Setting up a creative concept, designing packaging design from conceptual solutions and sketches to prototype development through a design model and an iterative process. 5. Positioning of elements of visual identity and recognizability of the packaging, <i>branding</i> , logo design, defining colors, shapes, primary and secondary typography, determining the hierarchy of information on packaging. 6. Vector and pixel graphics on packaging. 7. Coding, legal requirements and mandatory informations on packaging, intelligent packaging and recognition of security graphics on packaging. 8. Planning the use of packaging and functional packaging solutions. 9. Adaptation of the design to the target group. 10. Prototyping, design and visualization of the design solution. 11. Design and evaluation of packaging through an interdisciplinary and iterative approach with the possibility of connecting with related courses such as integration of practices for sustainable packaging development, packaging production processes, printing and material technology and 3D visualization. 12. The final presentation of the project from the concept and design of the packaging to the visualization of the prototype, presentation of the basic graphic standards and visual identity of the packaging and evaluation.		
1.5. <i>Types of Teaching Methods</i>	x Lectures ☐ Seminars and workshops x Exercises x Online education	x Independent tasks ☐ Multimedia and network ☐ Laboratory X Mentorship ☐ Other_

				☐ Fieldwork			
1.6. Student obligations							
Attending classes and regularly attending lectures and exercises. Practical work on exercises, presentation of project tasks. Continuous monitoring of classes and application of knowledge through the realization of a project assignment. Students complete the exercise every week independently with a check of each student's final solutions, which is recorded through the e-learning system. Requirements for being introduced to the exam: minimum attendance at 70% of the class, completed exercises and presentation of the project assignment.							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	x
Written exam		Oral exam	x	Essay		Research	
Project	x	Continuous knowledge assessment	x	Report		Practical work	x
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Grading: Exercises: 20% Presentation of the Project Assignment of packaging design: 40% Continuous Knowledge Assessment: 30% Class attendance: 10% Evaluation: 1. In written or oral form, describe the basics of packaging design and methodological approaches in the development of packaging design. 2. In written or oral form, analyze the selected product, compare competing products and adapt the design to the target group. 3. As part of the project assignment, in the exercises, distinguish elements of graphic design, aesthetic and functional aspects through the selection of shape, typography, color, vector and raster graphics in the process of designing and preparing packaging. 4. As part of the project assignment, apply knowledge through the design of packaging design from sketch to prototype creation, form elements of visual identity and graphic standards. 5. Within the scope of the project assignment, demonstrate practical skills in creating and visualizing prototypes, improve work with relevant software for design and prepress of packaging. 6. Within the scope of the project assignment, present the project from research, analysis and concept, to the design and visualization of the prototype and evaluate the design solutions.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			

M. Tomiša, M. Milković: <i>"Graphic design and communication"</i> , University of Varaždin, Varaždin, 2013, ISBN 9789537809195	2	
M. Rosner Klimchuk, S. A. Krasovec: <i>„Packaging Design - Successful Product Branding From Concept to Shelf“</i> , Johan Wiley & Sons, 2nd edition, New Jersey, 2012., ISBN 9781118027066	4	
1.10. Supplementary literature https://www.bboxpackingsolution.com/free-die-cut-design-for-paper-packagings.pdf		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
Student survey, self-evaluation form.		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Igor Zjakić PhD.	
Course title	Quality control in colour printing	
Study programme	Undergraduate university study programme Graphic technology	
Course status	Elective	
Year	III.	
ECTS credit and teaching method	ECTS credits	3 ECTS
	Number of hours (L+E+S)	1+0+1

COURSE DESCRIPTION
1.1. Course objectives
The aim of the course is to apply knowledge in print quality management. During production, there is a decrease in quality, and it is necessary to assess qualitatively the level of decrease. Students will be able to manage the printing process with automated systems and manage the printing quality process through control strips. Students will know how to use measuring systems of densitometry and spectrophotometry in specific situations. In order to enable repeatable production, the aim of the course is to standardize the quality in the printing process.
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. To investigate the deformation of raster elements

2. To evaluate the elements for establishing print quality 3. To analyze the concepts of quality in offset and other printing techniques 4. To identify the print quality problem 5. To categorize the elements that affect the decline in print quality 6. To evaluate and recommend print quality							
1.4. Course content							
Principles of reproduction of raster elements Deformation of raster elements Signal and control strips Colour measurement in print Management of ink density Standardization of printing Printing errors Hi-Fi printing Principles of lacquering in printing							
1.5. Types of Teaching Methods				x Lectures x Seminars and workshops ☐ Exercises ☐ Online education ☐ Fieldwork		☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_	
1.6. Student obligations							
submit a seminar							
1.7. Student work monitoring							
Attendance		Activity in classes	x	Seminar paper	x	Experimental work	
Written exam		Oral exam	x	Essay		Research	
Project		Continuous knowledge assessment		Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Students must submit a seminar and pass at least 51% of the material on the oral exam. The seminar consists of a project assignment. 1. As part of the project task, investigate the deformation of raster elements 2. Within the framework of the project task, evaluate the elements for establishing the quality of printing 3. As part of the project task, analyze the concepts of quality in offset and other printing techniques 4. Within the framework of the project task, identify the problem of print quality 5. Within the scope of the project task, categorize the elements that affect the decline in print quality 6. As part of the project task, evaluate and recommend the quality of printing							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
I. Zjakić: upravljanje kvalitetom ofsetnog tiska. HSN, 2007.		
<i>Supplementary literature</i> I. Zjakić: Tehničko uređivanje u procesu izrade knjige, HSN, 2013. H. Kiphan: Handbook of Print media, Springer, 2001. 1.10.		
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies		
<i>Student survey</i>		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader	Prof. Igor Zjakić PhD.	
Course title	Main printing techniques	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Year	III.	
ECTS credit and teaching method	ECTS credits	4 ECTS
	Number of hours (L+E+S)	2+2+0

COURSE DESCRIPTION
1.1. Course objectives
The course provides students with fundamental theoretical and practical knowledge of the main printing techniques, as well as familiarization with technology in printing plants. Special attention is paid to printing technologies from sheets, and especially to printing technologies from rolls. The possibilities of each main printing technique are studied. Managing printing is studied, and at the same time, human possibilities and limitations are inevitably dealt with in certain processes of graphic reproduction of originals using offset, gravure printing, flexo printing, screen printing and digital printing techniques, electrophotography and ink-jet.
1.2. Enrollment conditions
1.3. Expected learning outcomes
1. To describe of printing techniques 2. To classify systems in print 3. To differentiate the needs of choosing a printing technique according to customer requirements 4. To evaluate the need to use a certain printing technique 5. Using the correct printing technique

6. To analyze the problem and propose an optimal solution							
1.4. Course content							
Dividing of printing techniques Basic principles of conventional printing techniques Offset printing, working principles Letterset printing, today's application for finishing processes Gravure printing, working principles Flexographic printing, working principles Screen printing, working principles Fundamentals of digital printing techniques The working principle of electrophotography The working principle of ink-jet							
1.5. Types of Teaching Methods				x Lectures ☐ Seminars and workshops x Exercises ☐ Online education ☐ Fieldwork ☐ Independent tasks ☐ Multimedia and network ☐ Laboratory ☐ Mentorship ☐ Other_			
1.6. Student obligations							
1.7. Student work monitoring							
Attendance	x	Activity in classes	x	Seminar paper		Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous knowledge assessment		Report		Practical work	
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Students must pass at least 51% of the material on the written exam. Students can take the exam only if they have listened and completed the exercises. The exam is held in writing and orally. 1. Describe printing techniques in writing 2. Classify systems in print in written form 3. Differentiate in writing the needs of choosing a printing technique according to customer requirements 4. In writing, justify the need to use a certain printing technique 5. Use the correct printing technique in the exercises 6. In the exercises, analyze the problem and propose an optimal solution							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							

<i>Title</i>	<i>Number of copies</i>	<i>Number of students</i>
S. Bolanča: Glavne tehnike tiska, VGŠ 1997.		
1.10. <i>Supplementary literature</i> H. Kiphan: Handbook of Print media, Springer, 2001. I. Zjakić: Upravljanje kvalitetom ofsetnog tiska, HSN, 2007.		
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>		
Student survey		

COURSE DESCRIPTION

GENERAL INFORMATION		
Course leader		
Course title	Professional practice	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Semester	VI.	
ECTS credit and teaching method	ECTS credits	2
	Number of hours (L+E+S)	0+2+0

COURSE DESCRIPTION
1.1. <i>Course objectives</i>
<i>The objective of the course is to enable students to gain practical experiences and knowledge in a real work environment. Through active participation in professional activities, students develop their skills, acquire methods and techniques relevant to their field, and strengthen the competencies needed for the job market. Professional practice also fosters independence, teamwork, and creativity, providing students with opportunities to network with industry professionals. In this way, the course contributes to the overall education of students and prepares them for future careers.</i>
1.2. <i>Enrollment conditions</i>
1.3. <i>Expected learning outcomes</i>
1. <i>Apply competencies and skills in real working conditions and in solving specific engineering tasks.</i> 2. <i>Demonstrate professional responsibility for successfully completing work tasks in a work environment.</i> 3. <i>Differentiate between business processes, ethical principles, and rules of conduct within the organization.</i> 4. <i>Apply communication skills in a business environment, including written and verbal communication with colleagues and superiors.</i>

5. <i>Show the ability to work effectively in a team and adapt to a dynamic work environment.</i> 6. <i>Prepare a report and/or work journal on the completed professional practice.</i>							
1.4. <i>Course content</i>							
<i>Students plan their practice by selecting an institution and defining their goals. During the practice, they carry out practical tasks under the supervision of a mentor, participating in the completion of work assignments. After finishing the practice, they write a report on their completed professional practice. The course also emphasizes ethical standards and professionalism in the work environment.</i>							
1.5. <i>Types of Teaching Methods</i>				☐ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☒ Fieldwork		☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☒ Mentorship ☐ Other	
1.6. <i>Student obligations</i>							
<i>The obligations are defined by the Study Regulations and the Regulations on Professional Practice.</i>							
1.7. <i>Student work monitoring</i>							
Attendance		Activity in classes		Seminar paper		Experimental work	X
Written exam		Oral exam		Essay		Research	X
Project	X	Continuous knowledge assessment		Report	X	Practical work	X
Portfolio							
1.8. <i>Assessment and evaluation of student work during classes and at the final exam.</i>							
<i>The obligations are defined by the Study Regulations and the Regulations on Professional Practice.</i>							
1.9. <i>Mandatory literature and number of copies available in relation to the number of students currently attending the course</i>							
Title		Number of copies		Number of students			
1.10. <i>Supplementary literature</i>							
1.11. <i>Methods for monitoring the quality of acquired knowledge, skills, and competencies</i>							
<i>Student survey, self-evaluation form, etc..</i>							

COURSE DESCRIPTION

GENERAL INFORMATION

Course leader		
Course title	Final project	
Study programme	Undergraduate university study programme Graphic technology	
Course status	<i>Compulsory</i>	
Semester	VI.	
ECTS credit and teaching method	ECTS credits	2
	Number of hours (L+E+S)	0+2+0

COURSE DESCRIPTION		
1.1. Course objectives		
The objective of the course is to enable students to apply acquired theoretical and practical knowledge to solve specific problems within their field of study. Through independent research, students develop critical thinking, analytical approaches, and problem-solving skills. Additionally, the goal is to foster innovation and creativity, as well as enhance the ability to write academic papers according to academic standards.		
1.2. Enrollment conditions		
1.3. Expected learning outcomes		
7. Apply theoretical and practical knowledge from the study program to a specific problem or research question.		
8. Draw conclusions based on the analysis of results and relevant sources.		
9. Conduct the research process according to the mentor's instructions.		
10. Demonstrate writing skills by structuring the paper properly, with correct citation and use of relevant literature.		
11. Apply ethical standards in writing, such as academic integrity and responsible use of sources.		
1.4. Course content		
The course includes the preparation of an independent paper under the guidance of a mentor. Students will work on defining the topic, collecting and analyzing data, reviewing literature, and writing the final paper according to the prescribed format. The course includes regular consultations with the mentor.		
1.5. Types of Teaching Methods	☐ Lectures ☐ Seminars and workshops ☒ Exercises ☐ Online education ☐ Fieldwork	☒ Independent tasks ☐ Multimedia and network ☒ Laboratory ☒ Mentorship ☐ Other
1.6. Student obligations		
The obligations are defined by the Study Regulations and the Final Thesis Regulations.		

1.7. Student work monitoring							
Attendance		Activity in classes		Seminar paper		Experimental work	X
Written exam		Oral exam		Essay		Research	X
Project	X	Continuous knowledge assessment		Report	X	Practical work	X
Portfolio							
1.8. Assessment and evaluation of student work during classes and at the final exam.							
Assessment and evaluation are defined by the Study Regulations and the Final Thesis Regulations.							
1.9. Mandatory literature and number of copies available in relation to the number of students currently attending the course							
Title		Number of copies		Number of students			
1.10. Supplementary literature							
1.11. Methods for monitoring the quality of acquired knowledge, skills, and competencies							
Student survey, self-evaluation form, etc..							