

INFORMATION  
PACKAGE FOR  
UNDERGRADUATE  
STUDY OF GRAPHIC  
ENGINEERING

Name of the course: Mathematics I

Teacher: asst. prof. PhD. Ivan Budimir

Associate teachers:

Lectures (L): Ivan Budimir

Seminar (S):

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 3+3

ECTS credits: 7

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: I

Possibility of teaching in English: Yes

Course objectives:Students should understand the basic mathematical concepts contained in the course Mathematics 1. Understanding the mentioned concepts that students need to master constitute the basic level mathematical literacy, which is necessary for engineers of all technical sciences, including engineers graphic technologies. Knowledge of the course material enables the student to follow other professional courses technological subjects but also general and basic subjects in which phenomena are described analytically way. The student should be trained for precise mathematical formulation of real-world problems context as well as their numerical solution. It is expected that a student who has passed this course will to be able to formulate and quantitatively pose the appropriate problems that are characteristic of graphic scientific and professional practice. Students should understand the term functional dependencies as the influence of a group of graphic variables on the value of a certain graphic parameter. They should also be able to connect the concept of limes with boundary processes in graphic technology and the concept of derivation with the speed with which changes in graphic processes take place. Students need know how to optimize graphic processes using differential calculus methods. The aim of the course is training student to apply mathematics, especially differential calculus in a realistic graphic context.

Enrollment requirements: There are no prerequisites.

Prerequisite for taking the course exam: student attendance at seminars

**General And Specific Competence and learning outcomes of the course:**

Students will know how to pose a problem on a mathematical level; know how to propose a mathematical method suitable for describing the corresponding graphical problem; be able to explain mathematical concepts like functions, limes and derivatives; be able to explain the

significance of the mentioned terms in other technical terms areas; be able to give real examples and use them to explain mathematical concepts; know how to recognize appropriate forms of functional dependencies that are characteristic of the graphic profession; know how to explain derivation as the rate of change of the graphical process; know how to explain the second derivative as accelerating or slowing down of a certain process; be able to explain all the mathematical terms that are contained in curriculum of subjects and their importance in the field of technique and graphic technology; they will know mathematically carry out the necessary calculations as part of graphic scientific and professional practice; will develop the skill of a precise and concise engineering approach to technological problems; will acquire solid basics for further upgrading of mathematical and technical knowledge.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture: definition of the course content, examination methods and teaching methods literature. Introductory seminar: defining the duties of students related to attending classes. Repetition of material from high school.
2. Introduction to mathematical logic and set theory. Introduction to mathematics as scientific discipline. Significance of mathematics for other sciences. Overview of famous mathematicians. The role mathematics in technical sciences. Method of mathematical induction. Sets of numbers. Real numbers. Rational and irrational numbers. The golden ratio and the application of the golden ratio in of art. Application of the golden ratio as the rule of thirds in art photography.
3. The absolute value of a real number. Equations and inequalities with absolute values. Quadratic equations and inequalities. Cartesian coordinate system. Relations. Complex numbers. Algebra of complex numbers. De'Moivre's formula. Trigonometric form complex number. Representation of a complex number in the Gaussian plane. Fractal geometry. Graphic representation of fractals and application of fractal geometry in graphic design.
4. Binomial formula. Basic combinatorial principles with examples from real contexts and graphics technologies. Combinatorics and graphic protection. Cartesian coordinate system. Curves in planes and their application. Line, parabola, circle, ellipse, hyperbola. Bezier curves and their application in computer graphics.
5. Functions, dependent and independent variables, domain, codomain, mapping law. Ways assignment of functions. Tabular, graphical and analytical ways of assigning functions. Graphical representation functions. Composition and inverse function.
6. Elementary functions: polynomials, rational functions, exponential and logarithmic functions, trigonometric and arc functions, general potential. Functional connection between graphic variables. Examples of functions in chemistry, physics, mechanical engineering and other fields. Exponential laws in nature: law of growth, Newton's law of cooling, radioactive decomposition. Examples of functions in graphics technology. Psychophysical functions of color perception.

7. Linear transformation of the function graph. Translation, rotation, symmetry. Transformation digital images in vector graphics. Definition and assignment of strings. Arithmetic and geometric series. Paper formats as an example of a geometric sequence. Working definition of series limes and theorems about limes. Different types of limes and techniques for calculating string limes. Cauchy's strict logic limes string definition. The concept of landfill. Monotonic and bounded sequences. Euler's number  $e$ . Escher's graphic representation of the concept of limes in art.
8. I-colloquium. Fibonacci numbers and the golden ratio. The significance of Fibonacci numbers in history of art. Limes functions. Working definition of limes function. Limes and asymptotic behavior curve. Tasks on lime functions. A precise mathematical definition of limes. Theorems of Limes function. The concept of a continuous function. Continuity as the basic principle of the majority phenomenon in nature. The connection between limes and continuity.
9. Different techniques for computing the limes function. Limes of exponential functions. Limes of logarithmic functions. Trigonometric limes. Definition of limes on the left and limes on the right. Limes of the quotient of differences. Average rate of change. The rate of change at some point in time  $t$ .
10. Definition of the term derivative of a function at a point. Calculation of the derivative of the function at the point definition. Historical account of the discovery of the differential calculus. The concept of derivation in geometry and physics. Newton's and Leibniz's way of defining the derivation. Derivative as rate of change process. Derivation as the speed of a material body. The derivative as the slope of the tangent to the curve at a given point.
11. Definition of the derivative of a function. Theorems about derivations. The relationship between derivative and continuity functions. Basic techniques of derivation. Derivation of sum, difference, product and quotient. Composition derivation formula. Derivation of an implicitly given function. Logarithmic derivation. Derivation of a parametric given function.
12. Discrete derivatives. Image digitization and application of derivation in graphic technology. Image edge detection using derivation. Application of derivation in physics. Application of the derivation in chemistry and other fields. Tangent and normal problem. Determination of the angle between the curves by means of derivation. Definition of the second derivative. Significance of the second derivative in geometry and applications. Higher order derivatives.
13. Determination of monotonicity intervals and extrema using the first derivative. Description of extremes using the second derivation. Fermatov's theorem. Global extremes. Optimization problem. Optimization in graphics technology. Fermat's principle of refraction of light.



## References

Required:

1. P. JAVOR, *Matematička analiza 1*, Element , Zagreb, 1995.
2. F. AYRES, Jr., E. MENDELSON, *Shaum's Outline of Theory and Problems in Differential and Integral Calculus*, Mc Graw-Hill, Inc., USA, 1990.
3. B. P. DEMIDOVIČ, *Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke*, Tehnička knjiga, Zagreb, 1978.

Optional:

1. J. Stewart, *Calculus*, Cengage Learning, 7-th edition, 2012. 2.
2. Steven H. Strogatz, *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering (Studies in Nonlinearity)*, 2-nd edition, 2014.

Name of the course: Physics 1

Teacher: assoc. prof. PhD. Damir Modrić

Associate teachers:

Lectures (L): Damir Modrić, Katja Petric Maretić

Seminar (S):Katja Petric Maretić

Laboratory (LAB):Katarina Itrić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+1

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: I

Possibility of teaching in English: Yes

Course objectives: The goal of the course is to acquire basic and professional knowledge in the field of physics in graphic technology.

Enrollment requirements: /

Prerequisite for taking the course exam: Lab. exercises completed

**General And Specific Competence and learning outcomes of the course:**

Apply knowledge from mathematics, physics and modern computer tools to science and engineering problems, that is, use appropriate mathematical techniques and concepts to obtain quantitative solutions to problems in physics. Define the basic kinematic and dynamic terms of the code motion of a material point, a multitude of particles and a rigid body. Explain Newton's laws of dynamics material points and know how to apply them in various physical cases, under the action of various forces. According to the previous one, be able to describe different movements. Handle basic mechanical instruments. Explain and apply the laws of conservation of mechanical energy, momentum and moment of momentum. Define the basic terms and explain the basic laws of solid mechanics bodies, liquids and gases and be able to apply them. Define thermodynamic quantities and explain thermal laws based on molecular theory and give examples of their application. Apply acquired knowledge of basic physical concepts in the field of particle mechanics and solid bodies, fluid mechanics, and heat and thermodynamics, to solve simpler problems/tasks. Experimentally check some basic physical laws from the field of general physics. Observe the physical occurrences and record the results of laboratory measurements, and prepare coherent reports of their measurements. Use measuring instruments correctly. Assess the accuracy and precision of measurement results. Statistically and graphically analyze the obtained measurement results. Compare and contrast

theoretical results and results of experimental research in physics. Develop collaborative learning skills.

Course content (Syllabus) on a weekly basis:

1. Introduction. Units and Dimensional Analysis - 0.2 ECTS • Explain the difference between units and dimensions. • Describe the SI system of units. • Apply the method of dimensional analysis and find approximate relationships between the physical quantities that describe a system. • Apply methodology for solving estimation problems. Specifically,
  - o Identify the set of quantities that can be estimated and calculated.
  - o Recognize the approximate or exact relationship between these quantities and the quantity being estimated in the problem.
  
2. Kinematics I - 0.34 ECTS • Motion in one dimension
  - o Understand the general relationships between position, velocity, and acceleration for the motion of a particle along a line.
  - o Understand the special case of motion with constant acceleration, so that they can write expressions for velocity and position as functions of time, and determine or sketch graphs of these quantities.• Motion in two dimensions, including projectiles
  - o Know how to add, subtract, and resolve vectors of displacement and velocity.
  - o Determine the components of a vector along two specified, mutually perpendicular axes.
  - o Determine the total displacement of a particle or position of one relative to another.
  - o Determine the change in velocity of a particle or the relative velocities of two particles.
  - o Explain the concept of unit vectors and use unit vectors to describe forces.
  - o Describe the meaning of the parallel projection of one vector onto a direction defined by another vector.• Understand the general motion of particles in two dimensions, so that, given functions  $x(t)$  and  $y(t)$  that describe this motion, they can determine the components, magnitude, and direction of the particle's velocity and acceleration as functions of time.
  - o Understand the motion of projectiles in a uniform gravitational field.
  - o Write expressions for the horizontal and vertical components of velocity and position as functions of time, and sketch or identify graphs of these components.
  - o Use these expressions to analyze the motion of a projectile with arbitrary initial velocity.
  
3. Kinematics II - 0.34 ECTS
  - Explain the mathematical definition of the scalar product of two vectors.
  - Calculate the scalar product of two vectors using unit vectors associated with the Cartesian coordinate system.
  - Explain the mathematical definition of the direction and magnitude of the vector product of two vectors.
  - Calculate the vector product of two vectors using unit vectors associated with the Cartesian coordinate system.



- Explain the concepts of position, velocity, and acceleration for different types of motion.
  - Represent the motion of an object using definitions, graphs, equations, and motion diagrams.
  - Identify and apply the appropriate equations that describe the motion in a given situation.
  - Apply a consistent methodology to solve problems.
  - Evaluate the validity of the solution to a problem using dimensional analysis.
4. Dynamics I - Newton's Laws of Motion - 0.34 ECTS • Static Equilibrium (First Law) • Analyze situations in which a particle remains at rest or moves at constant velocity under the influence of several forces. • Explain the meaning of Newton's first law: physical laws (such as the law of force) are the same in all inertial reference frames. • Dynamics of a Single Particle (Second Law) • Understand the relationship between the force acting on an object and the consequent changes in the object's velocity.
- o Calculate, for an object moving in one dimension, the change in velocity that results when a constant force  $F$  acts over a given time interval.
  - o Calculate, for an object moving in one dimension, the change in velocity that results when a force  $F(t)$  acts over a given time interval.
  - o Determine, for a body moving in a plane whose velocity vector undergoes certain changes over a given time period, the average force that acted on the body.
- Understand how Newton's second law, is applied to an object subject to forces such as gravity, elastic force, or contact forces.
- o Draw a free-body diagram that shows all the actual forces acting on the body.
  - o Write the vector equation that results from applying Newton's second law to the body and define the components of this equation along the appropriate axes.
  - o Analyze situations in which an object moves with a certain acceleration under the influence of one or more forces, so that they can determine the magnitude and direction of the resultant force or one of the forces that make up the resultant force, such as upward or downward motion (free fall) with constant acceleration.
5. Dynamics II - 0.34 ECTS • Significance of the friction coefficient (motion on an incline)
- o Write the relationship between the normal force and the frictional force on a surface.
  - o Analyze situations in which an object moves along an incline or on a horizontal surface.
  - o Analyze under what circumstances an object will begin to slide, i.e., calculate the magnitude of the static friction force.
- Systems of two or more bodies (Newton's third law) • Understand Newton's third law so that for a given system, pairs of forces and bodies on which they act can be identified, and the magnitude and direction of each force can be stated. • Use Newton's third law to analyze problems involving more than one body.

6. Work, Energy, and Power I - 0.34 ECTS • Work and the relationship between work and energy • Definition of work, including when it is positive, negative, or zero o Calculate the work done by a constant force on an object that undergoes a certain displacement. o Relate work of a force with the area under the force-position graph and calculate it when the force is a linear function of position. o Use the scalar product operation to calculate the work done by a constant force  $F$  on an object that undergoes a certain displacement. • Understand and apply the theorem that relates work and energy o Calculate the change in kinetic energy or velocity resulting from a certain work done on an object. o Calculate the work done by the resultant force, or each of the forces that make up the resultant force, on an object that undergoes certain changes in velocity or kinetic energy. o Apply the theorem to determine changes in the kinetic energy and velocity of an object resulting from the application of these forces. • Forces and potential energy • Concept of conservative forces o State alternative definitions of "conservative forces" and explain why these definitions are equivalent. o Describe examples of conservative and non-conservative forces. • Concept of potential energy o State the general relationship between force and potential energy and explain why potential energy can only be associated with conservative forces. o Calculate the potential energy function associated with a given one-dimensional force  $F(x)$ . o Calculate the magnitude and direction of a one-dimensional force given the potential energy function  $U(x)$ . o Write the expression for the force of an ideal spring and the potential energy for a stretched or compressed spring. o Calculate the potential energy of one or more objects in a uniform gravitational field.
7. Work, Energy, Power II - 0.35 ECTS • Conservation of Energy • Understand the concepts of mechanical energy and total energy o State and apply the relationship between work done by non-conservative forces on an object and the change in the mechanical energy of the object o Describe and recognize situations in which mechanical energy is converted into other forms of energy. o Analyze situations in which the mechanical energy of an object changes due to friction or a force applied externally. • Understand conservation of energy o Identify situations in which mechanical energy is or is not conserved. o Apply conservation of energy in analyzing the motion of objects undergoing spring oscillations. o Apply conservation of energy in analyzing the motion of objects undergoing other non-constant one-dimensional forces. • Recognize and solve problems that require the application of both Newton's laws and conservation of energy. • Power • Understand the definition of power o Calculate the power required to maintain the motion of an object with constant acceleration (e.g. to move objects along a flat surface, lift an object at a constant speed, or overcome friction for objects moving at a constant speed). o Calculate the average power delivered by a force that performs a certain amount of work. • Recognize different forms of energy: mechanical, thermal, chemical, etc. • Describe energy transformation processes in a system and identify reversible and

irreversible processes. • Calculate the work done on an object by the forces acting on it and connect the work done on an object with the transfer of energy.

8. Particle Systems, Momentum I - 0.34 ECTS • Center of mass • understand the technique for finding the center of mass o determine the vector position of the center of mass of the system (based on the choice of coordinate system) o Locate the center of mass of a system consisting of two such bodies. • Explain why the acceleration of the center of mass of a system depends only on the total external force • understand and apply the relationship between the center of mass and linear motion, and between the center of mass acceleration and the resultant external force for a system of particles. • determine the center of gravity and use this concept to express the gravitational potential energy of a rigid body in terms of the position of its center of mass. • Impulse of a force and momentum • understand impulse and momentum o relate mass, velocity, and linear momentum for a moving body and calculate the total linear momentum for a system of bodies. o relate the impulse to changes in linear momentum and the average force acting on the body. o List and apply the relationships between linear momentum and the motion of the center of mass for a system of particles. o Calculate the area under a graph that shows the force as a function of time and relate it to changes in the momentum of the body. o calculate the change in momentum of a body given the function  $F(t)$  for the resultant force acting on the body.
9. Particle Systems, Momentum II - 0.34 ECTS • Conservation of momentum, collisions • understand the conservation of momentum o Explain how the conservation of momentum follows as a consequence of Newton's third law for an isolated system. o Recognize situations in which the total momentum or a component of the momentum vector is conserved. o Apply the conservation of momentum to one-dimensional elastic and inelastic collisions and completely inelastic two-dimensional collisions. o Apply the conservation of momentum to two-dimensional elastic and inelastic collisions. o Explain how the rate of change of the momentum of the system is related to the external forces acting on the system. • understand the concept of a reference frame o analyze the uniform motion of a body relative to a moving medium, such as a fluid flow. o analyze the motion of particles with respect to a reference frame that is accelerating horizontally or vertically at a constant rate.
10. Circular motion and rotation, torque, conservation of angular momentum - 0.35 ECTS • Uniform circular motion • Understand uniform circular motion of a particle o Describe kinematic quantities that describe circular motion of an object. o Relate the radius of the circle and the velocity or angular speed of the particle to the magnitude of the centripetal acceleration. o Describe the direction of the velocity and acceleration at any point during the motion. o Determine the components of the velocity and acceleration vectors at any time and sketch or identify graphs of these quantities. o Analyze situations in which an object moves with a certain acceleration

under the influence of one or more forces. o Explain the difference between centripetal force and centripetal acceleration. o Explain the difference between angular frequency and rotational speed. o Determine the angular frequency and period for a system undergoing simple harmonic motion. • Torque o Understand the concept of torque o Calculate the magnitude and direction of the torque associated with a specific force. o Calculate the torque of a rigid body due to the action of gravity. • Rotational kinematics and dynamics • Understand the analogy between translational and rotational kinematics so they can write and apply relationships between angular acceleration, rotational velocity, and angular displacement of a body rotating about a fixed axis with constant angular acceleration. • Understand the dynamics of rotation about a fixed axis o Describe the analogy between rotation about a fixed axis and linear translation. o Determine the angular acceleration with which a rigid body accelerates about a fixed axis when subjected to a certain external torque or force. o Determine the radial and tangential acceleration of a point on a rigid body. o Apply the conservation of energy to problems of rotation about a fixed axis. • Conservation of angular momentum

11. Fluid mechanics I - Hydrostatics - 0.34 ECTS

• Hydrostatic pressure • Understand the concept of pressure and how it applies to fluids • Apply the relationship between pressure, force, and area. o Apply the principle that fluid exerts pressure in all directions. o Apply the principle that fluids at rest exert pressure perpendicular to any surfaces with which they are in contact. o Determine locations of equal pressure in a fluid o Apply the relationship between pressure and depth in a fluid • Buoyancy • Understand the concept of buoyancy o Determine the forces on an object fully or partially submerged in a fluid. o Apply the Archimedes' principle to determine buoyant force and the densities of solids, fluids. • Surface Tension o Explain the influence of cohesive and adhesive forces on molecules in a fluid, the film and foam surfaces, contact angle, and the importance of these effects in the graphic industry. o Capillary effect o Explain the difference between real and ideal fluids

12. Fluid Mechanics II - Hydrodynamics - 0.34 ECTS

• Fluids in Motion: Laminar Flow o Examples of simple flows o Deformation of fluids • Fluids in Motion: Turbulent Flow o Reynolds number • Viscosity of fluids and graphic inks • Characteristics of ideal fluids • Continuity equation • Understand the continuity equation so that it can be applied to fluids in motion. • Bernoulli's equation • Understand Bernoulli's equation so that it can be applied to fluids in motion. o Determining flow velocity o Some examples - airplane wing, etc.

13. Temperature and Heat I - 0.34 ECTS

- Thermodynamics
  - o The concept of transfer of thermal (or internal) energy between systems and their surroundings, and the resulting temperature variations
  - o "Zeroth" law of thermodynamics
  - o Thermometers
  - o Temperature scales

- Mechanical equivalent of heat
- Understand the "mechanical equivalent of heat" so that I can determine how much heat can be produced by performing a certain amount of mechanical work.

14. Temperature and Heat II - 0.34 ECTS

- Thermal energy
- Heat transfer and thermal expansion
- Understand heat transfer and thermal expansion
- First law of thermodynamics
- Second law of thermodynamics
- Analyze what happens to the size and shape of an object when it is heated.
- Qualitatively analyze the effects of conduction, radiation, and convection in thermal processes.
- Specific heat capacity
- Phase changes
- Achieving thermal equilibrium

15. Kinetic Theory and Thermodynamics - 0.34 ECTS

- Ideal gases
- Understand the model of the kinetic theory of ideal gases
  - o State the assumptions of the model.
  - o State the relationship between temperature and the mean translational kinetic energy.
  - o State the relationship between Avogadro's number, Boltzmann's constant, and the universal gas constant R.
  - o Explain qualitatively how the model explains the pressure of a gas in terms of collisions with the walls of the container, and explain how the model predicts that, for a fixed volume, pressure must be proportional to temperature.
- Apply gas laws for ideal gases and thermodynamic principles,
  - o relate the pressure and volume of a gas during an isothermal expansion or compression.
  - o relate the pressure and temperature of a gas during constant volume heating or cooling, or the volume and temperature during constant pressure heating or cooling.
  - o Calculate the work on or by a gas during expansion or compression at constant pressure.
  - o Understand the process of adiabatic expansion or compression of gas.
  - o Identify and/or sketch the curves on a PV diagram that represent each of the above processes.
- Real gases
- o Relative humidity and its application in graphic design
- Laws of thermodynamics
- Apply the first law of thermodynamics
  - o Relate the heat absorbed by a gas, the work done by the gas, and the change in internal energy of the gas for any of the above processes.
  - o Relate the work done by a gas in a cyclic process to the area enclosed by the closed curve on a PV diagram.
- Understand the Second Law of Thermodynamics, the concept of entropy, and thermal engines and the Carnot cycle.
- Determine whether entropy will increase, decrease, or remain the same in a given situation.

### Format of instructions:

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

### References

Required: 1. P.Kulišić: Mehanika i toplina, Školska knjiga, 2005.

2. Teaching materials available at <http://phy.grf.unizg.hr/pages/kolegiji/fizika-1/nastavni-materijali.php>

Optional: 1. G. Alvin Halpern: Schaum's, 3000 solved problems in physics, McGraw-Hill, 2011.

2. Statistics and measuring fundamentals,

[,http://www.phy.pmf.unizg.hr/~mpozek/predavanja/sadrzaj.html](http://www.phy.pmf.unizg.hr/~mpozek/predavanja/sadrzaj.html)

Name of the course: Chemistry 1

Teacher: prof. PhD. Željka Barbarić-Mikočević

Teacher: asst. prof. PhD. Ivana Plazonić

Associate teachers:

Lectures (L): Željka Barbarić-Mikočević, Ivana Plazonić

Seminar (S): Željka Barbarić-Mikočević

Laboratory (LAB): Ivana Plazonić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: I

Possibility of teaching in English: No

Course objectives: Mastering the basics of chemistry, chemical calculus and acquiring basic skills in laboratory work.

Enrollment requirements: There are no entry requirements.

Prerequisite for taking the course exam: Completed and colloquial laboratory exercises.

**General And Specific Competence and learning outcomes of the course:**

1. Connect natural sciences and chemistry, measurements in chemistry and the system of physical quantities and units; 2. Differentiate: the structure of pure substances including the atomic structure of solids, the molecular structure of solids and the nature of gases and the nature of liquids; 3. Differentiate between types of matter, the concept of a chemical element, elementary substances, and chemical compounds; 4. Use general terms related to relative atomic and molecular mass 5. Explain chemical bonding; 6. Define different possibilities of quantitative expression of the composition of solutions; 7. Know stoichiometry, chemical reactions, chemical kinetics, and chemical equilibrium; 8. Apply, connect, and combine the necessary mathematical expressions and solve and calculate computational and simple stoichiometric problems; 9. Know basic laboratory skills and work rules in a chemical laboratory.

Course content (Syllabus) on a weekly basis:

1. Introduction class.

2. Chemical symbolism, stoichiometry.
3. Substances, aggregation states and physical properties of substances.
4. Structure of atoms and molecules, periodic table of chemical elements.
5. Chemical bonds.
6. Chemical bonds.
7. Solutions.
8. Electrolytes.
9. Electrolytes.
10. Chemical reactions.
11. Chemical kinetics.
12. Chemical equilibrium.
13. Chemical equilibrium.
14. Characteristics of elements by groups of the PSE.
15. Characteristics of elements by groups of the PSE.

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge  
 examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks       | <input type="checkbox"/> Multiple choice tasks          |
| <input checked="" type="checkbox"/> Alternative choice tasks | <input type="checkbox"/> Connecting and arranging tasks |



Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Evaluation of knowledge acquired in all forms of teaching on the final exam.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Anonymous student survey at the end of the semester.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: 1.) M. Biffl, Osnove kemije, Školska knjiga, Zagreb, 1987.; 2.) D. Nothig-Hus, M. Herak, Opća kemija, Školska knjiga, Zagreb, 1994.; 3.) M. Sikirica, Stehiometrija, Školska knjiga, Zagreb, 1985.; 4.) P. J. Hartsuch, Chemistry for the Graphic Arts, GATF, Pittsburgh, 1983.

Optional: I. Filipović, S. Lipanović, Opća i anorganska kemija, Školska knjiga, Zagreb, 1982.

Name of the course: Engineering graphics

Teacher: assoc. prof. PhD. Sanja Bjelovučić Kopilović

Associate teachers:

Lectures (L): assoc. prof. PhD. Sanja Bjelovučić Kopilović

Seminar (S):

Laboratory (LAB): Tigran Jokić B. Sc.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: I

Possibility of teaching in English: No

Course objectives: Familiarity with technical standards, spatial dawn, orthogonal projection, cross sections, dimensioning, and rules for complete preparation of technical documentation. Application of computers in the preparation of technical documentation. Acquisition of the necessary knowledge for engineering communication through drawing, which is, among other things, the link between mechanical engineering and graphic design: Designers design, for example, a machine or a vehicle or a device or a tool using 3D CAD software, in order to achieve its optimal functionality, and designers use the same or other software to design the external appearance in an aesthetic sense.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Completed colloquium and in-class tests, and attended exercises.

**General And Specific Competence and learning outcomes of the course:**

Students will know 2D/3D basics of AutoCAD, designing in isometrics with traditional tools, basics of 3D modelling.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture (definition of students' rights and obligations, necessary accessories and materials to bring to lectures, definition of literature) and introduction to Engineering Graphics, in general. Development of graphic representation in 2 separate directions: artistic and technical. A brief history of technical drawings, descriptive geometry, CAD and computer graphics. Introduction to CAD, CAM and CAE. CAD System configurations. Computer systems and

components. Choice of a CAD system. (0.13 ECTS)

Introductory exercises (defining students' rights and responsibilities). Introduction to AutoCAD: interface, coordinate systems, basic commands; creation of a simple 2D drawing. (0.13 ECTS)

2. Lecture: Introduction to 2D CAD: generating, modifying, duplicating, attributing basic geometric objects, dealing with groups of objects as a whole, adjusting the working environment, attributing objects. Standardization and norms; lines, paper formats, scales, dimensioning, symmetry. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
3. Lecture: 3D CAD modelling: Constructive body geometry, regularized Boolean operators. Profile extrusion, volume addition and subtraction. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
4. Lecture: Concept of projection. Types of projection. Orthogonal projection on two or more planes. Point, line and plane projection. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
5. Lecture: Technical drawing using traditional tools. Objectives and tools. Sketching in orthogonal projection. Sections of prisms, pyramids and rotating bodies (cylinders, cones and spheres) with a projecting plane using traditional tools and in AutoCAD. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
6. Lecture: Review of material and preparation for colloquium I. (0.13 ECTS)  
Exercises: Review of material and preparation for colloquium I. (0.13 ECTS)
7. Lecture: colloquium I. (0, 13 ECTS)  
Exercises: colloquium I. (0.13 ECTS)
8. Lecture: Evaluation of the results of colloquium I. Oral examination of the knowledge of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students). (0.13ECTS)  
Exercises: Evaluation of colloquium results I. Oral knowledge test of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students). (0.13ECTS)
9. Lecture: Sections of prisms, pyramids and bodies of rotation (cylinder, cone and sphere) with a projecting plane, traditional tools and in AutoCAD. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)

10. Lecture: Creating a view of the real sizes of the model's surfaces and its sections, using traditional tools. and in AutoCAD. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
11. Lecture: Sections of prisms, pyramids and bodies of rotation (cylinder, cone and sphere) with a projecting plane, traditional tools and in AutoCAD. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
12. Lecture: Edge representations, parametric, analytical and complex surfaces, Hermitian, Bezier, Bspline, NURBS surfaces. In-class test. (0.13ECTS)  
Exercises: Lecture problem-solving tasks in AutoCAD. (0.13 ECTS)
13. Lecture: Review of material and preparation for colloquium II. (0.13 ECTS)  
Exercises: Review of material and preparation for colloquium II. (0.13 ECTS)
14. Lecture: colloquium II. (0.13 ECTS)  
Exercises: colloquium II. (0.13 ECTS)
15. Lecture: Evaluation of colloquium II results. Oral examination of the knowledge of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students). (0.13ECTS)  
Exercises: Evaluation of colloquium II results. Oral examination of the knowledge of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students). (0.13ECTS)

**Format of instructions:**

- |   |  |   |
|---|--|---|
| lectures <input type="checkbox"/>               | laboratory <input type="checkbox"/>              | online <input type="checkbox"/>           |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/> | field work <input type="checkbox"/>       |
| exercises on computers <input type="checkbox"/> | independent assignments <input type="checkbox"/> | work with mentor <input type="checkbox"/> |
| other: <input type="checkbox"/>                 |  |   |

**Monitoring of students' work:**

- |  |  |   |   |
|--|--|---|---|
| attending classes <input type="checkbox"/>   | research <input type="checkbox"/>          | project <input type="checkbox"/>                          | practical work <input type="checkbox"/> |
| activities in class <input type="checkbox"/> | test report <input type="checkbox"/>       | oral exam <input type="checkbox"/>                        | portfolio <input type="checkbox"/>      |
| seminar work <input type="checkbox"/>        | experimental work <input type="checkbox"/> | continuous knowledge examination <input type="checkbox"/> |   |

**Type of written examination:**

- Essay type assignment   
Objective-type tasks (multiple items can be selected):

- Guessing and completion tasks
- Alternative choice tasks
- Problem solving tasks

- Multiple choice tasks
- Connecting and arranging tasks

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Bjelovučić Kopilović, S., Riješeni primjeri i zadaci iz tehničkog crtanja i nacrtne geometrije u AutoCADu 2004, Digitalni priručnik, 32 bita d.o.o., Zagreb, 2004. 2. Opalić, M., Kljain, M., Sebastijanović, S.: Tehničko crtanje, Zrinski d.d., Čakovec, 2003. 3. Pandžić, I., Virtualna okruženja, Element, Zagreb, 2013.

Optional: 1. Horvatić-Baldasar, K., Babić. I.: Nacrtna geometrija, Sand d.o.o., Zagreb, 2001., 2. Koludrović, Ć.: Tehničko crtanje u slici s kompjutorskim aplikacijama, Udžbenici Sveučilišta u Rijeci, Rijeka, 1994., 3. Giesecke ...et al.: Engineering Graphics, 8th Edition, Pearson Prentice Hall, New Jersey, 2004; Simmons, C.H., Maguire D.E., Manual of Engineering Drawing, 2nd Edition, Elsevier Newnes, Oxford, 2004;

Name of the course: Computer science 1

Teacher: Odaberite stavku. Tibor Skala

Associate teachers:

Lectures (L): Tibor Skala

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB): Diana Bratić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L + LAB Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+0+1

ECTS credits: 3

Study programme: Undergraduateavku.

Status of the course: Odaberite

stavku.

Semester: Odaberite stavku.

Semester number: Odaberite stavku.

Possibility of teaching in English: Odaberite stavku.

Course objectives: To standardize the level of computer literacy that, along with new knowledge and skills, they will be able to apply in business and continuing studies. Developing the ability of reliable and critical use of information and communication technologies. Developing logical and critical thinking and an algorithmic approach to solving various problems.

Enrollment requirements: none

Prerequisite for taking the course exam: completed and colloquial exercises

**General And Specific Competence and learning outcomes of the course:**

Students will be able to: Explain the systematic approach and state definitions of key theories related to with the emergence of informatics. List the basic characteristics of computer generations. Apply basic principles from the field of mathematical and logical basis of computer operation. List the types of computer networks and describe their development. List the basic characteristics of Web 2.0 technology. Give an example of use i present it. Differentiate between the basic terms: multimedia and hypermedia. State the definition of artificial intelligence and state its application. Differentiate basic concepts from the field of IS security. Apply operating system, Internet, computer word processing tools and spreadsheet calculator to basic and advanced level.

Course content (Syllabus) on a weekly basis:

1. Introduction to the basic concepts of the course. Development of computers throughout history: ideas and assumptions computers, mechanical devices, more

- mature ideas.  
(0.333 ECTS)
2. First digital computers, commercial development, microprocessors, personal computers. Concepts architecture and organization of digital computers: von Neumann architecture, parts, connection, logical and circuit foundations.  
(0.333 ECTS)
  3. Basic terms of a personal computer: hardware, software, peripheral devices, types of computers according to purpose.  
(0.333 ECTS)
  4. The concept of system. Definition of information system. Business system. Systemic approach (term system, system elements, connections in the system). Terms related to the information system. Algorithm. Functions of the information system in the business system. Hardware. Software.  
(0.333 ECTS)
  5. Cybernetics. System theory. Information sciences. Informatics.  
(0.333 ECTS)
  6. Data and information. Communication system. Information technologies. Informational society. Information system.  
(0.333 ECTS)
  7. Development of data processing and computers. Computer system. Choice of computer equipment.  
(0.333 ECTS)
  8. Software support for computer operation. Mathematical and logical bases of computer operation.  
(0.333 ECTS)
  9. Data organization. Logical organization of data. Physical organization of data. Addresses folder and file.  
(0.333 ECTS)
  10. Multimedia and hypermedia. Definitions and general terms. Disadvantages of the hypermedia model and possible solutions. A brief historical overview. Application of multimedia and hypermedia. Multimedia computer systems. Basic multimedia elements.  
(0.333 ECTS)
  11. Artificial Intelligence. A traditional approach to artificial intelligence. Symbolic representation of knowledge and reasoning as manipulation of symbols. Alternative approaches. Imitation of models found in nature.  
(0.333 ECTS)

12. Computer networks. Internet. Web 2.0 technologies. Development of networks. History of development and basic features. Media. Network equipment. Topology of LANs. OSI reference model. Protocols. Addressing in LAN. MAC addresses. IP addresses. Binary number system.  
(0.333 ECTS)
13. E-business. Information and communication technology in education.  
(0.333 ECTS)
14. Information society - characteristics and consequences: characteristics, state in our country and in the world, impact of IT on business, society, social groups of IT users, IT literacy, dependence of society and economy on IT, globalization and IT.  
(0.333 ECTS)
15. Protection, security and privacy in the application and use of information technology: security risks in the application and use of IT, licenses, open-source, personal security, privacy, legal consequences.  
(0.333 ECTS)

#### **Format of instructions:**

lectures x                      laboratory x                      online x  
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other: x

#### **Monitoring of students' work:**

attending classes  x                      research  x                      project                       practical work   
 activities in class  x                      test report                       oral exam  x                      portfolio   
 seminar work  x                      experimental work                       continuous knowledge examination

#### **Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Assessment and evaluation of students' work during classes and on the final exam: Normative assessment (examination is longer and larger units, tasks, average weights are examined).



**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**  x

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Lecture script in digital form. Script of tasks and exercises in digital form.

Šehanović, J., Hutinski, Ž.; Žugaj, M. Informatics for economists. Faculty of Economics Pula, Pula, 2002.

Cerić, V., Varga. M., (2004): Information technology in business. Zagreb:

Element Group of authors, Business computing. Znak, Zagreb, 1998. Manuals of programming tools from the program exercises

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Physical education 1

Teacher: Lecturer Katarina Knjaz, prof.

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Exercises (E): Katarina Knjaz, prof.

Type of instructions (*L- lectures; S- seminars; E - exercises*): E

Type of instructions presented as number of hours L+S+E on a weekly basis: 0+0+ 2

ECTS credits: 0

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: I

Possibility of teaching in English: Yes

Course objectives: The aim of the subject of Physical Education is to raise awareness of the importance of daily physical exercise, preservation of already acquired and the acquisition of new motor skills, and influence on anthropometric characteristics, motor and functional abilities and cognitive and the connotative dimensions of the personality. Also, improving health and working abilities, satisfaction the need for movement, training students for rational, meaningful use and implementation free time.

Enrollment requirements: No requirements

Prerequisite for taking the course exam: From the subject physical education students do not receive numerical grade and do not take the exam. For the execution of obligations in the subject, they receive the signature of the teacher, and conditions for obtaining signatures are attendance, commitment and active participation in 80% of the total number of teaching hours (30 teaching hours semesterically - 2 hours per week for 45 min).

#### **General And Specific Competence and learning outcomes of the course:**

- Recognize the impact of certain exercises on certain muscle groups
- Apply different principles of movement to learning and development of motor skills and to the acquisition of specific motor skills
- Demonstrate complexes of general preparatory exercises and apply them in sports and recreation
- Demonstrate the basics of techniques of some team and individual sports
- Apply the rules of team and individual sports in recreation

- Plan a trip to nature which implies the creation of basic preconditions for safe Staying in the mountains
- Build a sense of respect for the code of mountaineering ethics
- Influence the raising of working capacity and efficiency by acquiring habits on a daily basis physical exercise
- Apply certain theoretical and practical knowledge in those kinesiological activities that will help them to improve health and raise the quality of life

Course content (Syllabus) on a weekly basis:

1. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
2. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking and tours (Nature Park Medvednica)
3. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
4. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
5. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
6. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
7. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
8. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
9. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
10. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
11. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
12. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

13. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
14. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
15. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: questionnaire

### References

Required: There is no compulsory literature in the subject of Physical Education. Students are referred to literature related to physical education, improvement and preservation of health,

proper nutrition, prevention of injury, ways and goals of training, and the importance of regular exercise throughout life for the purpose of reducing a sedentary lifestyle.

Optional:

1. Proceedings of summer schools of kinesiologists of the Republic of Croatia. Available at: <http://www.hrks.hr/zbornici.htm>
2. Tempus project Education for Equal Opportunities at Croatian Universities. Available at : <http://www.eduquality-hr.com/>
3. Neljak, B., Caput-Jogunica, R. (2012). Kinesiological methodology in higher education. Zagreb: Faculty of Kinesiology, University of Zagreb.
4. Kulier, I. (2010). Goodbye fatness - weight loss strategy. Book. Zagreb. V.B.Z. d.o.o.
5. Moore, A. (2010). Standard dances. Zagreb: Knowledge.
6. Milanović, D. (2009). Theory and methodology of training. Zagreb: Faculty of Kinesiology, University of Zagreb Zagreb.
7. Klavora, P. (2009). Introduction to kinesiology: a biophysical perspective. Toronto: Sports Books Publisher.
8. Mišigoj-Duraković, M. (2008). Kinanthropology - biological aspects of physical exercise. Zagreb: Faculty of Kinesiology, University of Zagreb.
9. Jukić, I., Marković. G. (2005). Fitness exercises with weights. Zagreb. Faculty of Kinesiology University of Zagreb.
10. Sertić, H. (2004). Basics of combat sports, Zagreb. Faculty of Kinesiology.
11. Janković, V., N. Marelić (2003) Volleyball for all, Zagreb: Author's edition.
12. Kulier, I. (2001). What we eat. Zagreb: Impress.
13. Anderson, B. (2001). Stretching. Zagreb: Gopal.
14. Čorak, N. (2001). Fitness Bodybuilding. Zagreb: Hinus.
15. Children's Hospital Zagreb, Department for Reproductive Health (2001). Contraception – guide through methods and means of preventing pregnancy, Zagreb
16. Clark, N. (2000). Sports nutrition. Zagreb: Gopal
17. Children's Hospital Zagreb, Department for Reproductive Health (2000). Sexually transmitted diseases, Reproductive Health, Methods and Means of Protection against Pregnancy, Zagreb.
18. Mišigoj-Duraković, M. et al. (1999). Physical exercise and health. Zagreb: Faculty of Physical Sciences

Name of the course: Visual Arts I

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L): lectures

Seminar (S):S

Laboratory (LAB

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: LAB

ECTS credits: 3

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Winter

Semester number: I

Possibility of teaching in English: Only for foreign students

Course objectives:Students will gain an understanding of the history of Arts. Know how to apply and utilise tools and knowledge about technological processes and materials

Enrollment requirements: Practise in Arts

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

Elementary Art Concepts and chronology and evaluating the quality of visual material

Course content (Syllabus) on a weekly basis:

1. Prehistory Art
2. Mesopotamia Art
3. Egypt Art
4. Crete and Mycenae Art
5. Greece Art
6. Etruscans Art
7. Rome Art



**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: lectures, books from Art field

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.



Name of the course: Practice in Arts I

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L):

Seminar (S):

Laboratory LAB

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: LAB

ECTS credits: 2

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: I

Possibility of teaching in English: Only for foreign students

Course objectives: Students will know how to apply and utilise tools and knowledge about technological processes and materials in drawing and painting, collage-ing. Make a composition.

Enrollment requirements: No

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

Elementary Art Concepts and chronology and evaluating the quality of visual material

Course content (Syllabus) on a weekly basis:

1. Composing an abstract organic motif, collage
2. Composing an abstract geometric motif, collage
3. Composing a figurative motif by perceptive, draw, pencil
4. Composing a figurative motif with abstract organic forms, collage
5. Composing a figurative motif with typography, collage
6. Composing a geometric motif with titles, collage
7. Linear draw, monotonous line, ink

8. Linear draw, Calligraphy line, ink
9. Linear draw, Anatomy line, pencil
10. Placement of typography within the format, collage
11. Central Perspective, pencil
12. Frog's Perspective, ink
13. Bird's eye View, ink
14. Ink and pencil drawings, sketches
15. Anatomy study, ink

### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### **Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input type="checkbox"/> Guessing and completion tasks    | <input checked="" type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |  |

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

### **Assessment and evaluation of students' work during classes and on the final exam:**

Practical work

Other:

**Teaching process evaluation:** Multiple choice tasks

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: lectures, books from Art field, catalogues

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Introduction to graphic technology

Teacher: assoc. prof. PhD. Suzana Pasanec Preprotić

Associate teachers:

Lectures (L): -

Seminar (S):-

Laboratory (LAB):-

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L

Type of instructions presented as number of hours L+S+LAB on a weekly basis: L2+S0

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Elective

Semester: Winter

Semester number: I

Possibility of teaching in English: No

Course objectives: To acquaint students with the basics of the reproduction chain of graphic production. Bring students closer individual segments of graphic production and familiar with professional terminology in the Croatian language. The process of graphic production is a complex series of work operations that build on each other. In the lectures will introduce students to the products of the graphic industry, classifying them according to their purpose and basic work operations. Furthermore, students will get to know the basic division of graphics production for preparatory, basic, i.e. printing and final, i.e. graphic finishing. It will also be mentioned explain the key elements of each of the basic segments such as text and image processing, production copy templates needed to produce printing forms for all printing techniques in the preparatory graphic department production. Familiarity with printing techniques and the basic principle of the machines used in each from techniques within basic graphic production. Final production that is divided into final production in bookbinding, production of packaging and paper processing is closely related to dating materials used in the production of graphic products. After taking the course, the student will have an overall picture of graphic production, which will be additionally included in other professional courses clarify and deepen.

Enrollment requirements: There are no additional competencies in addition to those required for enrollment in undergraduate studies at the Faculty of Graphics

Prerequisite for taking the course exam: completed and colloquial exercises

**General And Specific Competence and learning outcomes of the course:**

Professional oral and written expression in Croatian and foreign (English/German) languages.

Application of basic and general knowledge in the analysis of technical and technological processes; Knowledge and identifying technological units of graphic production; Classification and explanation of actions and processes within technological units; Planning the sequence of basic process procedures in graphic technology; Assessment and selection of materials for a specific production process; Differentiation of the process of basic printing techniques and the application of professional knowledge in the selection of the technique with regard to the final graphic product; Evaluation characteristics of reproduction, finishing and multimedia devices; Using tools and knowledge about technological processes in the design, reproduction and distribution of visual messages.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture (def. rules and duties of students, def. literature). Introduction to the course, generally about graphics through a historical review of the development of civilizations (collaborative learning in small groups according to the ERR-framework of teaching, tasks of a complex type, creating a mental map), (0.07ECTS)
2. Characteristics of graphic techniques and characteristics of the development of printing (collaborative learning in small groups according to the ERR teaching framework, completion and arrangement tasks), (0.13ECTS).
3. Colloquium 1 (objective type tasks), (0.17ECTS)
4. Characteristics of text and image reproduction and basic principles of typography. Basic preparatory task graphic production. Basic differences between single-color and multi-colour templates, and single-tone and multi-tone. The basic feature of rasterization in basic graphic production. Basic differences between analogy and digital rasterization. System and device features for colour management (collaborative learning in small groups according to the ERR teaching framework, completion and arrangement tasks), (0.20ECTS).
5. Features of production of printing forms for four basic printing techniques. Defining the terms of print element and free surface. Implementing the characteristics of graphic techniques with features of printing techniques. Use of metal for production of printing forms in letterpress, offset, gravure and screen printing. Types of copiers template (positive, negative) and copy layers in the production of printing forms for tall, flat, gravure and transmissive printing. Characteristics of electromagnetic radiation in the production of printing form (collaborative learning in small groups according to the ERR teaching framework, supplemental tasks, arrangement), (0.22ECTS).
6. Features of basic graphic production. Features of the four basic printing techniques and their practical use. Basic characteristics of book printing, foil letterpress printing, offset printing, intaglio printing, embossing and screen printing. Features of construction solutions of machines for four basic techniques

printing (translation, rotation) and application of printing media (sheet, roll). Basic principles printing for four printing techniques (direct, indirect). Printing substrate application (paper, laminate, plastic mass, aluminium foil, cellophane, wood, glass, metal) for certain printing techniques (collaborative learning in small groups according to the ERR teaching framework, supplemental tasks, arrangement), (0.22ECTS).

7. Colloquium 2 (objective tasks in the field of preparatory and basic graphic production), (0.17ECTS).
8. Features of final graphic production. Characteristics of book typography, types and forms of binding books. Classification of the bookbinding product according to the purpose of the book (single, multiple, permanent, with the highest demand). Bookbinding the type (hard, soft, mechanical) and binding forms (adhesive, stitched, mechanical) book in accordance with its purpose. Adoption of basic knowledge about the types of binding units and their use in certain binding forms. Basic differences between accident and bookbinding product. Systematization of division paper format according to order and class. Systematization of the division of book formats regarding designing the way to fold the press/book sheet. Acquisition of basic knowledge about by the rules of the golden ratio (optical unit) when designing the left (even) and right (odd) pages of the bookbinding product. Collaborative learning in small groups according to the ERR framework teaching, completion, and arrangement tasks, (0.24ECTS).
9. Aspects of interpretation of packaging forms. Characteristics of different spatial packaging forms and basic features in its Greek design. Purpose of packaging (sales, transport) and its function (constancy of the material, ability to process). Designing of different types packaging forms (rolled, drawn, stamped, cut). Acquiring basic knowledge about the method of refining packaging material. Standardization of performance of packaging forms in function of reducing the costs of its production. Characteristics of packaging materials made of paper (corrugated cardboard, flat cardboard) and other materials (metal, glass, wood, textile, plastics, laminate). Use of accidents on packaging forms and selection criteria printing techniques depending on the type of packaging material and its spatial shape. Collaborative learning in small groups according to the ERR-framework of teaching, completion, and arrangement tasks (0.24ECTS).
10. Characteristics of graphic materials in the technical-technological process of creating a graphic product. Acquiring basic knowledge about the properties of paper and printing inks. Characteristics of plastic materials for making packaging forms. Application of glue in finishing processes (book-making, packaging, material processing). Collaborative learning in small groups according to the ERR framework teaching, completion, and arrangement tasks (0.20ECTS).
11. Colloquium 3 (objective tasks in the field of final graphic production). (0.25ECTS)



Problem solving tasks

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Criterion assessment (examination aimed at a more detailed check of smaller units, adapted tasks material characteristics)

Other: Colloquium (lecture) - evaluation of problem-solving and decision-making skills (in pairs) - Mind Map/Case Study

**Teaching process evaluation:** Evaluation by students (Survey)

**Student evaluation (survey)**

Other: Creation of rubrics in which evaluation criteria are determined (scale of 1 - 4)

**References**

Required: F. Mesaroš, Grafička enciklopedija, Tehnička knjiga, Zagreb, 1972.

Nastavni materijali na webu Katedre za knjigoveštvo i ambalažu link:

<http://dorada.grf.unizg.hr/pages/kolegiji/uvod-u-grafiC48Dku-tehnologiju/nastavni-materijali.php>

M. Gojo, S. Mahović Poljaček, Osnove tiskovnih formi, Sveučilište u Zagrebu Grafički fakultet, Zagreb, 2013.

F. Mesaroš, Tipografski priručnik, Grafički obrazovni centar, Zagreb, 1985.

S. Bolanča, Glavne tehnike tiska, Acta Graphica, Zagreb, 1997.

J. Solić; Knjigoveštvo 1-Uvod i uvezi, Grafički srednjoškolski centar, Zagreb, 1973.

D. Babić, Uvod u grafičku tehnologiju, Grafički centar za ispitivanje i projektiranje, Zagreb, 1998.

Optional: N. Stričević, Suvremena ambalaža (II i III dio)-ambalažni materijali/ ambalažni oblici, Zagreb, 1983.

N. Stričević, Suvremena ambalaža (I dio)-općenito o ambalaži, Zagreb, 1982.

V. Potisk, Grafička dorada-Priručnik za grafičare, Zagreb, 1997.

E. Kale, Povijest civilizacija, Školska knjiga, Zagreb, 1990.



Name of the course: English for Graphic Engineers and Designers 1

Teacher: Odaberite stavku. Ana Nemec

Associate teachers:

Lectures (L): Kliknite ili dodirnite ovdje da biste unijeli tekst.

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+1

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Elective

Semester: Winter

Semester number: I

Possibility of teaching in English: Yes

Course objectives: acquisition of academic vocabulary and basic vocabulary in mathematics, physics, and chemistry; revision of basic grammar through targeted exercises; detection of common mistakes learners make in English; translation of short texts from English to Croatian and vice-versa

Enrolment requirements: Skills and competences acquired in the course of high school education

Prerequisite for taking the course exam: attendance, continuous activity

**General And Specific Competence and learning outcomes of the course:**

independent use of academic vocabulary and basic vocabulary in mathematics, physics, and chemistry; proficiency in basic grammar; basic translating skills

Course content (Syllabus) on a weekly basis:

1. Revision of basic grammar units: parts of speech, tenses
2. Revision of basic grammar units: passive, conditionals
3. Word formation
4. Learning new vocabulary: methods and tips and tricks
5. Common mistakes in English: analysis
6. Quantifiers and countables/uncountables



**Teaching process evaluation:** survey

**Student evaluation (survey)**

Other:

### **References**

Required: any monolingual dictionary; grammar; course materials

Optional: newspapers and magazines

Name of the course: Mathematics II

Teacher: asst. prof. PhD. Ivan Budimir

Associate teachers:

Lectures (L): Ivan Budimir

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 3+3

ECTS credits: 7

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: II

Possibility of teaching in English: Yes

Course objectives:Students need to master mathematical concepts such as definite and indefinite integral, series numbers and functions, differential equations and concepts of linear algebra that are included in the course mathematics 2 as well as their application in a real context with special emphasis on applications in graphic technology. Understanding the mentioned terms constitutes the basic level of mathematics literacy, which is necessary for engineers of all technical sciences. Knowledge of the material of this course enables the student to understand the content of general and basic subjects such as chemistry, physics and of mechanical engineering in which the observed phenomena are described in a quantitative way. Mathematical techniques which the students will master will also enable them to monitor the content of professional graphics courses in which they describe certain regularities analytically. More precisely, students should connect the concept of certain integrals with processes in which a large number of very small contributions are added and which are characteristic of other, non-mathematical areas. Furthermore, students should connect the concept of definite integral with its application in chemistry, physics and mechanical engineering, but also in graphic scientific and professional practice. Students should be able to represent complex functions using simple polynomial series. Students they need to master matrix calculus and systems of equations. Students should be able to apply the matrix calculus in the field of vector and computer graphics. Also, students should acquire modeling skills real problems using a system of equations. Students should be able to model with differential equations. The main goal of the course is to acquire mathematical literacy and train students for the application of numerical methods contained in his curriculum in real life graphic context.

Enrollment requirements: Listened Mathematics I

Prerequisite for taking the course exam: student attendance at seminars

**General And Specific Competence and learning outcomes of the course:**

Students will be able to pose realistic problems in an analytical way; they will know how to choose a mathematical method suitable for describing the corresponding real problem; be able to explain mathematical concepts such as integral, order, differential equation and matrix; will be able to explain the significance of the mentioned concepts in other fields such as chemistry, physics and mechanical engineering; they will know how the mentioned terms are used applied in the field of graphic technology; will know how to apply matrix calculus for image processing to computer; they will be able to explain the concept of a definite integral as the sum of a large number of negligible ones contributions; they will be able to apply the term definite integral in graphics; they will know how to create mathematical models using differential equations; they will be able to interpret the solutions of differential equations; knowing will mathematically model real problems using the methods of infinitesimal calculus; students will be able to further develop their mathematical competence thanks to the solid foundations it provides knowledge of course content; students will improve precision, brevity and analyticity in their own approach to technical issues.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture: definition of the course content, examination methods and teaching methods literature. Introductory seminar: defining the duties of students related to attending classes. Repetition of material from mathematics 1, especially differential calculus.
2. Introduction to integral calculus. Definition of indefinite and definite integral. Indefinite integral as an antiderivation. Definition of primitive function. Basic formulas related to calculation indefinite integral. Techniques for calculating the indefinite integral. Direct method integration.
3. Substitution theorem in the indefinite integral. Substitution method. Theorem about the partial integration. Method of partial integration. Indefinite integral and derivatives. Basic theorems differential calculus. Rolle's and Lagrange's theorem.
4. The method of calculating the integral rational function. Decomposing the rational function into partial fractions. Integrating trigonometric functions. Integrating the irrational function. Binomial integrals. Calculating integrals using trigonometric substitutions.
5. Definition of an integral sum. Definition of a definite integral as a limit of integral sums. Definition of upper and lower Darboux sums. Definition of a definite integral as a supremum by the set of lower Darboux sums. Application of the definite integral for determination of the area below curves.
6. Calculation of definite integrals using the Newton-Leibniz formula. Substitution into a definite integral. Partial integration in a definite integral. The application of a certain integrals to problems in geometry and applications in other areas. Calculation

consumption of colored surfaces on graphic reproductions.

7. Determining the area between curves. Calculation of the volume of rotating bodies. Computing arc length of the curve. Application of the definite integral in chemistry and physics. Calculating times which overturns a material body moving at a non-uniform speed  $v(t)$ . Calculation of work and energy using a definite integral. Calculation of the center of mass of a homogeneous material body. Calculation of energy consumption in the change. Application of the definite integral in mechanics graphic machines.
8. I-colloquium. Rows of numbers. Geometric lines. Calculation of the area of fractal elements. Mandelbrot set. Brake curve. Zeno's paradoxes and the concept of infinite divisibility. Rows of functions. Maclaurin's and Taylor's red. Fourier red. Image filtering. Fourier image transformations. Laplace operator and digital image processing.
9. Differential equations. Classification of differential equations. Field of directions. Differential equations of the 1st order. Differential equations with separated variables. Linear differential equations. Homogeneous differential equations. Exact differential equations.
10. Differential equations of the 2nd order. Homogeneous linear differential equation of the 2nd order. Inhomogeneous linear differential equation of the 2nd order with constant coefficients. Modeling with differential equations. Differential equation of Newton's law cooling. Differential equation of radioactive decay. Differential equation population growth.
11. Introduction to linear algebra. Definition of matrix. Basic concepts of matrix calculus. Triangular matrix. Matrix transposition operation. Basic algebraic operations with matrices. Matrix multiplication. Digital image as matrix and matrix as image. Rank and inverse matrix.
12. Determinant matrix. Laplace development determinant. Saruss rule for calculation determinants. A regular matrix and its determinant. Determinant theorems. Matrix equations. Calculation of the inverse matrix using determinants. Image filtering. Linear image transformation operators. Gaussian filters.
13. Definition of a system of  $m$  equations with  $n$  unknowns. Cronecker Capelli theorem. GaussJordan method of elimination. Systems with a unique solution. Systems with infinity many solutions. Inconsistent systems. Application of the computer program Wolfram Alpha to matrix calculus and systems. Linear programming.
14. Applying the matrix to the solution of the system of equations. Solving the system using matrices equations. Cramer's rule for solving systems. Modeling problems from reality context using the system. Color systems. Matrix color display. Matrix



## References

- Required:
1. F. AYRES, Jr., E. MENDELSON, *Shaum's Outline of Theory and Problems in Differential and Integral Calculus*, Mc Graw-Hill, Inc., USA, 1990.
  2. W. H. Steeb, *Problems And Solutions in Introductory And Advanced Matrix Calculus*, Willi-Hans Steeb, 2006.
  3. B. P. DEMIDOVIČ, *Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke*, Tehnička knjiga, Zagreb, 1978.
- Optional:
1. J. Stewart, *Calculus*, Cengage Learning, 7-th edition, 2012.
  2. Steven H. Strogatz, *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering (Studies in Nonlinearity)*, 2-nd edition, 2014.



Name of the course: Physics 2

Teacher: prof. PhD. Vesna Džimbeg-Malčić

Associate teachers:

Lectures (L): Vesna Džimbeg-Malčić, Katja Petric Maretić

Seminar (S):Katarina Itrić

Laboratory (LAB):Katja Petric Maretić, Damir Modrić, Katarina Itrić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+1

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: II

Possibility of teaching in English: Only for foreign students

Course objectives:The application of fundamental and general knowledge in the analysis of technical and technological processes in graphic reproduction: 1) using basic knowledge of geometrical and physical optics to identify problems in graphic reproduction; 2) applying fundamental knowledge of interference and diffraction in devices used for quality control during graphic processes; 3) applying basic knowledge related to the phenomenon of electron emission from materials under the influence of electromagnetic radiation during graphic processes; 4) applying fundamental knowledge in calculating photometric quantities related to lighting sources during graphic processes; 5) applying acquired knowledge in electrostatics to explain the principles of digital printing; 6) solving mappings within geometrical optics on optical instruments; 7) analyzing and interpreting measurement results in the form of graphs and tables.

Enrollment requirements: Physics 1 course passed

Prerequisite for taking the course exam: Lab. exercises completed

**General And Specific Competence and learning outcomes of the course:**

Student will be able to: 1) explain Coulomb's law and define electric field, potential, voltage and their corresponding units of measurement; 2) use Ohm's and Kirchhoff's laws to calculate basic elements of direct/alternating current circuit; 3) apply the law of reflection and refraction in image formation, explain the formation of real/virtual image; 4) distinguish between diverging and converging lenses, and use the physical properties of lenses in optical instruments; 5) explain diffraction and diffraction pattern, recognize similarities and differences between interference and diffraction; 6) distinguish between the wave and particle properties of electromagnetic radiation-light; explain the photoelectric effect; 7) differentiate

color as a physical phenomenon from psychophysical color appearance, recognize characteristic spectra of colors in reflection; 8) define basic photometric quantities and their units of measurement, use Lambert's law in calculating illuminance of selected surfaces.

Course content (Syllabus) on a weekly basis:

1. Introduction. Division of optics: geometric, photometry, physical optics. Spectrum of electromagnetic waves. Visible part of the spectrum, light. Sources of light. Speed of light, wavelength, and frequency. Examples: displays of spectra and sources of light. (0.30ECTS)
2. Electrostatics. Electric charges; charge distribution on real bodies. Surface charge density. Electric force; Coulomb's law. Electric field. Electric potential and voltage. Electric dipole; electric field energy. Examples and problems. (0.33ECTS)
3. Electric capacitance and capacitors. Capacitance of a capacitor, dielectric, dielectric constant. Electrodynamics. Motion of charges under the influence of potential difference; electric current, electric current intensity, Ohm's law, Kirchhoff's laws, work and power of electric current. Examples and problems. (0.33ECTS)
4. Magnetic field of a moving charge; Oersted's experiment. Magnetic field of a current-carrying conductor. Motion of charged particles in a magnetic field; Lorentz force. Electromagnetic induction. Alternating current, oscillatory circuit, electromagnetic waves. Examples and problems. (0.33ECTS)
5. Waves. Formation of waves in general. Vibration; force of a harmonic oscillator. Equation of vibration; solving the equation, frequency and period of vibration. Wave equation; temporal and spatial component. Properties of electromagnetic waves; vector of electric and magnetic fields. Examples and problems. (0.34ECTS)
6. Geometric optics. Properties of light. Laws of geometric optics. The law of rectilinear propagation and the independence of the propagation of light beams. Limitations of the validity of the laws. Reflection of light; law of reflection. Properties of reflective surfaces. Specular and diffuse reflection. Formation of images on perfectly smooth reflective surfaces. Examples of reflection; reflection on some printing substrates. (0.34ECTS)
7. Refraction of light. Snell's law; absolute and relative refractive index. Total internal reflection. Refraction of light in flat optical systems. Parallel-sided plate; displacement of light ray. Prism; deviation of light ray, angle of deviation. Dispersion of light. Problems on refraction in flat systems. (0.34ECTS)
8. Image formation in geometric optics. Real and imaginary object. Formation of a real or imaginary image; methods of observing an image. Conditions for unambiguous image formation; Gaussian approximation. Spherical diopter. Errors in image

formation; real optical systems. Flat diopter. Image formation on flat systems. (0.34ECTS)

9. Imaging on thin lenses; thin lens equation, linear scaling. Focal point of the image and focal point of the object. Lens systems. Gradual mirroring. Optical instruments. Camera. Microscope, a scheme. Magnification of the microscope. Resolving power, Rayleigh's principle. Examples and problems. (0.33ECTS)
10. Physical optics. Wave nature of light. Interference of light. Coherent sources and conditions for the formation of bright and dark fringes. Devices for interference; Fresnel mirrors, thin films, Newton's rings. Interference phenomena in nature. Application of interference in graphic phenomena. Examples and problems. (0.34ECTS)
11. Diffraction. Diffraction at an obstacle; optical grating. Conditions for light maxima and minima. Intensities of individual maxima. Light diffraction at an obstacle. Fraunhofer and Fresnel diffraction. Conditions for light maxima and minima. Positions and values of maxima in the diffraction pattern. Natural phenomena involving diffraction. Applications of diffraction in graphic processes. Examples and problems. (0.34ECTS)
12. Particle nature of light; light as a photon. Photoelectric effect, A. Einstein; description of the phenomenon. Photoelectric effect equation; threshold frequencies. Photoelectric current and photocells. Natural phenomena involving diffraction. Applications of photoelectric effect in graphic processes. (0.34ECTS)
13. Colour physics. Visible light spectrum and colour tone. Frequency and energy of visible light. Psychophysical mood of colour. Theory of colour representation using three stimuli. Additive and subtractive colour mixture. Colour of opaque and transparent object. Examples and problems. (0.34ECTS)
14. Photometry; measurement of the visible part of electromagnetic waves. Energy and photometric sizes of light sources; equivalent. The sensitivity of the human eye in the visible light spectrum. Physical dimensions of the light source; intensity, flow and amount of light. Illumination of the surface. The connection between the light source and the surface; Lambert's law. Examples and problems. (0.34ECTS)
15. Photometry; presentation of functional relations and search for extreme values. Optimum lighting values of certain surfaces. Examples and problems.

### **Format of instructions:**

lectures

seminars and workshops

exercises on computers

laboratory

multimedia and internet

independent assignments

online

field work

work with mentor

other:

### Monitoring of students' work:

attending classes       research       project       practical work   
activities in class       test report       oral exam       portfolio   
seminar work       experimental work       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Laboratory exercises: independent completion of exercises, quizzes, papers. Seminars: independent solving of numerical problems. Final exam: written part of the exam (solving numerical problems), oral part of the exam (theory).

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

### References

Required: 1. P. Kulišić i V. Lopac: Elektromagnetske pojave i struktura tvari, Školska knjiga, Zagreb, 2003. 2. V. Lopac i ostali: Riješeni zadaci iz elektromagnetskih pojava i strukture tvari, Školska knjiga, Zagreb, 2003. 3. V. Mikac-Dadić, V. Džimbeg-Malčić, K. Petric-Maretić i D. Modrić: Vježbe iz fizike 2, Laboratorijske skripte za studente Grafičkog fakulteta, Zagreb, 2002

Optional: 1. V. Henč-Bartolić i P. Kulišić: Valovi i optika, Školska knjiga, Zagreb, 2004.  
2. V. Henč-Bartolić i ostali: Riješeni zadaci iz valova i optike, Školska knjiga, Zagreb, 2002.

Name of the course: Chemistry 2

Teacher: prof. PhD. Mirela Rožić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Ivana Plazonić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: II

Possibility of teaching in English: No

Course objectives: The course makes it possible to explain the laws of organic chemistry. It includes the most general relations organic chemistry that contributes to a better understanding of chemical processes and properties of organic substances in graphic technology.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Completed and colloquial exercises, preparation of a seminar paper

### **General And Specific Competence and learning outcomes of the course:**

The student will be able to evaluate the basic physical and chemical properties of organic compounds and materials essential in graphic technology. The student will be able to explain the mechanisms of reactions essential in graphic technology.

Course content (Syllabus) on a weekly basis:

1. Introduction to the course and detailed lesson plan. Chemical bond and structure of organic molecules. Showing the structure of organic molecules. Structural isomers. Formal charge. Atomic I molecular orbitals. (0.10 ECTS). Student participation in work and discussion (0.033 ECTS)  
Laboratory exercises: Familiarization with working in the laboratory. Isolation and cleaning of organic substances (0.083 ECTS)
2. Hybridization of atomic orbitals of carbon atoms. Single, double bond, triple bond.

- Electron delocalization. Polarity of covalent bonds. Physical connections. (0.10 ECTS). Student participation in work and discussion (0.033 ECTS) Laboratory exercises: Unsaturated hydrocarbons. (0.083 ECTS)
3. Hydrocarbons: alkanes, alkenes, alkynes, aromatic hydrocarbons. Nomenclature. Physical properties. (0.10 ECTS) Student participation in work and discussion (0.033 ECTS) Exercises: Alcohols, aldehydes, ketones (0.083 ECTS)
  4. Conformations of alkanes. Conformational analysis. Geometric isomers of alkenes. (0.10 ECTS) Student participation (0.033 ECTS) Laboratory exercises: Carboxylic acids (0.083 ECTS)
  5. COLLOQUIUM 1. (0.33 ECTS) Nomenclature and physical properties of hydrocarbon derivatives (alcohols, phenols, ethers, carboxylic acids, carboxylic acid derivatives, amines, nitriles, haloalkanes). (0.10 ECTS) Student participation in work (0.033 ECTS) Laboratory exercises: Fats and oils (0.083 ECTS)
  6. Introduction to organic reactions. Cleavage of a covalent bond. Carbocation. Oxidation and reduction organic compounds. Explanation of organic reaction by the theory of frontier orbitals. (0.10 ECTS). Preparation of students for the activity (0.033 ECTS) Laboratory exercises: Carbohydrates (0.083 ECTS)
  7. Acidity of organic compounds. Influence of electron delocalization on acidity. Influence of inductive effect on acidity. (0.10 ECTS) Solving tasks independently or in a group. Creation of mental maps on a predetermined topic (0.033 ECTS)
  8. Halogenation of alkanes-reaction of free radicals. Electrophilic addition to alkenes and alkynes. Stability of carbocations. Electrophilic substitution reactions of arenes. (0.10 ECTS) Solving example tasks: solving tasks independently or in a group (0.033 ECTS)
  9. Acid-base properties of alcohol and phenol. Basic properties of amines. Diazotization of aromatics connections. Diazo coupling reactions. (0.10 ECTS) Creation of mental maps on a given topic (0.033 ECTS)
  10. COLLOQUIUM 2. (0.33 ECTS) Reactions of electrophilic and nucleophilic addition to the carbonyl group. Nucleophilic reactions substitutions on carboxylic acids and derivatives. (0.10 ECTS) Independent solution tasks or in a group. (0.033 ECTS)
  11. Polymerization reactions. Thermoplastics. Duroplasts. Addition polymerization. Polymerization reactions to obtain polyisobutylene, polyethylene, polypropylene, PVC, acrylic resins. Polycondensation; obtaining polyester, alkyd resins, polyamides, formaldehyde resins. (0.10 ECTS) Active participation of students (0.033 ECTS)

12. Chirality, optical activity. Carbohydrates. Structure of cellulose, starch. Cellulose derivatives (0.10 ECTS) Student participation in discussion (0.033 ECTS) Solving tasks (0.033 ECTS)
13. More fatty acids. Esterification. Saponification of oils and fats. Oil oxidation (polyoxidation): reactions. (0.10 ECTS) Student participation in the discussion (0.033 ECTS)
14. Color and coloring of organic compounds. Correlation between the chemical structure of a compound and its colors. Classification of dyes according to their ability to adhere to different materials, molecular structures colored. (0.10 ECTS). Preparing students for work (0.033 ECTS)
15. Photopolymers. Chemistry of UV drying (chemical reactions of photoinitiation, propagation-polymerization prepolymer, termination). Surfactants. (0.10 ECTS). Student participation in discussion (0.033 ECTS) COLLOQUIUM 3 (0.33 ECTS) Presentation of the seminar paper. (0.5 ECTS)

#### Format of instructions:

- |   |  |   |
|---|--|---|
| lectures <input checked="" type="checkbox"/>    | laboratory <input checked="" type="checkbox"/>   | online <input type="checkbox"/>           |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/> | field work <input type="checkbox"/>       |
| exercises on computers <input type="checkbox"/> | independent assignments <input type="checkbox"/> | work with mentor <input type="checkbox"/> |
| other: <input type="checkbox"/>                 |  |   |

#### Monitoring of students' work:

- |   |   |  |   |
|---|---|--|---|
| attending classes <input checked="" type="checkbox"/>   | research <input type="checkbox"/>                     | project <input type="checkbox"/>                                     | practical work <input type="checkbox"/> |
| activities in class <input checked="" type="checkbox"/> | test report <input checked="" type="checkbox"/>       | oral exam <input type="checkbox"/>                                   | portfolio <input type="checkbox"/>      |
| seminar work <input checked="" type="checkbox"/>        | experimental work <input checked="" type="checkbox"/> | continuous knowledge examination <input checked="" type="checkbox"/> |   |

#### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** The final grade consists of the sum of points achieved through 3 colloquia, one group seminar work, class activities and colloquial laboratory exercises.

Evaluation elements: colloquiums: 0-50 points, laboratory exercises: 0-20 points, class activity: 0-15 points, seminar paper: 0-15 points.

**Student evaluation (survey)**

Other: Colloquiums, monitoring of students' activities in class.

**References**

Required: V. Tralić-Kulenović, B. Karaman, L. Fišer-Jakić, Uvod u organsku kemiju, Litograf, Zagreb 2004.

Optional: B. Thompson, Printing Materials, Science and Technology, Pira International, UK, 2004



Name of the course: Photographic processes

Teacher: asst. prof. PhD. Rahela Kulčar

Associate teachers:

Lectures (L): asst. prof. PhD. Rahela Kulčar

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):asst. prof. PhD. Rahela Kulčar

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: II

Possibility of teaching in English: Yes

Course objectives: The course introduces students to basic photochemical reactions and laws, and the structure and composition of photo-materials that are based on silver salts as a photoactive substance. Processes and chemistry that creates a photographic image. The photographic properties and characteristics of the photographic image are examined. The characteristics of the negative and positive material as well as the final images are listed. Followed by acquaintance with a digital camera, recording principle and image printing possibilities. The differences between classic and digital cameras, the application and advantages of each technology, and the types of photosensitive elements are explained.

Enrollment requirements: No

Prerequisite for taking the course exam: Completed laboratory exercises and passed the colloquium from the exercises.

**General And Specific Competence and learning outcomes of the course:**

The student will be able to practically apply the basic laws of photochemistry. After completing the course, the student will be able to perform the classical photographic process independently, based on the application of knowledge about the structure of materials and the procedures for obtaining a photographic image. Using sensitometric testing, they will determine the properties of photographic layers (gradation, ISO, spectral sensitivity)

Course content (Syllabus) on a weekly basis:

1. Photochemical reactions and the basic photochemical law. Grotthus' law, Lamert-Beer's law, Einstein's law, the Law of reciprocity, and Schwarcschild's law. Application of law in photography.
2. Construction and production of photographic materials. Types of substrates and their properties. Photographic layer and its components. Preparation of photographic emulsion.
3. Additives before application to improve the photographic properties of photo materials. Optical sensitizers and stabilizers. Additives for improving physical and mechanical properties. Application of emulsion.
4. Camera. Lens. Illumination of photographic materials. Photolysis of silver bromide, latent image. The mechanism of creating a latent image according to the theory of Gurney-Mott.
5. Processing of photographic layers in solutions. The developer and its components. Super-additivity properties. Utilization and regeneration of developers. Developer induction period.
6. Types of developers. The chemistry of development. Factors on which development depends. Physical development. Stopping development. Fixation. The composition of the fixing solution.
7. The chemistry of the fixative solution. Types of fixative solution. Regeneration of fixative solution. Washing and drying.
8. Characteristics of photographic layers. Sensitometry and its sizes. Photo exposure. Opacity. Transparency. Reflection. Density. Measuring devices in sensitometry.
9. Characteristic densities. Sensitometric testing of photo materials. Greyscale. Construction of the density dependence curve on D-logE exposure.
10. Sensitometric testing of photo materials. Gradation. Factors on which gradation depends.
11. Sensitometric testing of photo materials. General sensitivity of DIN, ASA, and ISO values. Spectral sensitivity.
12. Ability to separate photo materials. MTF function. Granulation and graining.
13. Procedures for obtaining a photographic image. Direct procedure. Indirect procedure. Negative positive procedure. Negative image, negative film, positive image, positive film.
14. Photographic paper, materials and properties. Application of different gradations of photo paper. Photo papers of variable gradation.



T. Ang; Digitalna fotografija, Znanje, Zagreb, 2004.

Optional: London, Stone, Upton; Photography, Pearson Education, 2008

Name of the course: Technical representational systems

Teacher: assoc. prof. PhD. Sanja Bjelovučić Kopilović

Associate teachers:

Lectures (L): assoc. prof. PhD. Sanja Bjelovučić Kopilović

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Tigran Jokić, B. Sc.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory / Elective

Semester: Summer

Semester number: II

Possibility of teaching in English: No

Course objectives: To become familiar with the precise aspects of representation, measurability, and movement of forms and systems necessary in technical correspondence, and multimedia design using computer-graphic methods.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Completed colloquium and in-class tests, and attended exercises.

**General And Specific Competence and learning outcomes of the course:**

Planning of research methodology in solving the assigned task; synthesis of 3D modelling and animation knowledge in the visualization development process; developing ideas for communicating a visual message in the form of new media.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture (defining students' rights and responsibilities, necessary accessories and materials to bring to lectures, definition of literature) and introduction to mechanical simulations in computer animation, in general. Development and brief history of computer animation. 3D system configurations for animation. A selection of current hardware and software. Real-time mechanics and frame-by-frame computer graphics: introduction, simple examples in current 3D tools (Blender/3ds Max, Maya). 3D objects. 3D scenes. Motion. (0.13 ECTS)

Introductory exercises (defining students' rights and responsibilities). Introduction to Blender or a similar 3D program: interface, coordinate systems, basic commands; creation of simple 2D and 3D animation. (0.13 ECTS)

2. Lecture: A short history of animation, Zagreb Cartoon School, basic principles of animation. In-class test. (0.13ECTS)

Exercises: Problem solving tasks from lectures in Blender or a similar 3D program. (0.13 ECTS)

3. Lecture: Introduction to current 3D tools (Blender/3ds Max, Maya) - interface, window types, basic key commands. Creating and editing simple objects. In-class test. (0.13ECTS)

Exercises: Problem solving tasks from the lecture in Blender or a similar 3D program. (0.13 ECTS)

4. Lecture: Basics of NURBS and merging surfaces and their use. In-class test. (0.13ECTS)

Exercises: Problem solving tasks from lectures in Blender or a similar 3D program. (0.13 ECTS)

5. Lecture: Modifiers (generation, deformation and simulation). In-class test. (0.13ECTS)

Exercises: Problem solving tasks from lectures in Blender or a similar 3D program. (0.13 ECTS)

6. Lecture: Review of material and preparation for colloquium I. (0.13 ECTS)

Exercises: Review of material and preparation for colloquium I. (0.13 ECTS)

7. Lecture: colloquium I. (0, 13 ECTS)

Exercises: colloquium I. (0.13 ECTS)

8. Lecture: Evaluation of the results of colloquium I. Oral examination of the knowledge of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students). (0.13ECTS)

Exercises: Evaluation of colloquium results I. Oral knowledge test of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students). (0.13ECTS)

9. Lecture: Materials and textures and their mapping to objects. In-class test. (0.13ECTS)

Exercises: Problem solving tasks from lectures in Blender or a similar 3D program.  
(0.13 ECTS)

10. Lecture: Lighting and cameras and their application. In-class test. (0.13ECTS)

Exercises: Problem solving tasks from lectures in Blender or a similar 3D program.  
(0.13 ECTS)

11. Lecture: Setting the environment - use of colors; stars and fog, clouds, background image, water. In-class test. (0.13ECTS)

Exercises: Problem solving tasks from lectures in Blender or a similar 3D program.  
(0.13 ECTS)

12. Lecture: Drawing (mirroring, transparency, shadows). Comparison of different plotting tools. In-class test. (0.13 ECTS)

Exercises: Solving problems from the lecture in Blender or a similar 3D program.  
(0.13 ECTS)

13. Lecture: Review of the material and preparation for the colloquium II. (0.13 ECTS)

Exercises: Review of material and preparation for colloquium I. (0.13 ECTS)

14. Lecture: colloquium II. (0.13 ECTS)

Exercises: colloquium II. (0.13 ECTS)

15. Lecture: Evaluation of colloquium II results. Oral examination of the knowledge of students who are dissatisfied with the grade. Grading according to the created rubric (grading criteria). Evaluation of the teaching process (survey by students).  
(0.13ECTS)

Exercises: Evaluation of colloquium II results. Oral examination of the knowledge of students who are dissatisfied with the grade. Grading according to the created rubric (evaluation criteria). Evaluation of the teaching process (survey by students).  
(0.13ECTS)

### **Format of instructions:**

lectures

seminars and workshops

exercises on computers

other:

laboratory

multimedia and internet

independent assignments

online

field work

work with mentor

### **Monitoring of students' work:**

attending classes       research       project       practical work   
activities in class       test report       oral exam       portfolio   
seminar work       experimental work       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- Guessing and completion tasks
- Alternative choice tasks
- Problem solving tasks
- Multiple choice tasks
- Connecting and arranging tasks

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: 1. Pandžić, I. et al., Virtualna okruženja, Element, Zagreb, 2011.  
2. Parent, R. et al., Computer Animation Complete, Morgan Kaufman Publishers, Elsevier Inc., Burlington, MA, USA, 2000.

Optional: Chronister, J., Blender Basics, Classroom Tutorial Book, 4th Edition, work licensed under a Creative Commons Attribution-Noncommercial-Share Alike 3.0 Unported License, at <http://www.cdschools.org/cdhs/site/default.asp>, 2011



Name of the course: Physical education 2

Teacher: Lecturer Katarina Knjaz, prof.

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Exercises (E): Katarina Knjaz, prof.

Type of instructions (*L- lectures; S- seminars; E - exercises*): E

Type of instructions presented as number of hours L+S+E on a weekly basis: 0+0+ 2

ECTS credits: 0

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: II

Possibility of teaching in English: Yes

Course objectives: The aim of the subject of Physical Education is to raise awareness of the importance of daily physical exercise, preservation of already acquired and the acquisition of new motor skills, and influence on anthropometric characteristics, motor and functional abilities and cognitive and the conative dimensions of the personality. Also, improving health and working abilities, satisfaction the need for movement, training students for rational, meaningful use and implementation free time.

Enrollment requirements: No requirements

Prerequisite for taking the course exam: From the subject physical education students do not receive numerical grade and do not take the exam. For the execution of obligations in the subject, they receive the signature of the teacher, and conditions for obtaining signatures are attendance, commitment and active participation in 80% of the total number of teaching hours (30 teaching hours semesterically - 2 hours per week for 45 min).

**General And Specific Competence and learning outcomes of the course:**

- Recognize the impact of certain exercises on certain muscle groups
- Apply different principles of movement to learning and development of motor skills and to the acquisition of specific motor skills
- Demonstrate complexes of general preparatory exercises and apply them in sports and recreation
- Demonstrate the basics of techniques of some team and individual sports
- Apply the rules of team and individual sports in recreation

- Plan a trip to nature which implies the creation of basic preconditions for safe Staying in the mountains
- Build a sense of respect for the code of mountaineering ethics
- Influence the raising of working capacity and efficiency by acquiring habits on a daily basis physical exercise
- Apply certain theoretical and practical knowledge in those kinesiological activities that will help them to improve health and raise the quality of life

Course content (Syllabus) on a weekly basis:

1. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
2. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking and tours (Nature Park Medvednica)
3. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
4. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
5. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
6. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
7. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
8. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
9. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
10. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
11. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
12. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

13. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
14. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
15. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### **Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### **Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: questionnaire

### **References**

Required: There is no compulsory literature in the subject of Physical Education. Students are referred to literature related to physical education, improvement and preservation of health,

proper nutrition, prevention of injury, ways and goals of training, and the importance of regular exercise throughout life for the purpose of reducing a sedentary lifestyle.

Optional:

1. Proceedings of summer schools of kinesiologists of the Republic of Croatia. Available at: <http://www.hrks.hr/zbornici.htm>
2. Tempus project Education for Equal Opportunities at Croatian Universities. Available at : <http://www.eduquality-hr.com/>
3. Neljak, B., Caput-Jogunica, R. (2012). Kinesiological methodology in higher education. Zagreb: Faculty of Kinesiology, University of Zagreb.
4. Kulier, I. (2010). Goodbye fatness - weight loss strategy. Book. Zagreb. V.B.Z. d.o.o.
5. Moore, A. (2010). Standard dances. Zagreb: Knowledge.
6. Milanović, D. (2009). Theory and methodology of training. Zagreb: Faculty of Kinesiology, University of Zagreb Zagreb.
7. Klavora, P. (2009). Introduction to kinesiology: a biophysical perspective. Toronto: Sports Books Publisher.
8. Mišigoj-Duraković, M. (2008). Kinanthropology - biological aspects of physical exercise. Zagreb: Faculty of Kinesiology, University of Zagreb.
9. Jukić, I., Marković. G. (2005). Fitness exercises with weights. Zagreb. Faculty of Kinesiology University of Zagreb.
10. Sertić, H. (2004). Basics of combat sports, Zagreb. Faculty of Kinesiology.
11. Janković, V., N. Marelić (2003) Volleyball for all, Zagreb: Author's edition.
12. Kulier, I. (2001). What we eat. Zagreb: Impress.
13. Anderson, B. (2001). Stretching. Zagreb: Gopal.
14. Čorak, N. (2001). Fitness Bodybuilding. Zagreb: Hinus.
15. Children's Hospital Zagreb, Department for Reproductive Health (2001). Contraception – guide through methods and means of preventing pregnancy, Zagreb
16. Clark, N. (2000). Sports nutrition. Zagreb: Gopal
17. Children's Hospital Zagreb, Department for Reproductive Health (2000). Sexually transmitted diseases, Reproductive Health, Methods and Means of Protection against Pregnancy, Zagreb.
18. Mišigoj-Duraković, M. et al. (1999). Physical exercise and health. Zagreb: Faculty of Physical Sciences

Name of the course: Visual Arts II

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L): lectures

Seminar (S):S

Laboratory

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S

ECTS credits: 2

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Summer

Semester number: II

Possibility of teaching in English: Only for foreign students

Course objectives: Students will gain an understanding of the history of Arts. . Know how to apply and utilise tools and knowledge about technological processes and materials.

Recognising the quality and message of visual material

Enrollment requirements: Practise in Arts

Prerequisite for taking the course exam: Visual Arts I

**General And Specific Competence and learning outcomes of the course:**

Art Concepts and Chronology, Evaluate the quality of visual material, have a professional presentation, identifying units, methods and messages of visual material

Course content (Syllabus) on a weekly basis:

1. Classicism
2. Romanticism
3. Realism
4. Impressionism
5. Expressionism
6. Fauve



**Student evaluation (survey) ☒**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: lectures, books from Art field

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Theory of Forms

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L): lectures

Seminar :Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory LAB

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: LAB

ECTS credits: 2

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Summer

Semester number: II

Possibility of teaching in English: Only for foreign students

Course objectives: Students will gain an understanding of the visual elements of Arts.

Enrollment requirements: Visual Art I and II, Practise in Arts

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

Understanding on elements and Concepts in Arts

Course content (Syllabus) on a weekly basis:

1. What is Form
2. Mesopotamia Art
3. Egypt Art
4. Crete and Mycenae Art
5. Greece Art
6. Etruscans Art
7. Rome Art
8. Early Christianity Art



- 9.
10. Signs, Part I
11. Signs, Functions of signs, Part II
12. Developmental forms, children's drawing and the concept of simplicity of form
13. Formal Simplicity as a Level of Structural Load
14. Kitsch, Camp
15. Style

**Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input type="checkbox"/> Guessing and completion tasks    | <input checked="" type="checkbox"/> Multiple choice tasks |
| <input type="checkbox"/> Alternative choice tasks         | <input type="checkbox"/> Connecting and arranging tasks   |
| <input checked="" type="checkbox"/> Problem solving tasks |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Practical work

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Multiple choice tasks

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

## **References**

Required: lectures, books from Art field

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Practice in Arts II

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L):

Seminar (S):

Laboratory LAB

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: LAB

ECTS credits: 2

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: II

Possibility of teaching in English: Only for foreign students

Course objectives: Students will know how to apply and utilise tools and knowledge about technological processes and materials in drawing and painting, collage-ing.

Enrollment requirements: No

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

Elementary Art Concepts and chronology and evaluating the quality of visual material

Course content (Syllabus) on a weekly basis:

1. Linear drawing according to the old master, reproduction, ink
2. Make a collage by flat representational system, color papers, by motif
3. Make a poster by flat representational system, acrylic, by concept
4. Make a poster by Color tone, acrylic, portrait
5. Make a painting by Color tone, aquarel, *still life*
6. Make a book cover by Color tone, acrylic, concept
7. Make a poster, Chiaroscuro, acrylic, portrait
8. Make a book cover, Chiaroscuro, acrylic, concept

9. Make a painting, colorism, acrylic, portrait
10. Make a poster, colorism, collage, concept
11. Make a book cover, colorism, collage, concept
12. Make a painting, Impressionism way, acrylic, landscape
13. Ornaments, sketches, pencil
14. Ornaments, ink
15. Sketches, pencil, ink

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input type="checkbox"/> Guessing and completion tasks    | <input checked="" type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |  |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Practical work

Other:

**Teaching process evaluation:** Multiple choice tasks

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

## **References**

Required: lectures, books from Art field, catalogues

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: English for Graphic Engineers and Designers 2

Teacher: Odaberite stavku. Ana Nemec

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+1

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: II

Possibility of teaching in English: Yes

Course objectives: expand the vocabulary related to the field of study; translate more complex texts from English to Croatian and vice-versa; development of summarizing skills

Enrolment requirements: Skills and competences acquired in the course of high school education

Prerequisite for taking the course exam: attendance, continuous activity

**General And Specific Competence and learning outcomes of the course:**

independent use of ESP vocabulary; proficiency in grammar; translating and summarizing skills

Course content (Syllabus) on a weekly basis:

1. Dimensions: literal and metaphorical
2. Summaries and abstracts: acquaintance
3. Brushing up language skills: Reporting verbs
4. Discussing summaries done by students
5. Phrases, idioms, and sayings: quiz and gap-filling
6. Brushing up language skills: idiomatic language
7. History of photography: video and discussion



**Student evaluation (survey)**

Other:

**References**

Required: any monolingual dictionary; grammar; course materials

Optional: newspapers and magazines



Name of the course: Digital multimedia 1

Teacher: prof. PhD. Klaudio Pap, Asst.prof. Maja Rudolf, PhD

Associate teachers:

Lectures (L): prof. PhD. Klaudio Pap, Asst.prof. Maja Rudolf, PhD

Seminar (S):

Laboratory (LAB):Asst.prof. Maja Rudolf, PhD

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: II

Possibility of teaching in English: Only for foreign students

Course objectives:Acquiring fundamental knowledge about digital multimedia components and their potential use. This subject studies digital multimedia with all its basic components. Basic knowledge is provided on digital text, digital image, sound, video, and animation. The basics of the em square, digital writing lines, and font are defined as an organized set of digital squares. The definition of vector, pixel, and raster images is explained. The mathematical definition of the Bezier curve and types of connections in vector graphics are also discussed. The digital vector path and its attributes for use, as well as the digital image element, its multichannel coding of gray levels, and organized grouping into a digital image, are defined. Basic digital transformations and filtering over digital images are studied. The histogram of the digital image is introduced, along with its use for redistributing n-channel coded gray levels. The basics of digital rasterization, color digitization in different color systems, and the basic integration of text, image, sound, video, and animation into multimedia content are covered. The definition of basic HTML elements and attributes, as well as the CSS basic command set and fundamentals of usage for multimedia content presentation on the web medium, are also included.

Enrollment requirements: Basic knowledge of working on a computer

Prerequisite for taking the course exam: Attended lectures, completed exercises

**General And Specific Competence and learning outcomes of the course:**

Evaluation of the characteristics of prepress, printing, finishing, and multimedia devices

Classification of different media and identification of their main features depending on the type of communication

Defining the type and purpose of the message based on the user, form, and type of graphic

media

Using tools and knowledge of technological processes and materials in designing, reproducing, and distributing visual messages

Classifying the basic components of digital multimedia

Differentiating between vector, pixel, and raster image formats

Using different types of encoding of digital information in different digital media

Using graphic tools for basic processing and integration of digital multimedia content

Differentiating between different color digitization systems in the digital multimedia environment

Using software tools for basic digital transformations and filtering of digital images

Applying the basics of HTML and CSS technology for simple multimedia presentations on a website.

Course content (Syllabus) on a weekly basis:

1. Lecture: Basic definitions of digital text, digital image, sound, video, and animation; Exercises: Basic font operations, editing, generating, and installation (0.3 ECTS)
2. Lecture: Definition of em square, digital writing line, and font as an ordered set of em squares; Exercises: Basics of vector graphics and typography application in vector programs (0.3 ECTS)
3. Lecture: Definition of vector, pixel, and raster images; Exercises: Complex shapes in vector graphics and color systems (0.3 ECTS)
4. Lecture: Mathematical definition of Bezier curve and types of connections in vector graphics; Exercises: Introduction of pixel graphics into vector environments (0.3 ECTS)
5. Lecture: Definition of digital vector path and its attributes for use; Exercises: Basics of 3D simulation in vector program, Colloquium (0.4 ECTS)
6. Lecture: Digital image element, its multichannel coding of grayscale and organized grouping into a digital image; Exercises: Basics of coloring monochromatic images, working with selections and channels (0.3 ECTS)
7. Lecture: Basic digital transformations and filtering on digital images; Exercises: Basics of digital retouching (0.3 ECTS)
8. Lecture: Histogram of digital image and its use for redistribution of n-channel coded grayscales; Exercises: Basics of photomontage (0.3 ECTS)
9. Lecture: Introduction to the basics of digital rasterization; Exercises: Automation of digital content processing: Actions (0.3 ECTS)

10. Lecture: Basics of digitizing color in different color systems; Exercises: Basics of multi-page layout, master, styles, wrapping text around image (free forms), colloquium (0.3 ECTS)
11. Lecture: Basics of integrating text and images; Exercises: Basics of multi-page layout, master, styles, wrapping text around image (free forms) (0.3 ECTS)
12. Lecture: Basics of integrating sound and video into multimedia content; Exercises: Introduction to video, basics of cutting sequences, merging sequences, and adding sound (0.4 ECTS)
13. Lecture: Basics of animation in multimedia content; Exercises: Basic animations - frames, tweening (0.4 ECTS)
14. Lecture: Definition of basic HTML elements and attributes and CSS basic set of commands; Exercises: HTML: forms and lists (0.4 ECTS)
15. Lecture: Basics of multimedia content presentation on the web medium; Exercises: Introduction of multimedia content into web documents, colloquium (0.4 ECTS)

#### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

#### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

#### **Assessment and evaluation of students' work during classes and on the final exam:**

Normative assessment.

Other:

#### **Teaching process evaluation:**

**Student evaluation (survey)**

Other:

#### **References**

Required: K. Pap: Osnovna HTML pravila <http://www.klaudiopap.com/pretraznici-i-navigacija-na-webu/>

ed. John G. Webster, Multimedia Encyclopedia of Electrical and Electronics Engineering, V 37, 1999,

Multimedia, 1999.

Jesse S. Jin, Changsheng Xu, Min Xu, The Era of Interactive Media, ISBN 978-1-4614-3500-6, 2013.,

Springer

Optional: 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/>

Name of the course: Computer science 2

Teacher: Odaberite stavku. Tibor Skala

Associate teachers:

Lectures (L): Tibor Skala

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB): Diana Bratić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L + LAB Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+0+1

ECTS credits: 3

Study programme: Undergraduatavku.

Status of the course: Odaberite

stavku.

Semester: Odaberite stavku. summer

Semester number: Odaberite stavku. II

Possibility of teaching in English: Odaberite stavku. For foreign students

Course objectives: Acquiring knowledge about the principles of computer system operation, the principles of design, construction and maintenance of the information system, and with areas of application and trends in information development technologies. The aim of the course is to introduce students to models of information system construction and its use in the business environment. Various aspects of computer application will be pointed out optimization of business processes and implementation of electronic business systems. It will also be defined describe the ways of presentation of processing results with an emphasis on the application of multimedia, and the development and application of virtual reality. Students will learn about the types of computer networks, and the basic one's devices necessary for their realization. The concept of the network will be expanded with knowledge from the field Internet and its technologies, internet services, the way to find data on the Internet, and the necessary infrastructure. Security and protection of information systems are the foundation uter applications in corporate conditions. Awareness of the existence of threats and importance will develop protection of data content. Data protection measures will be defined and explained, as well as specific possibilities of their application. At the pragmatic level, students will be trained to work in open-source systems.

Enrollment requirements: passed the Computer Science 1

Prerequisite for taking the course exam: completed and colloquial exercises

**General And Specific Competence and learning outcomes of the course:**

Students will be able to: understand and explain the principles of computer system operation,

analyze and explain trends in the development of information technology, create and adapt presentations and use basic network services based on acquired IT literacy.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture. Introduction to the subject and explanation of the way of work. Referral to teaching contents presented on the Internet and within the LMS system  
Types of information systems, models of building information systems.  
(0.333 ECTS)
2. Information systems in certain business areas, information system in the area finance and accounting, production information systems, procurement information systems, sales information systems, personnel information systems. Elements of the system software support, the concept of an operating system, types and functions of an operating system.  
(0.333 ECTS)
3. Approach to the construction of an information system, life cycle of an information system, stages of construction information system, information system development planning, business analysis system, information system design, information system development, implementation new system, system maintenance.  
(0.333 ECTS)
4. Electronic business is a condition for modern business and organization in under modern conditions, stages of development of electronic business, company-to-company business (B2B), business of the company with the end user (B2C), business of the end user s company (C2B), end user to end user (C2C) business. Block diagrams and data flow diagrams, numerical coding.  
(0.333 ECTS)
5. Textual presentation of content, inclusion of sound in the description and presentation of content, graphically display, multimedia in the display of content. The concept of multimedia, multimedia as a technology, multimedia as a communication phenomenon, development of multimedia communication systems, hypertext and hypermedia for non-linear content movement, IT concept multimedia, virtual reality, elements for building virtual reality.  
(0.333 ECTS)
6. Multimedia in the presentation and connection of facts in the function of learning, virtual reality step according to kinetic memory, multimedia as a condition for efficient realization of lifelong learning, multimedia description of the real system in exchange for a conceptual image of the description of the real system. Spreadsheets, simple databases.  
(0.333 ECTS)
7. Elements of the digital communication system, data transfer in a computer network, technological computer network aspects, necessary elements for building a computer

network, computers, communication channels, communication adapters, communication protocols, operating system for network management. Constituent parts, the role of computers in communication.  
(0.333 ECTS)

8. Types of computer networks, local networks, regional networks, wide area networks, topologies computer networks, connection of topology and organizational solutions in the business system, telematic services. User interface, technological aspects of computer networks.  
(0.333 ECTS)

9. The concept of Internet communication, the origin and development of the Internet, the working principle of the Internet, characteristics of the Internet, elements and topology of the Internet, Internet services and their application in business. Internet services, electronic mail, discussion groups, distribution lists, transmission remote data. Web infrastructure, areas of application, further development of the Internet. Conditions Internet business, development and areas of application. Principles of data transmission in the network computers.  
(0.333 ECTS)

10. Systems and methods for finding information on the Internet, thematic catalogs, search engines, methods querying using search engines, basic logical operators, setting phrases to search engines, substitution operators, structured search, search by file type, metasearch engines, intelligent agents, alternative search methods, search strategies, evaluation of found content, according to institution, according to a well-known and recognized author, recognition of reference literature.  
(0.333 ECTS)

11. Application of Internet technology in the function of learning, hypertext, hypermedia, application of ICT in teaching, distance learning, mixed teaching systems. Areas of application information technologies.  
(0.333 ECTS)

12. The concept of information system protection, the concept of information system security, reasons construction of the information system protection system, the concept of computer crime, sources and forms of threats to the information system, nature as a source of threat, man with attribution intentionality, man with the attribution of unintentionality, technical means as a source of threats.  
(0.333 ECTS)

13. Steps in building a business information system security system, policy definition information system security, selection of security system building strategies information system, selection of the bearer of responsibility for the construction of the security system, selection of approaches in the way of implementation of the

security system.

(0.333 ECTS)

14. Assessment of the importance of the data content of the business system, external factors of importance data content, internal factors of data content significance, assessment of form and intensity of threats to data content with regard to the estimated significance, risk assessment of individual content, quantitative assessment measures and qualitative assessment measures. Selection protection measure.  
(0.333 ECTS)
15. Protection measures of information systems, material carrier as a protection measure, programmatic protection measures, protection at the level of the operating system, protection at the level of application software support, backup with change of material carrier as a protection measure, protection cryptographic protection measures, symmetric crypto systems, asymmetric encryption systems, function of a digital signature, ways to create a digital signature, virus protection, technical protection measures, physical protection measures, organizational protection measures, protection measures from the area rights. Verification of the validity of the protection measures taken.  
(0.333 ECTS)

#### **Format of instructions:**

lectures x                      laboratory x                      online x  
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other: x

#### **Monitoring of students' work:**

attending classes  x                      research  x                      project                       practical work   
activities in class  x                      test report                       oral exam  x                      portfolio   
seminar work  x                      experimental work                       continuous knowledge examination

#### **Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- Guessing and completion tasks                       Multiple choice tasks  
 Alternative choice tasks                       Connecting and arranging tasks  
 Problem solving tasks

Other: Assessment and evaluation of students' work during classes and on the final exam: Normative assessment (examination is longer and larger units, tasks, average weights are examined).



**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**  x

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Vlatko Čerić ... et al. Informacijska tehnologija u poslovanju. Dobrinić, D. et al. Izravni marketing. TIVA Tiskara, Varaždin, 2005. Stair, R.M.; Reynolds, G.W. Principles of Information Systems. 8th ed. Thomson, Boston, 2008. Rainer, R.K.Jr.; Turban, E.; Potter, R.E. Introduction to Information Systems: Supporting and Transforming Business. Wiley, Hoboken, 2006.

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Physics in graphic technology

Teacher: prof. PhD. Vesna Džimbeg-Malčić

Associate teachers:

Lectures (L): Vesna Džimbeg-Malčić

Seminar (S): Vesna Džimbeg-Malčić

Laboratory (LAB): Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+0

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: Only for foreign students

Course objectives: The aim of the course is to introduce students to the basic ideas of quantum physics, so that the acquired knowledge can be applied to issues related to graphic technology. The phenomena of reflection, absorption, transmission, radiation of primary sources of electromagnetic waves, reemission of secondary sources, explanation of associated spectra, and their understanding are related to atomic and molecular structures.

Enrollment requirements: Physics 2 course passed

Prerequisite for taking the course exam: /

**General And Specific Competence and learning outcomes of the course:**

after passing the exam, students will be able to: 1) recognize the basic laws that describe radiation black body, distinguish the characteristics of individual parts of the spectrum; 2) distinguish basic electronic transitions in an atom (emission and absorption), recognize line and band spectrum; 3) distinguish primary (artificial, natural) and secondary radiation sources, define standard radiation sources; 4) recognize the difference between incoherent and coherent radiation, understand the advantages of using laser (coherent radiation) in graphic reproduction; 5) define the basic forms of interaction of electromagnetic radiation with matter: reflection, refraction (transmission) and absorption 6) define systems that absorb and scatter light, explain the Beer-Lambert law, distinguish Kubelka-Munk absorption and scattering coefficients; 7) recognize the difference between polarized and non-polarized electromagnetic radiation, and correctly use Fresnel's equations when calculating reflection 8) analyze the interaction of light and the printing surface based on simple physical models (Murray-Daveis and Yule-Nielsen), based on this, understand the optical magnification of the raster element .

Course content (Syllabus) on a weekly basis:

1. Introductory lecture; overview of topics. Problems of classical physics at the turn of the 19th and 20th centuries. Introduction to quantum physics. (0.30ECTS)
2. Isothermal cavity as a black body model. Thermal radiation. Continuous radiation spectrum. Empirical laws describing blackbody radiation: Kirchhoff's law. Stefan Boltzmann's law. Wien's displacement law. Examples and tasks. (0.33ECTS)
3. Rayleigh-Jeans and Wien's law of radiation based on the principles of classical physics. The mean energy of a classical harmonic oscillator. Ultraviolet disaster. Examples and tasks. (0.33ECTS)
4. Harmonic oscillator energy quantization: discrete energy states. The mean energy of a quantum harmonic oscillator. Planck's law of blackbody radiation. Examples and tasks. (0.33ECTS)
5. Quantization of electromagnetic radiation; photon. Photoelectric effect: external and internal. Application in graphic reproduction. Compton effect. Examples and tasks. (0.34ECTS)
6. Balmer's empirical formula. Bohr's model of the hydrogen atom. The line spectrum of the radiation of excited gases. Emission and absorption spectra. The spectrum of electromagnetic radiation from the Sun. Examples and tasks. (0.34ECTS)
7. Einstein's probability coefficients for electron transitions in an atom: stimulated and spontaneous emission, absorption. Coherent radiation as a result of stimulated emission. Examples and problems. (0.34ECTS)
8. Physics of lasers. Types of lasers based on the method of excitation, based on the aggregate state of the laser medium. Helium-neon laser. Laser diodes. Application of lasers in modern graphic reproduction. Laser printer, photocopier, scanner. Optical communication. Examples and problems. (0.34ECTS)
9. De Broglie relations. Electron microscope and its application in graphic technology. Examples and tasks. (0.34ECTS)
10. Interaction of electromagnetic waves with matter through the model of harmonic oscillator. Resonant and non-resonant interaction; reflection, transmission (refraction), absorption. Examples and problems. (0.33ECTS)
11. Systems that absorb and scatter light. Beer-Lambert system. Kubelka-Munk system. Examples and tasks. (0.34ECTS)
12. Dispersive relation. Graphic representation of the dependence of the refractive index on the frequency. Area of anomalous dispersion. Interaction of light with the printing substrate. Examples and tasks. (0.34ECTS)

13. Reflection, diffuse and specular. Polarization of light by reflection. Fresnel equations. Polarization reflectometry. Examples and tasks. (0.34ECTS)
14. Primary sources of radiation; artificial and natural. Secondary sources of radiation. Reemission. Selective absorption, transmission. Colour sensation. Reflectance spectra of coloured and uncoloured surfaces. Examples. (0.33ECTS)
15. Models for describing reflection from halftone images: Murray-Davies and Yule-Nielsen models. Optical and mechanical dot gain. (0.33ECTS)

**Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Assessment and evaluation of students' work during classes and on the final exam:  
 seminars: independent solving of numerical problems; final exam: written part of the exam  
 (solving numerical problems), oral part of the exam (theory)

## References

Required: 1. P. Kulišić i V. Lopac: Elektromagnetske pojave i struktura tvari, Školska knjiga, Zagreb, 2003. 2. V. Lopac i ostali: Riješeni zadaci iz elektromagnetskih pojava i strukture tvari, Školska knjiga, Zagreb, 2003. 3. D. Horvat: FIZIKA odabrana poglavlja, HINUS, Zagreb 1999; 3. <http://phy.grf.hr/pages/kolegiji/fizika-u-grafiC48Dkoj-tehnologiji/nastavni-materijali.php>

Optional: T. Young, S. Freedman: Sears and Zemansky's University Physics with Modern Physics, A. Wesley, San Francisco 2003

Name of the course: Chemistry in graphic technology

Teacher: Odaberite stavku. Mirela Rožić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: No

Course objectives: The aim of the course is to acquire and apply basic knowledge of physical chemistry in the analysis of physical processes in graphic technology. It includes the most general relations of physical chemistry that contribute to understanding of chemical processes in graphic technology: chemical bond and structure of molecules, physical bonds, physical equilibria of pure substances, chemical equilibria, boundary surface of phases, colloidal systems, adsorption equilibria, reactivity of metals, two-component ideal and real liquid solutions, vapor pressures liquid, viscosity of liquids, kinetics of homogeneous reactions, fundamentals of crystal structure

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Passed subject Chemistry 1

**General And Specific Competence and learning outcomes of the course:**

The student will be able to explain the influence of the structure of molecules on intermolecular interactions, influence of intermolecular interactions on the physicochemical properties of substances (saturated vapor pressures, viscosity, melting point, boiling point), the influence of intermolecular interactions on the adhesion of molecules to different substrates. The student will be able to describe azeotropic mixtures of liquids. The student will be able to list borderline phenomena phase surfaces and determine the influence of intermolecular interactions on them. The student will be able to distinguish ideal and real systems (gases, liquids, electrolytes). The student will be able to explain and describe thermodynamic functions (entropy, Gibbs function) and predict the direction of natural change. The student will be able to explain and describe basic kinetic relations. The student will be able to evaluate the chemical reactivity of metals. The student will be able to explain the conductivity of electrolyte solutions based on their structure of electrolytes.

Course content (Syllabus) on a weekly basis:

1. Introduction to the course and detailed lesson plan. Chemical bond and structure of molecules. Intermolecular forces. (0.10 ECTS) Student participation in work and discussion (0.033 ECTS) Solving tasks: Ideal gas. Solving tasks independently or in a group. (0.033 ECTS)
2. Ideal and real gases. Deviation of realistic behavior compared to ideal behavior gas: influence of intermolecular attractive and repulsive interactions between molecules. Van der Waals constants. The influence of temperature on the strength of intermolecular attractive forces. Kinetic theory of ideal gases. The influence of temperature on the kinetic energy of molecules. (0.10 ECTS) Student participation in work and discussion (0.033 ECTS) Solving tasks: Real gas, kinetic theory of ideal gases. Independent Solving tasks or in a group. (0.033 ECTS)
3. Saturated vapor pressure of liquids. Effect of temperature on vapor pressures of liquids. Dynamic equilibrium between liquid and vapor. The influence of the strength of intermolecular interactions on pressures vapor liquid. (0.10 ECTS) Student participation in work and discussion (0.033 ECTS) Solving tasks: Vapor pressure of liquids. Clausius-Clapeyron equation. Participation students. (0.033 ECTS)
4. One-component phase equilibria. Definition of phase and phase change. p-T phase diagram. Equilibrium of liquid-vapor, solid-liquid, solid-vapor. Melting point. Boiling point. Supercritical fluid. Enthalpies of phase transitions. Influence of intermolecular interactions on melting points and boiling points of substances and enthalpies of phase transitions. (0.10 ECTS) Preparation of students for the activity (0.033 ECTS) Solving problems: Clausius-Clapeyron equation. Student activity in the making tasks (0.033 ECTS)
5. COLLOQUIUM 1. (0.33 ECTS) Liquefaction of gases. Critical temperatures and critical pressures of gases. The influence of the strength of attractive intermolecular forces on the value of critical constants. Saturated steam. (0.10 ECTS) Student participation in work (0.033 ECTS) Solving problems: Van der Waals equation in the saturated region. Taking part in creating assignments (0.033 ECTS)
6. Two-component solutions of two liquids. Ideal (zeotropic) and real (azeotropic) mixing liquids. The influence of molecular structure and intermolecular interactions on formation ideal or realistic solutions. Vapor pressure of ideal solutions. Negative and positive deviations. (0.10 ECTS). Preparation of students for the activity (0.033 ECTS) Solving tasks: Vapor pressures of ideal and real solutions. Independent Solving tasks or in a group. (0.033 ECTS)
7. Fractional distillation of zeotropic and azeotropic solutions. Partially miscible liquids. Immiscible liquids. (0.10 ECTS) Solving tasks: Vapor pressures of ideal and

- real solutions. Independent Solving tasks or in a group. Creation of mental maps on a predetermined topic (0.066 ECTS)
8. Viscosity of liquids. Influence of temperature and intermolecular interactions on viscosity liquid. (0.10 ECTS) Solving tasks: Viscosity of liquids. Solving tasks independently or in a group. (0.066 ECTS)
  9. Electrolyte conductivity. Solvation of ions. Association of ions into ion pairs. The balance of creation ion pairs. Effect of ion association on electrolyte conductivity. Conductivity of solutions of electrolytes at low concentrations. Ion mobility. Molar conductivity. Influence electrostatic attractive forces on the conductivity of solutions of strong 1:1 electrolytes. Jumping conduction mechanism of  $\text{H}_3\text{O}^+$  and  $\text{OH}^-$  ions. Dependence of conductivity on temperature. (0.10 ECTS) Creating a mental map (0.033 ECTS) Solving tasks: Conductivity of electrolyte solutions. Solving tasks independently or in group. (0.033 ECTS)
  10. COLLOQUIUM 2. (0.33 ECTS) The natural direction of change. Entropy. Gibbs function. (0.10 ECTS) Solving tasks: Entropy, Gibbs function. Solving tasks independently or in group. Creation of mental maps. (0.066 ECTS)
  11. Boundary surface of phases. Surface tension of liquids. Influence of temperature and intermolecular interaction on the surface tension of liquids. (0.10 ECTS) Solving tasks: Surface tension of liquids. Solving tasks independently or in a group. (0.066 ECTS)
  12. Reversible, irreversible adsorption. Langmuir isotherm. Freundlich isotherm. Adsorption from solution. Positive, negative adsorption. Surfactants. Surface inactive substances. Gibbs adsorption equation. Adsorption of surfactants on at the solid/liquid interface. (0.10 ECTS) Solving tasks: Adsorption. Solving tasks independently or in a group. (0.066 ECTS)
  13. Chemical reactivity of metals. Standard electrode potentials. Nerst's equation. Electrolytic cell. Laws of electrolysis. Platinization. (0.10 ECTS) Student participation in discussion (0.033 ECTS) Solving tasks: Electromotive force of galvanic articles, Nerst's equation, electrolysis. Solving tasks independently or in a group. (0.033 ECTS)
  14. Kinetics of homogeneous reactions. Law of speed. Molecularity of the reaction. Experimentally determining the order of the reaction. Activation energy. Catalysts. (0.10 ECTS) Solving tasks: Kinetics of homogeneous reactions, activation energy, catalysts. Solving tasks independently or in a group. (0.066 ECTS)





Required: : P. W. Atkins, M.J. Clugston, Načela fizikalne kemije, Školska knjiga, Zagreb, 1996.

Optional: P.W. Atkins, J. Depaula, Physical Chemistry, W.H. Freeman and Co, 2001.

Name of the course: Probability and statistics

Teacher: asst. prof. PhD. Ivan Budimir

Associate teachers:

Lectures (L): Ivan Budimir

Seminar (S): Ivan Budimir

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1

ECTS credits: 4

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Winter

Semester number: III

Possibility of teaching in English: Yes

Course objectives: Students should master the basic concepts of combinatorics, probability and mathematical statistics. Knowledge of the terms covered in this course is basic mathematical literacy, which is necessary for engineers of all technical sciences, including graphic technology engineers. The material of this course provides a solid basis for upgrading the new mathematical and technical knowledge needed for further training and studies, especially those that assume basic knowledge in probability and statistics. In addition, mastering the mathematical material contained in this course is one of the best methods to develop concise and analytical thinking in students. Students need adopt the rules for applying probabilistic and statistical methods to concrete graphic patterns. Students should also achieve a deeper, mathematical understanding of complex probabilistic issues. Students should be able to interpret the mathematical laws of probability theory. Students need be able to prove some probabilistic theorems. Mathematical techniques of probability theory that will students master will also enable them to follow the content of basic and professional graphics subjects in which study random phenomena. Students should be able to recognize probabilistic patterns in the real world. For example, they need to be able to calculate the probabilities of winnings in games of chance. Students should be able to recognize probabilistic laws in graphics technology. Students need understand the application of the distribution of random variables. Students should understand the law of normal distribution and give examples of the application of the normal distribution in the graphic structure. Students should be able to implement statistical processing of graphic data. Students should be able to perform some statistical tests on different graphic patterns. Students should be able to perform a regression analysis on a graphic data.

Enrollment requirements: Attended Mathematics 1 and Mathematics 2 courses.

Prerequisite for taking the course exam: students should attend seminars

**General And Specific Competence and learning outcomes of the course:**

Students will be able to interpret real random phenomena using probability and statistics as mathematical disciplines; will know how to choose a probabilistic method suitable for describing the appropriate random phenomenon; be able to explain basic concepts of probability and statistics; they will know how to interpret basic combinatorial principles, basic laws of probability, Bayes theorem, concept of discrete and continuous random variables, concept of density function and distribution function; they will be able to state examples of application of probability and statistics in a real context; they will know how they are listed probabilistic laws appear in graphics technology; they will know how to apply discrete and continuous random variables and connect them with real random phenomena; know the significance of the normal distribution and its application in mathematical statistics; know how to perform statistical hypothesis testing on the basis of graphic samples; know how to perform regression analysis on graphical data; will be able to independently build on the acquired knowledge by adopting new statistical methods and tools that they will use successfully for the interpretation and analysis of graphic data.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture: definition of the course content, examination methods and teaching methods literature. Introductory seminar: defining the duties of students related to attending classes. The foundation of probability theory as a mathematical discipline. Different approaches to theory probabilities. Historical overview of the development of probability theory.
2. Introduction to combinatorics. Basic combinatorial principles. The principle of consecutive counting. Permutations, variations and combinations with and without repetition. Application of combinatorics in graphics. Bar codes and graphic protection.
3. Introduction to Probability. Definition of random experiment, random event, space of elementary events, sigma algebra of events and probability measure. Definition probability space. Finite and infinite probability spaces. Basic properties probability functions. Examples of random phenomena in the real world and graphics technology.
4. Elementary probabilistic models. Finite-dimensional probability spaces. Laplace's model. Probability on countably-infinite probability space. The Monte-Halles problems. Geometric probability. Examples of probabilistic models in print and graphics design.
5. Conditional probability. Independent events. Random event trees. A complete system events. The problem of the gambler's ruin in the game of roulette. Event trees. Probability trees. Bayes theorem. Quality control of the printing process.
6. Random variables. Definition of a random variable. Discrete random variables. Functions density and distribution of a discrete random variable. Discrete random probability table variable. Expectation and variance of a discrete random variable.

Independent random variables.

7. Binomial distribution. Application of binomial distribution in games of chance. Poisson distribution. Application of the Poisson distribution in sports. Approximation of binomial distribution to Poisson. Application of binomial and Poisson distribution in graphics. Geometric distribution and its applications.
8. I-colloquium. Definition of a continuous random variable. Density and distribution functions continuous random variables. Expectation and variance of a continuous random variable. Uniform distribution and its applications in real context and graphics.
9. Exponential distribution. Applications of the exponential distribution for random modeling phenomenon in sports. Probable distribution of the time interval until failure occurs graphic machine. Normal distribution. Gaussian curve. Expectation and variance of the normal distribution.
10. Unit normal distribution  $N(0,1)$ . General normal distribution  $N(a,b)$ . General reduction normal distributions to a single normal distribution. Determining the probability of normal distribution. Using a normal distribution table. Applications of normal distribution in real life context. Examples of normal distribution in graphics.
11. Laws of large numbers. Weak laws of large numbers. Strong laws of large numbers. Laws of the great numbers and probability of winnings in games of chance. Central limit theorems. Classic central limit theorem. Central limit theorem for arithmetic means. Approximation binomial distribution with normal distribution.
12. Introduction to the descriptive and mathematical statistics. Basic statistical terms. Elements descriptive statistics. Confidence intervals for large samples. Confidence intervals code proportion of large samples.
13. Testing hypotheses about unknown parameters. Testing hypotheses about expectation at large samples. Testing hypotheses about proportions in large samples.
14. Linear regression models. Statistical analysis of graphic patterns. Regression models for determining the mutual influence of graphic parameters.
15. Preparation for the II-colloquium and written and oral exam.

### Format of instructions:

lectures <input checked="" type="checkbox"/>	laboratory <input type="checkbox"/>	online <input checked="" type="checkbox"/>
seminars and workshops <input checked="" type="checkbox"/>	multimedia and internet <input type="checkbox"/>	field work <input type="checkbox"/>
exercises on computers <input checked="" type="checkbox"/>	independent assignments <input checked="" type="checkbox"/>	work with mentor <input type="checkbox"/>
other: <input type="checkbox"/>		

### Monitoring of students' work:

attending classes       research       project       practical work   
activities in class       test report       oral exam       portfolio   
seminar work       experimental work       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks                     |
| <input type="checkbox"/> Alternative choice tasks         | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |  |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

The success of students is evaluated in colloquiums, written and oral exams. On the written exam the student demonstrates knowledge by solving tasks. Students who pass the colloquium are released taking a written exam. In the oral exam, the student explains the probabilistic principles to the examiner and statistical regularities and the skill of applying probability and statistics in a real context.

Other: The student takes 2 colloquiums during the semester. Students who successfully pass the colloquium they are exempted from the written exam.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

- Required: 1. D. Stirzaker, *Elementary Probability* , Cambridge University Press, 2003.  
2. Sheldon M. Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, 3. Edition, E lsevier Inc. , Berkeley, 2004.  
3. Z. Pauše, *Uvod u matematičku statistiku*, Školska knjiga, Zagreb, 1993.

- Optional: 1. K. Balakrishnan, *Theory and Problems of Combinatorics* , Schaum's Outline Series, McGraw - Hill, 1995 .  
2. Geza Chay, *Introduction to Probability with Statistical Applications*, Birkhauser, Boston , 2007.

Name of the course: Computer and programming basics

Teacher: prof. PhD. Klaudio Pap

Associate teachers:

Lectures (L): prof. PhD. Klaudio Pap

Seminar (S): prof. PhD. Klaudio Pap

Laboratory (LAB):Asst.prof. Maja Rudolf, PhD

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+1+1

ECTS credits: 4

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Winter

Semester number: III

Possibility of teaching in English: Only for foreign students

Course objectives:Acquiring fundamental knowledge in the areas of computer architecture, computer applications and programming. The subject provides basic knowledge of computer structure and programming. Number systems, mutual conversion, and Boolean algebra are explained. Basic coding standards are defined in a graphic environment. Learning to solve logical schemes in the form of input-output state tables. Basic logical circuits such as AND, OR, XOR, NOT, NAND, NOR, and XNOR are demonstrated. The bistable, register, counter, decoder, data bus, address bus, adder, half-adder, and basic memory circuit are explained. Memories, central processors, data storage media, and graphic environment interfaces are classified, as well as standards for interconnecting components and peripheral devices. Basic single-cycle, two-cycle, and three-cycle instructions are introduced. Detection of limits of computer architecture regarding the maximum number and possible computational precision. The basic parts and functions of operating systems are explained. Programming languages are classified, and the use of compilers and interpreters is discussed. Basic programming algorithms are presented using a flowchart system, data structures, programming branches using relational and logical operators, using program user and system functions, local and global variables, programming loops, n-dimensional arrays, subroutines, program functions, and modular programming. Typical syntax and semantic programming errors and ways to solve them are presented.

Enrollment requirements: Basic knowledge of working on a computer

Prerequisite for taking the course exam: Attended lectures, completed exercises

### **General And Specific Competence and learning outcomes of the course:**

Application of fundamental knowledge in analyzing technological processes

Application of high-level programming languages

Classification of basic software packages in the graphic industry

Explanation of the basic structure of computers and their components

Application of knowledge of number systems and their conversion for data encoding

Classification of memory types, types of central processors, data storage media, and input/output interfaces

Application of basic principles in creating simple programs

Adaptation of program code to solve desired problems.

Course content (Syllabus) on a weekly basis:

1. Lecture: Computer applications in the graphic industry: in graphic design, printing, post-processing, internet; Practice: Software packages in graphic design and introduction to the operating system. (0.2 ECTS)
2. Lecture: Computer structure, interfaces with a focus on graphical environment; Practice: Computer architecture, processor placement, memory, hard disk. (0.2 ECTS)
3. Lecture: Memory: classification and development. Hard disks: classification and development. Standards for connecting computers: classification and development; Practice: Connecting peripheral units in a graphical environment (0.2 ECTS)
4. Lecture: Number systems, conversion between different number systems, logical algebra; Practice: Conversion tasks between number systems. Exam. (0.3 ECTS)
5. Lecture: Basic logical gates AND, OR, NOT, XOR, NAND, and NOR; Practice: Solving input-output truth tables of given logical schemes with AND, OR, NOT, XOR, NAND, and NOR gates (0.2 ECTS)
6. Lecture: Bistable, register, counter, decoder, data and address bus, adder, half-adder; Practice: Solving simple logic circuits (0.2 ECTS)
7. Lecture: Basic school computer, memory circuit, single-cycle, two-cycle, and three-cycle instructions, operating system; Practice: Basic machine language commands for single-cycle, two-cycle, and three-cycle instructions (0.2 ECTS)
8. Lecture: Programming languages: classification, application, compiler and interpreter, development of graphical programming languages. Exam; Practice: Running programs in an interpreter and compiler environment (0.3 ECTS)
9. Lecture: Algorithm, flowchart. System of marking in the flowchart; Practice: Algorithmic problem-solving using the system of markings in the flowchart (0.2 ECTS)



10. Lecture: Execution commands, input commands, output commands for different programming environments; Practice: Writing programs with different methods of data input and output (0.2 ECTS)
11. Lecture: Variable, constant, arithmetic operators; Practice: Programming tasks for calculation based on given equations (0.3 ECTS)
12. Lecture: Relational and logical operators. Realization of program branching using relational and logical operators; Practice: Tasks with single and multiple branching (0.4 ECTS)
13. Lecture: Program functions: user, system. Local and global variable; Practice: Tasks with system functions. Writing a user function (0.4 ECTS)
14. Lecture: Program loops, nested loops, loop counters, one-dimensional and n-dimensional arrays; Practice: Filling, searching, sorting, and recalculation of arrays using programming (0.4 ECTS)
15. Lecture: Subprograms, program modules, modular programming; Practice: Writing internal and external subprograms, Exam (0.3 ECTS)

#### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

#### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

#### **Assessment and evaluation of students' work during classes and on the final exam:**

Normative assessment.

Other:

#### **Teaching process evaluation:**

**Student evaluation (survey)**

Other:

#### **References**

Required: G. Smiljanić: Mikroracunala, Školska knjiga

Optional: J. Reid, T. Valentine: JavaScript Programmer's Reference, ISBN 978-1-4302-463 0-5, ISBN 978-1-4302-463 0-5 (e-book), 2013

D. Flanagan: JavaScript: The Definitive Guide, 4th Edition, O'Reilly & Associates Inc., 2001

K. Pap: Rješeni primjeri u Javascriptu :<http://klaudiopap.com/osnove-racunala-i-programiranja/>

Name of the course: Graphic arts machinery 1

Teacher: assoc. prof. PhD. Dubravko Banić

Associate teachers:

Lectures (L): assoc. prof. PhD Dubravko Banić

Seminar (S): assoc. prof. PhD Dubravko Banić, Iva Šarčević, B.Sc. Eng

Laboratory (LAB): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+0

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: No

Course objectives: Course objective is to adopt basic and professional knowledge in the field of machinery used in the printing process. Students study the basic materials used for the construction of machinery used in in the printing process. They learn basic definitions, divisions, performances, applications of mechanisms and elements of graphic machines. They will get to know the basic elements used to transmit motion in different constructions of graphic machines in the printing process. The student will understand the conditions of mobility, analyse the motion of individual mechanisms and apply them to graphic arts machinery. Mechanisms that are studied in more detail are: articulated quadrilateral, motor, sliding, eccentric, stop and curve mechanism. The following are studied: basic assemblies of printing units, cylinder drives and regulation of their centre distance, influential constructional parameters of the printing unit on print quality, constructions of dyeing units with long and short color path, systems with intermittent or continuous dye supply, principles of quantity regulation and zonal color distribution, units for transporting the printing surface of machinery, systems for inserting or displaying sheets, constructions of paper roll supports for rotary printing machinery, systems for guiding sheets/strips between printing units, display devices for rotary printing machines, technological and structural features of individual groups of machines.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Attendance of lectures and seminars 80%, finished project

**General And Specific Competence and learning outcomes of the course:**

Recognize mechanical parts of machinery used in the printing process. Correctly use

assembly drawings of machinery used in the printing process. Control the drive mechanisms of machinery used in the printing process. Proposed corrections for the modernization of the machinery park used in the printing process with the aim of improving the implementation results. Analyse different approaches in the production of printed materials when segmenting products and their advantages. Explain individual elements and communicate effectively in concrete cases of eliminating problematic operation of the printing press.

Course content (Syllabus) on a weekly basis:

1. Basic definitions, divisions, performance, application of mechanisms and elements of printing press machines used in the printing processes.  
/Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
2. Basic materials used for the construction of printing press machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
3. Basic elements used for motion transmission in the construction of printing press machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
4. Basic constructions, conditions of mobility, analysis of motion, application in printing press machines of articulated quadrilateral, motor and pulley mechanism.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
5. Basic constructions, conditions of mobility, analysis of motion, application of curved, stop and eccentric mechanism in printing press machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

6. Development of constructive solutions of printing units - structures and types of printing press machines according to the method and technique of printing and according to the type of printing substrate. Platen press - system diagrams of printing units Liberty, Gordon, Boston, Gally, Heidelberg GT, semi-automatic platen press of the Boston system, advantages and disadvantages of platen press. Web press machines - printing and impression cylinder, one-color printing units (1+0), printing units for one-color double-sided printing (1+1), two-color printing units (2+0), printing unit for double-sided two-color printing (2+2), printing unit for four colors on one side (4+0), attachment of the cover to the printing cylinder.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

7. Working method and constructive solutions of web-based flexographic printing machine - schemes of flexographic web printing machines with horizontal and vertical tape guidance, flexographic web printing machines with satellite printing unit. Offset printing machines - roller drives, regulation of their centre distance - basic assemblies of printing units: basic, offset and printing cylinders, bearings, gears and other common machine elements.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

8. Method of operation and constructive solutions of pendulum systems for accelerating arcs to the speed of the base cylinder. Rotating systems for accelerating arcs to peripheral speed of the base cylinder.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

9. Working method and constructive solutions of dyeing (moistening) units - systems with a long and short color path - systems with intermittent or continuous flow colors - principles of quantity regulation and color zonal distribution - devices for remote regulation - dyeing devices on the machines shown earlier.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples.

(0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

10. Working method and constructive solutions of units for the transport of the printing press substrates - systems for inserting/exposing sheets - paper roll support assemblies for rotations - sheet/strip guidance systems between printing units.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples.  
(0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

11. Working method and constructive solutions of units for the transport of the printing press substrates - display devices for web-based printing machines (longitudinal and transverse cutting, longitudinal and transverse bending - principles of adding strips - display of specimen's newspaper) - devices for exposing the tape of the printing substrate by rewinding.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples.  
(0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

12. Working method and constructive solutions of digital printing press machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples.  
(0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

13. Working method and constructive solutions of screen printing machines and pad printing machines  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples.  
(0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

14. Influence of constructive characteristics of printing press on print quality.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples.  
(0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)



**Student evaluation (survey) □**

Other: Student poll. In addition to poll defined by ISVU, upon course completion students are participation in a poll which examines: activity of lecturers and students during classes, evaluation of the usefulness of classes and improvement suggestions. Statistical report contains student activity, attendance of classes, fulfilment of duties, colloquium and final grades.

**References**

Required: Marošević, Tiskarski strojevi, VGŠ, Zagreb, 1986, reprint, Karl-Heinz Decker, Elementi strojeva, Golden marketing-tehnička knjiga, Zagreb, 2006.

Optional: K. Helmut, "Handbook of Print Media Technologies and production methods", Springer, 2001; WWalenski, "Der Rollen offset druck", Fach Schriften Verlag, 1995. S. J. Michael Adams, Penny Ann Dolin , Printing technology, 5th ed. Clifton Park : Delmar, 2002.



Name of the course: Printing plates 1

Teacher: prof. PhD. Sanja Mahović Poljaček; assoc.prof. PhD. Tomislav Cigula

Associate teachers:

Lectures (L): Sanja Mahović Poljaček, Tomislav Cigula

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Sanja Mahović Poljaček, Tomislav Cigula, Tamara Tomašegović

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: Yes

Course objectives: To become familiar with the types of printing plates for different printing techniques. Defining and distinguishing the processing materials for the production of different types of printing plates. Creating images on the printing plates using analogue processes. Defining and quantifying the parameters of certain material for production of printing plates, i.e. the requirements for creating images on the surface of the printing plates.

Enrollment requirements: -

Prerequisite for taking the course exam: passed Chemistry 2, completed and colloquiated Labs from the course Printing plates 1

**General And Specific Competence and learning outcomes of the course:**

Knowledge and identification of technological segments in graphic production; classification and explanation of actions and processes within the graphic production, planning the sequence of process procedures in graphic technology. After completing the course, the student can: describe the workflow printing plates production using the analogue process, recognize and explain the functional properties of printing plates with regard to the selective acceptance of printing inks; list and classify the materials used in the production of printing plates; describe and evaluate the types of printing plates within one printing technique; analyse the functional properties of printing plates; explain and differentiate copying procedures in the production of printing plates, choose the material and the process of making printing plates within one printing technique; list and describe surface phenomena on printing plates; literature search related to materials and the conventional process of printed plates production.

Course content (Syllabus) on a weekly basis:

1. Definition of printing plates and production workflow (0.2 ECTS)
2. Types of printing plates (0.2 ECTS)
3. Materials for production of printing plates, basic properties (0.2 ECTS)
4. Analogue processes, basic features of photosensitive layers and copying process (0.2 ECTS)
5. Production of printing plates for intaglio printing (0.2 ECTS)
6. Production of printing plates for screen printing (0.2 ECTS)
7. Diazo copying procedures for production of printing plates (0.2 ECTS)
8. Production of polymer printing plates (0.2 ECTS)
9. Chemical deposition and dissolution of metals in the production of printing plates for letterpress and intaglio printing techniques (0.2 ECTS)
10. Electrochemical procedures, deposition of copper and chromium in the production of printing plates for intaglio printing (0.2 ECTS)
11. Production of printing plates for conventional intaglio printing (0.2 ECTS)
12. Production of printing plates for pad printing (0.2 ECTS)
13. Production of printing plates for conventional offset printing (0.2 ECTS)
14. Surface phenomena on the printing plate surfaces (0.2 ECTS)
15. Surface properties of printing plates, adsorption of wetting solution and inks (0.2 ECTS)

**Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Multiple choice tasks

Alternative choice tasks

Connecting and arranging tasks

Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

colloquium (exercises) - checking the knowledge mastered in the exercises with knowledge of the necessary and completed tasks from the exercises; written colloquium (lectures) - possibility of taking the material segmentally, final exam - written and oral knowledge test.

Other: -

**Teaching process evaluation:** Anonymous survey

**Student evaluation (survey)**

Other: -

**References**

Required: M. Gojo, S. Mahović Poljaček, *Osnove tiskovnih formi*, Sveučilište u Zagrebu Grafički fakultet, Zagreb, 2013. H. Kipphan, *Handbook of Print Media*, Springer Verlag Berlin Heidelberg New York, Heidelberg, 2001.

Optional: N.R. Eldred, *Chemistry for the Graphic Arts*, 3rd edition, GATFPress, Pittsburg, 2001. Filipović, I., Lipanović S., *Opća i anorganska kemija*, Zagreb: Školska knjiga, 1991. P. Atkins, J. de Paula, *Atkin's Physical Chemistry*, 8th edition, Oxford University Press, Oxford 2006. V. S. Bagotsky, *Fundamentals of Electrochemistry*, John Wiley & Sons, Inc., New Jersey, 2006.

Name of the course: Reproduction photography 1

Teacher: prof. PhD. Lidija Mandić

Associate teachers:

Lectures (L): Lidija Mandić

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Ana Agić, Nikolina Stanić Loknar

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: Yes

Course objectives:Identifying and understanding the basic stages of the reproduction process with an emphasis on the preparation stage. Acquiring knowledge about input processes and the principle of operation of input devices. Acquiring knowledge about factors which affect the quality of reproduction (resolution, bit depth, tonal range, color space, format records ...). Differences in preparation depending on the purpose. Identifying and understanding screen systems, amplitude and frequency modulation, hybrid screen. Knowledge of objective measurements for control reproduction quality. Ability to recognize and correct errors that occurred in the preparatory work phase.

Enrollment requirements: Physics, Photographic processes

Prerequisite for taking the course exam: completed and pass exam of exercises

**General And Specific Competence and learning outcomes of the course:**

Describe the basic stages of the reproduction process and explain the role of graphic prepress. List and describe factors affecting the quality of reproduction. Distinguish the basic types of screen systems. Use appropriate measuring devices to control the quality of reproduction. Identify and associate errors in reproduction with possible causes in graphic preparation.

Course content (Syllabus) on a weekly basis:

1. The role of preparation in the reproduction chain, Defining student obligations and scoring

Exercises: digital image processing: levels

2. Classification of image types and their characteristics  
Exercises: Digital image processing: histogram
3. Recording of originals, light sources and their spectrophotometric curve  
Exercises: Digital image processing: corrections using curves
4. Why screening is carried out and the role of the screen element, which makes up the screen system  
Exercises: Digital image processing: image correction
5. Characteristics of different types of screening  
Exercises: Digital image processing: image correction
6. Densitometric measurements and what is expressed through densitometric measurements  
Exercises: Digital image processing: image correction
7. Tone reproduction curves and their correction  
Exercises: Digital image processing: image correction
8. Steps covered by RIP (raster image processor)  
Exercises: Digital image processing: image correction
9. Analog to digital signal conversion  
Exercises: Digital image processing: image correction
10. Digital image  
Exercises: Digital image processing: image correction
11. Image compression  
Exercises: Digital image processing: layers
12. Image record formats  
Exercises: Digital image processing: actions
13. Methods for control of black separation  
Exercises: Digital image processing: profiles
14. What must be included in the preparation and which parameters should be checked in the PDF  
Exercises: Digital image processing: image correction

15. Getting to know the most common mistakes in preparation

Preliminary exam

**Format of instructions:**

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

Guessing and completion tasks                       Multiple choice tasks  
 Alternative choice tasks                       Connecting and arranging tasks  
 Problem solving tasks

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

2 preliminary exam(lectures) exercise exam and test on MERLIN

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** continuous monitoring through exams and practical work

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: teaching material on MERLIN

Optional: H. Kipphan et al., Handbook of Print Media, Springer, Berlin, 2001.; R. S. Berns, Billmeyer and Saltzman's Principles of Color Technology - 3rd ed., John Wiley & Sons, New York, 2000.; R. C. Gonzalez & R. E.

Woods, Digital Image Processing - 3rd ed., Upper Saddle River, NJ, USA: Prentice Hall, 2007

Name of the course: Physical education 3

Teacher: Lecturer Katarina Knjaz, prof.

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Exercises (E): Katarina Knjaz, prof.

Type of instructions (*L- lectures; S- seminars; E - exercises*): E

Type of instructions presented as number of hours L+S+E on a weekly basis: 0+0+ 2

ECTS credits: 0

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: Yes

Course objectives: The aim of the subject of Physical Education is to raise awareness of the importance of daily physical exercise, preservation of already acquired and the acquisition of new motor skills, and influence on anthropometric characteristics, motor and functional abilities and cognitive and the connotative dimensions of the personality. Also, improving health and working abilities, satisfaction the need for movement, training students for rational, meaningful use and implementation free time.

Enrollment requirements: No requirements

Prerequisite for taking the course exam: From the subject physical education students do not receive numerical grade and do not take the exam. For the execution of obligations in the subject, they receive the signature of the teacher, and conditions for obtaining signatures are attendance, commitment and active participation in 80% of the total number of teaching hours (30 teaching hours semesterically - 2 hours per week for 45 min).

**General And Specific Competence and learning outcomes of the course:**

- Recognize the impact of certain exercises on certain muscle groups
- Apply different principles of movement to learning and development of motor skills and to the acquisition of specific motor skills
- Demonstrate complexes of general preparatory exercises and apply them in sports and recreation
- Demonstrate the basics of techniques of some team and individual sports
- Apply the rules of team and individual sports in recreation

- Plan a trip to nature which implies the creation of basic preconditions for safe Staying in the mountains
- Build a sense of respect for the code of mountaineering ethics
- Influence the raising of working capacity and efficiency by acquiring habits on a daily basis physical exercise
- Apply certain theoretical and practical knowledge in those kinesiological activities that will help them to improve health and raise the quality of life

Course content (Syllabus) on a weekly basis:

1. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
2. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking and tours (Nature Park Medvednica)
3. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
4. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
5. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
6. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
7. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
8. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
9. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
10. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
11. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
12. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)



13. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
14. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
15. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: questionnaire

### References

Required: There is no compulsory literature in the subject of Physical Education. Students are referred to literature related to physical education, improvement and preservation of health,

proper nutrition, prevention of injury, ways and goals of training, and the importance of regular exercise throughout life for the purpose of reducing a sedentary lifestyle.

Optional:

1. Proceedings of summer schools of kinesiologists of the Republic of Croatia. Available at: <http://www.hrks.hr/zbornici.htm>
2. Tempus project Education for Equal Opportunities at Croatian Universities. Available at : <http://www.eduquality-hr.com/>
3. Neljak, B., Caput-Jogunica, R. (2012). Kinesiological methodology in higher education. Zagreb: Faculty of Kinesiology, University of Zagreb.
4. Kulier, I. (2010). Goodbye fatness - weight loss strategy. Book. Zagreb. V.B.Z. d.o.o.
5. Moore, A. (2010). Standard dances. Zagreb: Knowledge.
6. Milanović, D. (2009). Theory and methodology of training. Zagreb: Faculty of Kinesiology, University of Zagreb Zagreb.
7. Klavora, P. (2009). Introduction to kinesiology: a biophysical perspective. Toronto: Sports Books Publisher.
8. Mišigoj-Duraković, M. (2008). Kinanthropology - biological aspects of physical exercise. Zagreb: Faculty of Kinesiology, University of Zagreb.
9. Jukić, I., Marković. G. (2005). Fitness exercises with weights. Zagreb. Faculty of Kinesiology University of Zagreb.
10. Sertić, H. (2004). Basics of combat sports, Zagreb. Faculty of Kinesiology.
11. Janković, V., N. Marelić (2003) Volleyball for all, Zagreb: Author's edition.
12. Kulier, I. (2001). What we eat. Zagreb: Impress.
13. Anderson, B. (2001). Stretching. Zagreb: Gopal.
14. Čorak, N. (2001). Fitness Bodybuilding. Zagreb: Hinus.
15. Children's Hospital Zagreb, Department for Reproductive Health (2001). Contraception – guide through methods and means of preventing pregnancy, Zagreb
16. Clark, N. (2000). Sports nutrition. Zagreb: Gopal
17. Children's Hospital Zagreb, Department for Reproductive Health (2000). Sexually transmitted diseases, Reproductive Health, Methods and Means of Protection against Pregnancy, Zagreb.
18. Mišigoj-Duraković, M. et al. (1999). Physical exercise and health. Zagreb: Faculty of Physical Sciences

Name of the course: Practice in Arts III

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L):

Seminar (S):

Laboratory LAB

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: LAB

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III

Possibility of teaching in English: Only for foreign students

Course objectives: Students will know how to apply and utilise tools and knowledge about technological processes and materials in drawing and painting, collage-ing, designing posters, covers... Recognizing values on visual material.

Enrollment requirements: No

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

Elementary Art Concepts and chronology and evaluating the quality of visual material. Using tools, materials and making conceptions in designing by using aesthetics.

Course content (Syllabus) on a weekly basis:

1. Optical balance, painting
2. Optical balance, poster, collage
3. Optical balance, magazine page, collage
4. Optical balance, poster, advertisement, collage
5. Rhythm, collage
6. Rhythm, book cover, collage
7. Rhythm, poster, painting

8. Domination, book cover, collage
9. Domination, magazine page, collage
10. Harmony, poster, painting
11. Harmony, book cover, collage
12. Unity, poster, painting
13. Dynamic balance, unity, poster, painting
14. Unity, harmony, poster, painting
15. Unity, harmony, optical balance, magazine page, collage

**Format of instructions:**

- |   |  |  |
|---|--|--|
| lectures <input type="checkbox"/>               | laboratory <input checked="" type="checkbox"/>   | online <input checked="" type="checkbox"/>     |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/> | field work <input checked="" type="checkbox"/> |
| exercises on computers <input type="checkbox"/> | independent assignments <input type="checkbox"/> | work with mentor <input type="checkbox"/>      |
| other: <input type="checkbox"/>                 |  |  |

**Monitoring of students' work:**

- |   |  |   |  |
|---|--|---|--|
| attending classes <input checked="" type="checkbox"/> | research <input type="checkbox"/>          | project <input type="checkbox"/>                          | practical work <input checked="" type="checkbox"/> |
| activities in class <input type="checkbox"/>          | test report <input type="checkbox"/>       | oral exam <input type="checkbox"/>                        | portfolio <input type="checkbox"/>                 |
| seminar work <input type="checkbox"/>                 | experimental work <input type="checkbox"/> | continuous knowledge examination <input type="checkbox"/> |  |

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input type="checkbox"/> Guessing and completion tasks    | <input checked="" type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |  |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Practical work

Other:

**Teaching process evaluation:** Multiple choice tasks

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: lectures, books from Art field, catalogues

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Original graphic I, II, III, IV

Teacher: doc.art .Josip Jozić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Josip Jozić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: Josip Jozić

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III, V

Semester: Summer

Semester number: IV, VI

Possibility of teaching in English: Yes

Course objectives: This teaching subject refers to the so-called original graphic techniques today primarily in the use of artistic expression. The specific language of original graphics, as well as other technologies of pretext systems, is a matter of personal choice in designing graphic media and graphic products. This is the goal of this teaching subject, as well as in the humanistic dimension of the foundations of the practical content of historical sources and culture of the profession.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: The exam can only be accessed by students who have attended complete exercises and successfully completed them and submitted a complete map of the works. The consistency of sketches and performances, performance and originality of the idea are assessed. The overall grade of the course represents the sum of the grades of all papers.

**General And Specific Competence and learning outcomes of the course:**

The specific language of this course, as well as other technologies of presentation systems of original graphics, refers to letterpress printing techniques: linocut. In practice, students get to know black and white linocut in the graphic technique itself, and the preparation of a sketch for a specific technique. In the gravure printing technique, metal printing forms and etching press - and the mechanical dry needle method. The content refers to original graphics that use chemical methods to create a printing form (matrix). In practice, etchings and aquatints are made from these techniques. In the subject, students get to know another technique of original graphics that uses the chemical method of creating a printing form, the reserveage. Students also get to know the usual combinatorics of original graphics (e.g. aquatint + dry needlig).

Course content (Syllabus) on a weekly basis:

1. Preparation and elaboration of working sketches
2. Selection of working sketches and correction of sketches
3. Transfer of sketches to the form
4. Preparation of the form for making an impression
5. Cutting and preparation of paper
6. Preparation of paint and colouring of the form
7. Test print
8. Correction and refinement of the form
9. Test print
10. Printing of editions of 5 prints
11. Drying prints
12. cropping prints
13. cropping and signing of copyright prints
14. evaluation of works
15. Storing copyright prints in the works folder

**Format of instructions:**

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment   
Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Multiple choice tasks

Alternative choice tasks

Connecting and arranging tasks

Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Checking and evaluating work assignments during the semester and handing in the folder, which includes work sketches and author's prints.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** The specific language of original graphics, as well as other technology of presentation systems, is a matter of personal choice of motifs, artistic expression, and the skill of creating author's prints. Only students who have attended the complete exercises and successfully completed them and submitted a complete portfolio of works can take the exam. The compatibility of the sketches and the performance, the execution and the originality of the idea are evaluated. The overall grade of the course represents the sum of the grades of all papers.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Dž. Hozo: Umjetnost multioriginala, Prva književna komora, Mostar, 1988.

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.



Name of the course: Communication science

Teacher: asst. prof. PhD. Daria Mustić

Associate teachers:

Lectures (L): Daria Mustić

Seminar (S):Daria Mustić

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1

ECTS credits: 4

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Winter

Semester number: III

Possibility of teaching in English: Only for foreign students

Course objectives:The aim of this course is to acquaint students with the theoretical foundations of the communication science and the importance of communication in human life. Students become familiar with the development of communication, through the contribution of certain disciplines to communication science, contemporary theories, they learn about the key features of human communication, main communication dimensions, and types of communication, and application of communication in various areas of social life. Such knowledge is of great importance for future graphic designers because it helps them to understand their professional and its social role.

Enrollment requirements: none

Prerequisite for taking the course exam: seminar work

**General And Specific Competence and learning outcomes of the course:**

Knowledge of dimensions of human communication, types of communication, public communication; knowing communication process mediated by mass media; knowledge of basic concepts in the field of communication analysis and creation of the communication process, communication management, critical analysis of communication codes.

Course content (Syllabus) on a weekly basis:

1. Basic concepts of communication science
2. Historical development of communication and communication science as a science of communication
3. Communication development of the individual

4. Characteristics of interpersonal communication
5. History of the study of interpersonal communication
6. Interpersonal communication competence
7. Conversation, public speaking and listening
8. Theories of public communication
9. Communication models
10. Persuasion
11. Key concepts of semiotics
12. Communication research methods and evaluation of graphic communication
13. Mass media and understanding media communication
14. Media representation
15. Postmodern frameworks of communication and new information technologies of graphic communication (ICT, Internet, Facebook, Twitter)

### Format of instructions:

- |  |  |   |
|--|--|---|
| lectures <input checked="" type="checkbox"/>               | laboratory <input type="checkbox"/>              | online <input type="checkbox"/>           |
| seminars and workshops <input checked="" type="checkbox"/> | multimedia and internet <input type="checkbox"/> | field work <input type="checkbox"/>       |
| exercises on computers <input type="checkbox"/>            | independent assignments <input type="checkbox"/> | work with mentor <input type="checkbox"/> |
| other: <input type="checkbox"/>                            |  |   |

### Monitoring of students' work:

- |   |  |   |   |
|---|--|---|---|
| attending classes <input checked="" type="checkbox"/>   | research <input type="checkbox"/>          | project <input type="checkbox"/>                          | practical work <input type="checkbox"/> |
| activities in class <input checked="" type="checkbox"/> | test report <input type="checkbox"/>       | oral exam <input checked="" type="checkbox"/>             | portfolio <input type="checkbox"/>      |
| seminar work <input checked="" type="checkbox"/>        | experimental work <input type="checkbox"/> | continuous knowledge examination <input type="checkbox"/> |   |

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

## References

Required: F. Vreg: "Humana komunikologija", HKD i Nonacom, Zagreb 1998.

S.Tkalac: "Teorija humora - Paulosov model", HKD i Nonacom, Zagreb, 2008.

M. Plenković: "Komunikologija masovnih medija", Barbat, Zagreb 1993. J. Plenković (edited by): "Virtual Society, Informatologia, Separat speciale No. 8", CCA and Faculty of Civil Engineering of the University of Rijeka, Zagreb 1999.

E.Vlajki: Uvod u komuniciranje postmodernizma, Fakultet za političke i društvene znanosti, Banja Luka, 2007.

S.Elezović: Antropološka komunikacija, A.G.Matoš & HKD, Nonacom, Zagreb, 2007.

Optional: G. S. Jowett and W. O'Donnell: "Propaganda and Persuasion", Sage Publications, Newbury Park and London and New Delhi, 1992.

J.Plenković, M. Plenković, M (1988).: Društvo, znanost i tehnologija, Sveučilišni udžbenik, Sveučilište u Rijeci i HKD, Rijeka / Zagreb.

J. Plenkovic (edited by): "Društvo i tehnologija, 1996., 1997. i 1998."; Građevinski fakultet Sveučilišta u Rijeci i HKD, Rijeka / Zagreb

M. Plenković: "Poslovna komunikologija", Alinea, Zagreb 1998.

F. Vreg: "Demokratsko komuniciranje", Narodna i sveučilišna biblioteka BiH, Sarajevo i Fakultet političkih znanosti, Sarajevo, 1991.

Name of the course: Multimedia communications 1

Teacher: asst. prof. PhD. Tajana Koren Ivančević

Associate teachers:

Lectures (L): Tajana Koren Ivančević

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Trpimir Jeronim Ježić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Elective

Semester: Winter

Semester number: III

Possibility of teaching in English: Only for foreign students

Course objectives:Students will learn the basics of HTML and CSS. They will be able to distinguish individual HTML elements and attributes. Students will learn how to implement multimedia content on a website through HTML and CSS and how to be position elements in precisely defined positions. They will learn transformations, transitions and animations on to the web.

Enrollment requirements: Kliknite ovdje da biste unijeli tekst.

Prerequisite for taking the course exam: fulfilling obligations in laboratory exercises

### **General And Specific Competence and learning outcomes of the course:**

The student will be able to distinguish and compare HTML elements. By applying styles, the student will be able to define appearance and positioning of elements. The student will be able to classify multimedia content on the web. The student will be able to use multimedia content when creating a website. The student will be able to connect multiple web hubs and create basic navigation. The student will be able to manipulate HTML elements in terms of transitions, transformations and animation. The student will be able to adjust the web content pages to all the most popular browsers and devices.

Course content (Syllabus) on a weekly basis:

1. Getting to know the basic HTML elements related to text and tabular display. Use of basic HTML elements and checking the appearance of the HTML document in the browser. (0.2 ECTS)

2. Introduction of forms, surveys, interactivity, links. Possibility of comparison and selection form for the desired survey. Setting up navigation and determining where the content will appear. (0.2 ECTS)
3. Getting to know CSS. Ability to influence the appearance of the website by changing styles. (0.2 ECTS)
4. Selectors and grouping of elements through CSS. Understanding the benefits of grouping elements through styles (0.2 ECTS)
5. Introducing multimedia elements. Introducing an image into an HTML document. Image processing and preparation for posting on a website. (0.2 ECTS)

Exercises - Colloquium (0.8 ECTS)

6. Image mapping. Determining the coordinates of a part of the image as a link to another element. (0.2 ECTS)
7. Introduction of audio and video material into HTML. (0.2 ECTS)
8. Nesting of external multimedia elements in the page. Distinguishing individual audio and video format. Differentiation of HTML elements for the introduction of multimedia content on the web. (0.2 ECTS)
9. Absolute positioning of elements. Understanding the coordinate system. The possibility of stacking elements to precisely defined positions. (0.2 ECTS)
10. Absolute and relative positioning of elements. Differences, advantages and disadvantages. (0.2 ECTS)

Exercises - Colloquium (0.9 ECTS)

11. Adapting content to different screen sizes and devices
12. Manipulation with HTML elements by mouse movement. The possibility of changing the appearance of elements by mouse-over (0.2 ECTS)
13. Transitions. The concept of time. Transition from one state to another in a period of time. (0.2 ECTS)
14. 2D and 3D transformation of HTML elements. Manipulating HTML elements through 2D and 3D transformations. Differentiation of 2D and 3D space. (0.2 ECTS)
15. Animation of HTML elements. Animating various HTML elements. Flow programming animations. Animation management.

Exercises - Colloquium (0.9 ECTS)



Name of the course: English for Graphic Engineers and Designers 3

Teacher: Odaberite stavku. Ana Nemec

Associate teachers:

Lectures (L): Kliknite ili dodirnite ovdje da biste unijeli tekst.

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+1

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Elective

Semester: Winter

Semester number: III

Possibility of teaching in English: Yes

Course objectives: expand the vocabulary related to the field of study; translate more complex texts from English to Croatian and vice-versa; formation of adjectives and their independent use

Enrolment requirements: Skills and competences acquired in the course of high school education

Prerequisite for taking the course exam: attendance, continuous activity

**General And Specific Competence and learning outcomes of the course:**

independent use of ESP vocabulary; proficiency in grammar; translating and summarizing skills

Course content (Syllabus) on a weekly basis:

1. Beyond colour: introduction into the phenomenon of colour (video and discussion)
2. Orange is it: gap-filling and basic colour vocabulary
3. Brushing up language skills: adjectives
4. Revision of homework: adjectives
5. Colour idioms: video and exercises
6. Psychology of colour: discussion and gap-filling
7. Colour theory: introduction (video)

8. Colour theory: text and vocabulary
9. Printing basics: introduction
10. Short history of printing: text and vocabulary
11. Printing technologies: introduction (video and discussion)
12. Printing techniques: text and vocabulary
13. Printing techniques: revision
14. Reading comprehension: passwords
15. Revision

### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### **Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks                     |
| <input type="checkbox"/> Alternative choice tasks         | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |  |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

### **Assessment and evaluation of students' work during classes and on the final exam:**

Continuous assessment; exam (written and oral)

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** survey



**Student evaluation (survey)**

Other:

**References**

Required: any monolingual dictionary; grammar; course materials

Optional: newspapers and magazines

Name of the course: Graphic arts machinery 2

Teacher: assoc. prof. PhD. Dubravko Banić

Associate teachers:

Lectures (L): assoc. prof. PhD Dubravko Banić

Seminar (S): assoc. prof. PhD Dubravko Banić; Iva Šarčević, B.Sc. Eng.

Laboratory (LAB):

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+0

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory / Elective

Semester: Summer

Semester number: IV

Possibility of teaching in English: No

Course objectives: The course objective is the acquisition of basic and technical knowledge about machinery used in postpress and packaging production processes. Course content encompasses basic knowledge about postpress machinery. This includes machine elements, kinematics, and technological and constructive characteristics of machines. The following machines' construction and characteristics are analysed: cutters (hand, guillotine, three knife trimmers, and slitters), cutting-out machines (column, bridge, and vertical-platen die cutters), paper folding machines (knife, buckle and combined folding), gathering, binding (wire-stitching, thread-stitching and thread-sealing), gluers, auxiliary machines, enhancement machinery, sheet counters, discreet and continuous presses, transport units, feeding and delivery units, and safety units. After analysing construction of machines, their technological characteristics are considered. Materials used in machine construction and machine tools and their exploitation characteristics are considered throughout the course.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Attendance of classes (80%) and finished project

**General And Specific Competence and learning outcomes of the course:**

Application of basic knowledge to analysis of technical and technological processes in print finishing. Assessment and selection of materials for given production process. Identifying technological segments of production process. Classification and explanation of processes within production segments. Planning print finishing operation sequences.

Course content (Syllabus) on a weekly basis:

1. Student će upoznati klasifikaciju doradnih strojeva i procesa u sustavu grafičke proizvodnje.

- Classification of postpress machines and processes in print finishing.  
/Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
2. Material separation processes – cutting machines employing straight blades.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
  3. Print finishing machines for material separation – cutting machines employing rotary blades and straight three-blade trimmers.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
  4. Die cutting machines for cutting out irregular shapes.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
  5. Safety devices in material separation processes.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
  6. Sheet gathering machines.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
  7. Gluing machines  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
  8. Thread-stitching machines.  
/Student preparation for the lecture – submitted homework about the topic.

- Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
9. Wire-stitching machines.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
10. Finishing processes and machines for perfect binding.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
11. Finishing processes and machines for hard cover binding.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
12. Construction of transport units.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
13. Auxiliary machines in print finishing.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
14. Technological and constructive characteristics of print finishing machines and lines with consideration of product finishing requirements.  
/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
15. Machinery manufacturers, influence of machine construction on process performance and product quality. Interaction of printing machines with print finishing processes and machines.

/Student preparation for the lecture – submitted homework about the topic.  
Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

### Format of instructions:

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input type="checkbox"/> Guessing and completion tasks    | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Colloquium (identification, sketching, and explaining functions of: mechanisms, machine elements, units, and processes) and project. Colloquium includes written and oral exam. Two colloquiums are held during the course. Conditions for taking colloquium: 1. To have submitted all homework which had the purpose of preparing students for lectures. 2. Attending and active participation in classes (80% attendance). Conditions for project: 1. To submit original solution for a given topic. 2. To present project orally. Final grade is based on colloquium grade (85%) and project grade (15%).

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Student poll. In addition to poll defined by ISVU, upon course completion students are participation in a poll which examines: activity of lecturers and students during classes,

evaluation of the usefulness of classes and improvement suggestions. Statistical report contains student activity, attendance of classes, fulfilment of duties, colloquium and final grades.

### **References**

Required: Course materials at [www.grf.hr](http://www.grf.hr), KaKarl-Heinz Decker, Elementi strojeva, Golden marketingtehnička knjiga, Zagreb, 2006.

Optional: K. Helmut, "Handbook of Print Media Technologies and production methods", Springer, 2001. G. A. Furler, "Technologie der Klebebindung", Deutscher Drucker Verlagsgesellschaft&Co KG, Stuttgart 1971. G. Martin, "Finishing Processes in Printing", Focal Press, London 1972.

Name of the course: Printing plates 2

Teacher: prof. PhD. Sanja Mahović Poljaček; assoc.prof. PhD. Tomislav Cigula

Associate teachers:

Lectures (L): Sanja Mahović Poljaček, Tomislav Cigula

Seminar (S):-

Laboratory (LAB): Sanja Mahović Poljaček, Tomislav Cigula, Tamara Tomašegović

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: IV

Possibility of teaching in English: No

Course objectives: Getting to know of the digital production of printing plates. Defining and comparing different systems of making printing plates according to printing techniques, technical solutions of printing units and construction of printing plates. The ability to plan the stages of the reproduction process within the framework of graphic prepress. Definition of different production procedures depending on the type and material of printing plates and related calculated process conditions. Calculation of process parameters in the production of printing plates for various graphic products.

Enrollment requirements: enrolment of Printing plates 1

Prerequisite for taking the course exam: passed Printing plates 1, completed and colloquiated Labs from the course Printing plates 2

**General And Specific Competence and learning outcomes of the course:**

Knowledge and identification of technological phases in graphic prepress; classification and explanation of actions and processes within the prepress; planning the sequence of process procedures in graphic technology. After completing the course, the student can: define the CtP system for creating printing plates for different printing techniques, classify and compare units for image setting on the printing plates, compare and analyse different types of CtP printing plates within one printing technique, apply different tools for optimization of processes in production of printing plates, calculate and choose the type of printing plate considering the process parameters, analyse and evaluate the development of CtP technologies, work in a team, apply knowledge of a foreign language in the review of literature..

Course content (Syllabus) on a weekly basis:

1. Workflow of graphic reproduction - the position of printing plates in the reproduction process (0.2 ECTS)
2. Definition and structure of the printing plates - transfer of printing ink to the printing substrate (0.2 ECTS)
3. Types of CtP printing plates ( 0.2 ECTS)
4. Connection between: photosensitive layer – digital image – image on printed plate (0.2 ECTS)
5. Computer processing of information and procedures for imaging of printing plates (0.2 ECTS)
6. Analog photomechanical process of making printing plates (0.2 ECTS)
7. Digital (CtP) process for production of printed plates (0.2 ECTS)
8. CtP processes for production of polymer printing plates (0.2 ECTS)
9. CtP process for production of polymer printing plates (0.2 ECTS)
10. CtP process for production of printing plates for intaglio printing (0.2 ECTS)
11. CtP process for production of printing plates for screen printing (0.2 ECTS)
12. CtP process for production of printing plates for offset printing (0.2 ECTS)
13. CtP process for production of printing plates for pad printing (0.2 ECTS)
14. Measuring the quality level of printing plates (0.2 ECTS)
15. Instrumental and visual methods of monitoring the quality level of printing plates (0.2 ECTS)

**Format of instructions:**

lectures <input checked="" type="checkbox"/>	laboratory <input checked="" type="checkbox"/>	online <input type="checkbox"/>
seminars and workshops <input type="checkbox"/>	multimedia and internet <input type="checkbox"/>	field work <input type="checkbox"/>
exercises on computers <input type="checkbox"/>	independent assignments <input type="checkbox"/>	work with mentor <input type="checkbox"/>
other: <input type="checkbox"/>		

**Monitoring of students' work:**

attending classes <input checked="" type="checkbox"/>	research <input type="checkbox"/>	project <input type="checkbox"/>	practical work <input type="checkbox"/>
activities in class <input checked="" type="checkbox"/>	test report <input checked="" type="checkbox"/>	oral exam <input checked="" type="checkbox"/>	portfolio <input type="checkbox"/>
seminar work <input type="checkbox"/>	experimental work <input type="checkbox"/>	continuous knowledge examination <input type="checkbox"/>	



**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Multiple choice tasks

Alternative choice tasks

Connecting and arranging tasks

Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

colloquium (exercises) - checking the knowledge mastered in the exercises with knowledge of the necessary and completed tasks from the exercises; written colloquium (lectures) - possibility of taking the material segmentally, final exam - written and oral knowledge test.

Other: -

**Teaching process evaluation:** Anonymous survey

**Student evaluation (survey)**

Other: -

**References**

Required: Mahović S. Utjecaj različitih ofsetnih tiskovnih formi na kakvoću grafičke reprodukcije, Magistarski rad, Grafički fakultet 2004.; Brajnović O. Postupci izrade tiskovnih formi za fleksografski tisak, Magistarski rad, Grafički fakultet 2011.; Gojo M., Mahović Poljaček S., Osnove tiskovnih formi, Grafički fakultet 2014.

Optional: R. M. Adams, , F. J. Romano, *Computer to Plate: Automating the Printing Industry*, GATFPress, Pittsburg, 1999; H. Kipphan, *Handbook of Print Media*, Springer Verlag Berlin Heidelberg New York, Heidelberg, 2001; J. T. Lind, G. M. Radencic, *GATF Computer-To-Plate Performance Study*, Vol. 31, GATF Research & Technology Reports, Printing Industries Press, 2002; K. Johansson, P. Lundberg, R. Ryberg, *A Guide to Graphic Print Production, 3rd Edition*, Wiley, New York, 2011; J. Deemer, *Glossary of Graphic Communications*, 4th edition, GATFPress, Pittsburg, 2008.

Name of the course: Typography

Teacher: Associate Professor Ivana Žiljak Stanimirović, Ph.D.

Associate teachers:

Laboratory (LAB): Željko Bosančić, mag.ing.graph.tech; Ana Agić, mag.ing.graph.tech

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L; S; LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+1  
Lectures (30 hours), laboratory exercises (15 hours), seminars (15 hours)

ECTS credits: 5

Study programme: Undergraduate Study

Status of the course: Mandatory

Semester: Summer Semester number: IV

Possibility of teaching in English: for foreign students

Course objectives:

Acquiring knowledge in the field of typography. Knowledge of the classification of letter cuts with regard to historical development and optical characteristics. Knowledge of the planning, design and realization of one's own individualized typeface and knowledge of redesigning and solving the tasks of standardizing typefaces for use on different platforms. The subject interprets the historical development of typography, classification, the future of typography, designing an individualized font. Professional tools for creating fonts and independent work with them are introduced. Designing individualized typography, handwritten forms, own design solutions and pictograms. Using the Bezier curve in character design. Letter Heights and space, as a carrier graphic space of the character. Connections and ligatures, formation of style sets with regard to typographic features. Conceptual (ideography, pictography), syllabic and phonetic alphabet in digital typography. Creating a font from pictures, drawing a character, portrait. Pi fonts. Code font. Glagolitic font, work with Glagolitic. Standardization in TrueType, OpenType and ClearType standard for display on display screen and multimedia devices. Coding and mathematical background of font definition. Measurement of blackening of letters and text. Rules in typography with regard to legibility, connection in handwritten forms, alignment of thickness values, font editing, alignment, spacing between letter characters. Typographic dictionary and standardization for communication on relations designer, graphic artist, printer, web designer. Classification of typography into individual font categories, taking into account historical development and optical characteristics. Contemporary classification of individualized design typographic solutions on the web.

Enrollment requirements: basics of working with a computer.

Prerequisite for taking the course exam: exercises, seminars

### **General and Specific Competence and learning outcomes of the course:**

- Knowledge of the historical development of typography and the classification of typography into individual font categories,
- The ability to create your own database through classification,
- Knowledge of the creation and realization of individualized typographic cuts of own design solutions,
- The ability to solve the redesign of letter characters and edit the characteristic characters of the Croatian language,
- Designing all necessary signs for international application,
- Knowledge of typography for signage, pictograms and code font,
- Knowledge of typography standards and coding for use on different platforms in print and on the web.

Course content (Syllabus) on a weekly basis:

1. L: Historical development of typography, overview of the whole typography in use, future development typography, designing an individualized font. The Bezier curve as the basis of the character outline. Definition of typeface anatomy and letter heights.

S: Introduction to the software package for creating a font and instructions for creating an individualized digital signature in the form of a font and a personal portrait in the form of a pictogram in "True type" format for use via a computer keyboard. Creation of a font from images, drawing of letters, signatures, portraits.

LAB: Creating a template for creating an original individualized handwriting, choosing a tool (point pen, rounded pen, brush) for creating a handwriting shape with regard to the ascending and descending strokes.

0.3 ECTS

2. L: Classification of handwritten forms of letter cuts according to optical characteristics and tool, bold, alternating, uniform stroke and brush stroke.

S: Design with application of individualized digital signature and portrait in pdf form with included parameters for printing and display on computer screen. Classification of handwritten fonts, generation of personal data in handwritten forms.

LAB: Transfer of letter characters into digital form and template processing in graphics programs for image and text processing. Work in table area character cells, as the bearer of the graphic space of the letter sign.

0.3 ECTS

3. L: Classification of basic forms: renaissance, transitional and classic antiqua according to optical characteristics and historical development from Roman

lapidary capital, Carolingian and humanist minuscule, to Renaissance, transitional and classicist antiquity.

S: Individual classification of fonts from the category of basic shapes.

Generating personal data in Renaissance, Transitional and Classicist fonts.

LAB: Transferring digitized handwritten characters and punctuation to a program for construction of the letter character, placement in code positions in the background layer, vectorization.

0.3 ECTS

4. L: Classification of individual fonts: artistic antiqua, semi-grotesque, newspaper antiqua, free stroke, semi-Egyptian according to optical characteristics and historical development.

S: Creating an individual base of basic forms with all alphabetic characters and Croatian characteristic characters in programs for inclusion and classification of fonts, testing in programs for breaking, and standardization in postscript and pdf format.

LAB: Using the Bezier curve to shape the uppercase, cursive, and punctuation characters of an individualized handwritten font.

0.3 ECTS

5. L: Classification of technical forms according to optical characteristics and historical development of technical ones form, grotesk, egyptian, italian, OCR.

S: Classification of fonts from the category of individual cuts and shapes. Generating personal data in artistic antique, semi-grotesque, newspaper antique, free stroke and semi-Egyptian fonts.

LAB: Square editing and digital character spacing testing.

0.4 ECTS

6. L: Classification of special and profile shapes, outline letters, shaded letters, crossed out letters, decorated letters ranked according to optical characteristics.

S: Creating a database of individual forms with all alphabetic characters and Croatian characteristic characters in programs for inclusion and classification of fonts, testing in programs for breaking, and standardization in postscript and pdf format.

LAB: Adjustment of thickness values of letter characters, height. Correct layout in typography with regard to readability, connection, alignment of thickness values, font editing, alignment, spacing between letter characters.

0.3 ECTS

7. L: Classification of mathematical signs, accents, general symbols, music font, code font, according to optical characteristics.

S: Classification of fonts from the category of technical cuts and shapes. Generation of personal data in fonts: grotesque, Egyptian, Italian and OCR fonts for machine reading.

LAB: Generating and saving the font in standard format, installing the font, testing, printing and comparing with the original template.

0.3 ECTS

8. L: New modern classification, database creation through classification. Standardization in TTF format, postscript and pdf format.

S: Creating a database of technical forms with all alphabetic characters and Croatian characteristic characters in programs for inclusion and classification of fonts, testing in programs for refraction, and standardization in postscript and pdf format.

LAB: Presentation of the finished font. Uploading the final document in professional TTF format to the online database. Designing a presentation in a graphic program for image and text processing. Saving in standard professional pdf format.

0.3 ECTS

9. L: Connection and ligatures, formation of style sets with regard to typographic features.

S: Classification of fonts from the category of special and profile cuts and shapes. Generating personal data in fonts: poster letters, outline letters, shaded letters, hatched letters, decorated letters.

LAB: Choice of font for redesign and creation of texture for incorporation into letter characters.

0.3 ECTS

10. L: Measuring blackening of letters and text through software solutions.

S: Creating a database of special and profile shapes with all alphabetic characters and Croatian

characteristic characters in programs for inclusion and classification of fonts, testing in programs for breaking, standardization in postscript and pdf format.

LAB: Creating a textured font, shaded letters, hatched letters, decorated letters.

0.3 ECTS

11. L: Glagolitic in font, working with Glagolitic, code positions.

S: Classification of fonts from the PI font category; mathematical signs, accents, general symbols, music font. Generating data in fonts.

LAB: Finalization and presentation of the font with texture, saving it in TTF format and uploading it to the online database.

0.3 ECTS

12. L: Standardization in TrueType, OpenType for print and ClearType standard for screen display screens and multimedia devices.

S: Creating a database of PI fonts with all letters, accents, special characters, testing in break programs e.g. page break with formulas, and standardization in postscript and pdf format.

LAB: Choice of topic and creation of pictograms for digitization

0.4 ECTS

13. L: Typographical dictionary and standardization for communication between designers, graphic artists, printer, web designer.

S: Classification of fonts from the category of new modern classification of LCD fonts, retro fonts, fonts with the appearance of foreign characters and fonts in the form of code fonts. Generating data in fonts of your choice.

LAB: Processing of individualized template, digitalization.

0.4 ECTS

14. L: Symbols (ideography, pictography), syllabic and phonetic script in digital typography.

S: Classification of characteristic fonts with signs and logos, markings for signaling and sports events.

LAB: Editing pictograms in a font creation program.

0.4 ECTS

15. L: Contemporary classification of individualized designer typography solutions on the web. The future development of typography and the future development of standards for the application of typography in conventional and multimedia environments.



Problem solving tasks

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Quality monitoring includes the analysis and evaluation of student achievements, seminar papers, project tasks on exercises and research activities with the aim of achieving the expected learning outcomes.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Official survey

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required:

- Franjo Mesaroš: "Typography Handbook", Graphic Education Center, Zagreb, 1985.,
- Franjo Mesaroš: „Grafička enciklopedija“, Tehnička knjiga, Zagreb, 1971.,
- Vilko Žiljak: "Stolno Izdavaštvo - DeskTop Publishing",DRIP,1990. Zagreb,303 str.UDK 655:681.3,ISBN 86-815-1704-x,
- Vilko Žiljak: „Tipografski rječnik“, www.ziljak.hr

Optional:

- Linotype: „Typographic Categories“, „Foundries and Libraries“ <http://www.linotype.com/> - -
- Linotype: Font Magazine <http://www.linotype.com/> ,
- Taschen Books: "Type. A Visual History of Typefaces and Graphic Styles 1628–1900.",Volume 1, 2010, 2013. ,
- Taschen Books: "Type. A Visual History of Typefaces and Graphic Styles 1901–1938.",Volume 2, 2010, 2013.

Methods of quality monitoring that ensure the acquisition of output knowledge, skills and competences:

Quality monitoring includes the analysis and evaluation of student achievements, project tasks on exercises and research activities with the aim of achieving the expected learning outcomes.



Name of the course: Paper

Teacher: prof. PhD. Branka Lozo

Associate teachers:

Lectures (L): prof. PhD. Branka Lozo

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):assoc.prof. PhD. Sonja Jamnicki Hanzer, PhD. Maja Strižić Jakovljević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: IV

Possibility of teaching in English: Only for foreign students

Course objectives: The goal of the course is to enable students to acquire knowledge about graphic paper, types and processing of raw materials, the method of its production, properties and use, emphasize the cause-and-effect relationships of the procedures in the production of its final properties, and show ways of testing paper properties that describe its properties characteristics with an explanation of the meaning of a particular property when using graphic papers for different purposes.

Enrollment requirements: Lectures, seminars and laboratory practices in mathematics, physics and chemistry (classes' attendance, not necessarily a passed course).

Prerequisite for taking the course exam: Completed laboratory exercises.

**General And Specific Competence and learning outcomes of the course:**

Students will be able to list and describe raw materials for making paper; Count and describe the key stages in paper production; Explain the differences in the properties of paper produced from different raw materials; Determine the direction of the fibers in the sheet of paper and the side of uncoated paper; Explain different general properties of paper and explain how they are determined; Explain the different mechanical properties of paper and how to determine them; Explain the different optical and chemical properties of paper and describe how they are determined; Recognize and describe different types of graphic paper and their purpose.

Course content (Syllabus) on a weekly basis:

1. Overview of content and form of teaching, basic definitions, overview of paper types, factual data on global production and consumption.
2. Explanation of the operation of the paper machine and the role of each unit, explanation of the process in each phase of production.
3. Raw materials for paper production and their classification, properties of individual categories, composition and morphology of fibers by type.
4. Processing of fiber- based raw materials, defiberization, bleaching, cooking.
5. Processing of fiber- based raw material, delignification, pulp preparation and consistency.
6. Waste paper as raw material, recycling, statistical data, other disposal options, EU and Croatian documents
7. Collection, sorting and transport of waste paper.
8. Recycling; pulping, purification, recycling with and without the deinking flotation process.
9. The first written intermediate knowledge test.
10. Properties of recycled paper and recycled fibers.
11. Paper-machine and flow, paper properties that it affects.
12. Drying part of the paper machine, calendering, and surface treatment.
13. Refining papers, coating, properties, finishing, formatting.
14. Special papers, types, purpose, examples.
15. Second written knowledge test.

**Format of instructions:**

lectures <input checked="" type="checkbox"/>	laboratory <input checked="" type="checkbox"/>	online <input type="checkbox"/>
seminars and workshops <input type="checkbox"/>	multimedia and internet <input type="checkbox"/>	field work <input type="checkbox"/>
exercises on computers <input type="checkbox"/>	independent assignments <input type="checkbox"/>	work with mentor <input type="checkbox"/>
other: <input type="checkbox"/>		

**Monitoring of students' work:**

attending classes <input checked="" type="checkbox"/>	research <input type="checkbox"/>	project <input type="checkbox"/>	practical work <input type="checkbox"/>
activities in class <input checked="" type="checkbox"/>	test report <input type="checkbox"/>	oral exam <input checked="" type="checkbox"/>	portfolio <input type="checkbox"/>

seminar work  experimental work  continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other:

**Assessment and evaluation of students' work during classes and on the final exam:**

Students are offered the option of taking an exam through a knowledge tests (2 or 3 during the semester), if each test is positively evaluated. Students can also take the exam during regular exam periods (written and oral).

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: 1. Teacher's lectures published on the department's website 2. Teaching materials for laboratory practices published on the website of the department 3. A. Golubović, Papermaking technology and properties, Zagreb, University of Zagreb Faculty of Graphics, 1993 4. Handbook of Paper and Board. H. Holik (Ed.), WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Printing 1

Teacher: prof. PhD. Nikola Mrvac

assoc. prof. PhD. Mile Matijević

Associate teachers:

Lectures (L): ): prof. Ph.D. Nikola Mrvac; Assoc. Ph.D. Mile Matijević

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):prof. dr. sc. Nikola Mrvac; doc. dr. sc. Mile Matijević; dr.sc. Diana Bratić; mr.sc. Ivan Pučić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Class activity, online activity, project assignments, portfolio, presentation of completed activities Semester: Summer

Semester number: IV

Possibility of teaching in English: No

Course objectives:The aim of the course is to enable students to acquire competencies related to general printing technologies. In addition, to enable them to see all the relevant parameters from printing production point of view that affect the possibility of realizing an individual graphic product, as well as the diversity of possible ways of realizing graphic products. In this sense, the focus of the course content is directed towards the study of the diversity of printing production conditions and the determination of the legality in which certain phases of printing take place optimally.

Enrollment requirements: Basics of working on a computer in web 2.0 environment

Prerequisite for taking the course exam: Class activity, online activity, project assignments, portfolio, presentation of completed activities

**General And Specific Competence and learning outcomes of the course:**

Students will be able to: 1) assess the suitability of certain technologies for the printing of certain graphic products 2) standardize the work related to the printing of the same 3) standardize the consumption of materials with regard to the available printing technology 4) prepare and organize everything necessary to enable the printing of graphic of the product 5) evaluate, review and come to a conclusion which way is optimal for the realization of a certain graphic product.

Course content (Syllabus) on a weekly basis:

1. Defining basic terms. General printing technology. Laws of general work technology adapted to the printing production process. (0.33 ECTS)
2. Elaboration of the printing production process. Technological preparation of the work for printing - fate of the work. 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, the available resources for work. Classification of graphic products. (0.33 ECTS)
3. Description (snapshot) of the graphic product. (0.33 ECTS)
4. Criteria for selecting a printing technique. Elaboration of the printing production process for certain printing techniques. (0.33 ECTS)
5. Specificity and production possibilities of individual printing techniques. Elaboration of the printing production process for certain printing techniques. (0.33 ECTS)
6. Criteria for choosing basic materials for making a graphic product. Paper selection criteria for making individual graphic products or parts of these products. (0.33 ECTS)
7. Analysis of consumption of basic materials in accordance with printing production. Set sheet. (0.33 ECTS)
8. Paper formats. Standards of printing machines. Placement of the graphic product on the sheet and design of printing forms. Determining the minimum and actual size of the book block. (0.33 ECTS)
9. Determining the shape (size) of the basic binding unit (book sheet). Calculation of the number of book pages in a given book block. Layout of pages for individual press forms. (0.33 ECTS)
10. Determining the order of printing in individual print formats. Determining binding lines (back), cutting before and after printing, folding, frontal and side marks, and angles for the bookbinder. Margin size calculation. (0.33 ECTS)
11. Assembly sheet. Calculation of required quantities of materials. Calculation of the need for the amount of paper. Calculation of the need for the amount of dye. (0.33 ECTS)
12. Work norms. Material consumption norms (0.33 ECTS)
13. Elaboration of the production process for printing rotations. (0.33 ECTS)
14. Elaboration of the production process for specific graphic products. (0.33 ECTS)
15. Topics chosen by students. (0.33 ECTS)

### Format of instructions:

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:   
e-learning, web 2.0 technologies

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

### Assessment and evaluation of students' work during classes and on the final exam:

Evaluation of all student activities; seminar work, project tasks, research, presentations and all other activities that are related to the obligations of the course and the realization of the expected learning outcomes.

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Teaching process evaluation:** Evaluation of all activities that are recorded and then analyzed and improved after each semester, according to the interests and specific needs of each generation. Quality monitoring includes: analysis and evaluation of student achievements, seminar papers, project tasks, research activities, presentations and all other activities that are related to the obligations related to the course and the achievement of the expected learning outcomes.

**Student evaluation (survey)**

Other: [Kliknite ovdje da biste unijeli tekst.](#)

### References

Required: Nikola Mrvac, Predavanja i vježbe iz kolegija Tisak 1, [www.eva-sms.net](http://www.eva-sms.net), Veselinović D., Bauer G., Priručnik za tisak, Grafički fakultet, Zagreb, 1993

Optional: Additional readings, [www.eva-sms.net](http://www.eva-sms.net)

Name of the course: Reprophotography 2 (Prepress)

Teacher: assoc. prof. PhD. Maja Strgar Kurečić

Associate teachers:

Lectures (L): Maja Strgar Kurečić

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Maja Strgar Kurečić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: IV

Possibility of teaching in English: No

Course objectives: Identifying and understanding the basic stages of the prepress. Acquiring knowledge about the principles of multi-colour reproduction. Acquiring knowledge about the factors that influence the quality of reproduction. Ability to use appropriate software for computer image processing, as well as for graphic design. Knowledge and understanding of measuring devices for reproduction quality control.

Enrollment requirements: Reprophotography 1

Prerequisite for taking the course exam: completed labs, colloquium

**General And Specific Competence and learning outcomes of the course:**

Students will be able to describe the basic stages of the reproduction process and explain the role of graphic prepress. List and describe the factors that affect the quality of reproduction. Explain the principle of multicolour reproductions. Distinguish the basic types of raster systems. Apply appropriate processing software for graphic design. Use appropriate measuring devices to control the quality of reproduction. Identify and relate errors in reproduction with possible causes in graphic prepress.

Course content (Syllabus) on a weekly basis:

1. The role of graphic prepress. Overview of the basic stages of the reproduction process (input/processing/output). Workflow display with implemented Colour Management. Elaboration and description of individual stages in the graphic prepress emphasizing the factors on which the quality of reproduction depends.

2. Colour basics. Experiencing colour, describing colour, metamerism. Subjective and objective characteristics of colour. Colour mixing - additive and subtractive synthesis. Complementary colours. Colour spaces.
3. Colour reproduction quality control. Colorimetry. Devices for measuring colours, characteristics, differences. Colorimetric difference. Standards and permitted deviations.
4. Colour Management (Part I). Colour management then and now. Colour transformations in the reproduction process. Problems. Colour Management System - basic role. System components. Reference colour space. Module with colour matching algorithms. ICC profiles.
5. Colour Management (Part II). The principle of colour conversion in the Colour Management system. The importance of calibration and characterization devices that participate in the reproduction process. Proof print - soft proof, hard proof.
6. First colloquium
7. Reproduction processes (Part I). Input processes. Digitization. Input devices - scanner, digital camera. Factors about which it depends on the quality of the input (resolution, bit depth, tonal range, colour space, imaging format...)
8. Reproduction processes (Part II). Image processing for different outputs - for display on a monitor (Internet, electronic devices), for printing (newspaper, magazine, book, poster). Standards and requirements.
9. Raster systems (Part I). The principle of multi-colour reproduction - separation, screening. Types of raster, linework, moire. The influence of the type of raster, linearity, and raster angles on the quality of reproduction. A problem of moiré.
10. Raster systems (Part II). Amplitude and frequency modulation. Hybrid rasters. Application.
11. Characteristics of multi-colour reproduction (Part I). Defining the parameters on which the reproduction quality depends. Colorant coverage (ink coverage). Trapping. Increase of raster elements (dot gain). Gray balance.
12. Characteristics of multicolour reproduction (Part II) Achromatic replacement - UCR, GCR, UCA.
13. Typical errors in graphic prepress.
14. Second colloquium
15. Invited lecture





Optional: P. Green (editor), *Color Management: Understanding and Using ICC Profiles*, John Wiley & Sons, Ltd, 2010. R. G. Kuehni, *Color Space and Its Divisions*, Hoboken, NJ, USA: John Wiley & Sons, Inc., 2003. R. C. Gonzalez & R. E. Woods, *Digital Image Processing - 3rd ed.*, Upper Saddle River, NJ, USA: Prentice Hall, 2007.

Name of the course: Physical education 4

Teacher: Lecturer Katarina Knjaz, prof.

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Exercises (E): Katarina Knjaz, prof.

Type of instructions (*L- lectures; S- seminars; E - exercises*): E

Type of instructions presented as number of hours L+S+E on a weekly basis: 0+0+ 2

ECTS credits: 0

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: IV

Possibility of teaching in English: Yes

Course objectives: The aim of the subject of Physical Education is to raise awareness of the importance of daily physical exercise, preservation of already acquired and the acquisition of new motor skills, and influence on anthropometric characteristics, motor and functional abilities and cognitive and the connotative dimensions of the personality. Also, improving health and working abilities, satisfaction the need for movement, training students for rational, meaningful use and implementation free time.

Enrollment requirements: No requirements

Prerequisite for taking the course exam: From the subject physical education students do not receive numerical grade and do not take the exam. For the execution of obligations in the subject, they receive the signature of the teacher, and conditions for obtaining signatures are attendance, commitment and active participation in 80% of the total number of teaching hours (30 teaching hours semesterically - 2 hours per week for 45 min).

#### **General And Specific Competence and learning outcomes of the course:**

- Recognize the impact of certain exercises on certain muscle groups
- Apply different principles of movement to learning and development of motor skills and to the acquisition of specific motor skills
- Demonstrate complexes of general preparatory exercises and apply them in sports and recreation
- Demonstrate the basics of techniques of some team and individual sports
- Apply the rules of team and individual sports in recreation

- Plan a trip to nature which implies the creation of basic preconditions for safe Staying in the mountains
- Build a sense of respect for the code of mountaineering ethics
- Influence the raising of working capacity and efficiency by acquiring habits on a daily basis physical exercise
- Apply certain theoretical and practical knowledge in those kinesiological activities that will help them to improve health and raise the quality of life

Course content (Syllabus) on a weekly basis:

1. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
2. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking and tours (Nature Park Medvednica)
3. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
4. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
5. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
6. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
7. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
8. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
9. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
10. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
11. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
12. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

13. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
14. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)
15. Sports hall (volleyball, basketball, football, circuit training, badminton), swimming, shooting, rowing, walking tours (Jarun) and hiking tours (Nature Park Medvednica)

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: questionnaire

### References

Required: There is no compulsory literature in the subject of Physical Education. Students are referred to literature related to physical education, improvement and preservation of health,

proper nutrition, prevention of injury, ways and goals of training, and the importance of regular exercise throughout life for the purpose of reducing a sedentary lifestyle.

Optional:

1. Proceedings of summer schools of kinesiologists of the Republic of Croatia. Available at: <http://www.hrks.hr/zbornici.htm>
2. Tempus project Education for Equal Opportunities at Croatian Universities. Available at : <http://www.eduquality-hr.com/>
3. Neljak, B., Caput-Jogunica, R. (2012). Kinesiological methodology in higher education. Zagreb: Faculty of Kinesiology, University of Zagreb.
4. Kulier, I. (2010). Goodbye fatness - weight loss strategy. Book. Zagreb. V.B.Z. d.o.o.
5. Moore, A. (2010). Standard dances. Zagreb: Knowledge.
6. Milanović, D. (2009). Theory and methodology of training. Zagreb: Faculty of Kinesiology, University of Zagreb Zagreb.
7. Klavora, P. (2009). Introduction to kinesiology: a biophysical perspective. Toronto: Sports Books Publisher.
8. Mišigoj-Duraković, M. (2008). Kinanthropology - biological aspects of physical exercise. Zagreb: Faculty of Kinesiology, University of Zagreb.
9. Jukić, I., Marković. G. (2005). Fitness exercises with weights. Zagreb. Faculty of Kinesiology University of Zagreb.
10. Sertić, H. (2004). Basics of combat sports, Zagreb. Faculty of Kinesiology.
11. Janković, V., N. Marelić (2003) Volleyball for all, Zagreb: Author's edition.
12. Kulier, I. (2001). What we eat. Zagreb: Impress.
13. Anderson, B. (2001). Stretching. Zagreb: Gopal.
14. Čorak, N. (2001). Fitness Bodybuilding. Zagreb: Hinus.
15. Children's Hospital Zagreb, Department for Reproductive Health (2001). Contraception – guide through methods and means of preventing pregnancy, Zagreb
16. Clark, N. (2000). Sports nutrition. Zagreb: Gopal
17. Children's Hospital Zagreb, Department for Reproductive Health (2000). Sexually transmitted diseases, Reproductive Health, Methods and Means of Protection against Pregnancy, Zagreb.
18. Mišigoj-Duraković, M. et al. (1999). Physical exercise and health. Zagreb: Faculty of Physical Sciences

Name of the course: Visual Communication

Teacher: Odaberite stavku. Daria Mustić

Associate teachers:

Lectures (L): Daria Mustić

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Daria Mustić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Summer

Semester number: IV

Possibility of teaching in English: Only for foreign students

Course objectives: Training students to understand the importance of visual communication in mass media communication and in everyday life. Within the course, they acquire knowledge about new dimensions of visual communication in the context of strong development of modern visual communication technologies. Students gain knowledge about the concepts of television, commercials, visual content on the web, video games, street visual communication. They develop the ability to "read" visual content, understand the role of the visual in the communication space of the public and the ability to critically analyze visual content on visible-invisible level (text-subtext). Graphical content is analyzed through six fundamentals communication perspectives: personal, historical, technical, cultural, ethical and critical. Through presentations of their own works, they learn to express themselves visually, and they develop the necessary speaking and presentation skills for public performance.

Enrollment requirements: none

Prerequisite for taking the course exam: completed exercises and regular attendance at classes

**General And Specific Competence and learning outcomes of the course:**

Students will be able to apply the acquired knowledge about visual communication in media practice, recognize and explain the state, novelties, challenges and problems in visual communication. Independent design of visual communications in media campaigns; creation of visual communication, visual identification and visual identity; application of new dimensions of visual web communication in the context of strong development of modern visual communication technologies; implementation of information graphics and visual communication in the media and graphic industries.

Course content (Syllabus) on a weekly basis:

1. Introduction to visual communication  
Defining the basic concepts of visual communication  
Practical development of visual communication laws in order to acquire visual competence
2. History of visual communication
3. Visual signs (Practice task: Sign, signifier, signified)
4. Sign, icon, symbol (Exercise task: create an icon or your own iconic system)
5. Infographics (Exercise task: Creating information graphics)
6. Photography (Exercise task: Photo analysis or photo content analysis of Croatian newspapers/press)
7. Poster (Exercise task: Creating a poster/advertisement)
8. Visual codes (Exercise task: Simulating logical and aesthetic codes)
9. Visual effects of television (Exercise task: Criteria and standards for the analysis of television visuals content)
10. Visual analysis of television content (advertisements, TV spots, TV genres, design)
11. Visual web communication (Exercise task: Visual analysis of a web portal)
12. Newsletter / Fanzine (Exercise task: Creating a Newsletter / Fanzine)
13. Theories of visibility; Theoretical communication contribution to the development of visual communication
14. Visual communication and six basic communication perspectives
15. Contribution of Saul Bass to graphic design and development of visual communications, Visual communication and media campaigns

**Format of instructions:**

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- Guessing and completion tasks
- Alternative choice tasks
- Problem solving tasks
- Multiple choice tasks
- Connecting and arranging tasks

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.



**Assessment and evaluation of students' work during classes and on the final exam:**

Assessment of independent practice tasks, written exam with essay-type tasks.

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Teaching process evaluation:** [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Student evaluation (survey)**

Other: [Kliknite ovdje da biste unijeli tekst.](#)

**References**

Required: 1. J. Fiske and J. Hartley: "Čitanje televizije", Barbat i Prova, Zagreb 1992.

2. J. Plenković i M. Plenković: "Društvo, znanost i tehnologija", Sveučilište u Rijeci, Građevinski fakultet, Rijeka, 1998.

3. M. Plenković: "Komunikologija masovnih medija", Barbat, Zagreb

1993. (od str. 202. do str. 235.).

4.

P.M. Lester: Visual Communication (image with messages), Thomson & Wadsworth, Belmont, 2003.

5.

E. Vlajki: Uvod u komuniciranje postmodernizma, Fakultet za političke i društvene znanosti, Banja Luka, 2007.

Optional:

1. S. Elezović: Antropološka komunikacija, A.G. Matoš & HKD, Nonacom, Zagreb, 2007.

2.

J.M. Floch: Visual Identities, Continuum, London and New York, 2000.

3.

L. Sanders-Bustle (Edited by): Image, Inquiry, and Transformative Practice, Peter Lang, Frankfurt an Main, 2003.

4. J. Plenković (edited by): "Virtual Society, Informatologia, Separat speciale No. 8", CCA and Faculty of Civil Engineering of the University of Rijeka, Zagreb 1999.

5. M. Plenković i B. Caratan (edited by): "Communication and Society, Informatologia, Separat speciale No. 7", Referral Centre of the University of Zagreb and Faculty of Political Sciences of the University of Zagreb, Zagreb 1988.

6. J. Plenković (Edited by): "Društvo i tehnologija, 1996., 1997. i 1998."; Građevinski fakultet Sveučilišta u Rijeci i HKD, Rijeka / Zagreb

Name of the course: Practice in Arts IV

Teacher: prof. PhD. Vanda Jurković

Associate teachers:

Lectures (L):

Seminar (S):

Laboratory LAB

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: LAB

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: III

Possibility of teaching in English: Only for foreign students

Course objectives: Students will know how to apply and utilise tools and knowledge about technological processes and materials in drawing and painting, collage-ing, designing posters, covers... Recognizing values on visual material.

Enrollment requirements: No

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

Elementary Art Concepts and chronology and evaluating the quality of visual material. Using tools, materials and making conceptions in designing by using aesthetics.

Course content (Syllabus) on a weekly basis:

1. Portrait, drawings
2. Portrait, styling, using different tools, collage
3. Portrait, reduction, making a sign
4. Sketches to make a sign
5. Using styling to make a magazine cover
6. Using styling to make a cartoon character
7. Application of a character to a product

8. Making a poster for an abstract concept
9. Making a book cover
10. Illustrating a book text
11. Illustrating a poem
12. Constructing a logo
13. Making a logo
14. Redesigning a sign
15. Designing a sign

### Format of instructions:

- |   |  |  |
|---|--|--|
| lectures <input type="checkbox"/>               | laboratory <input checked="" type="checkbox"/>   | online <input checked="" type="checkbox"/>     |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/> | field work <input checked="" type="checkbox"/> |
| exercises on computers <input type="checkbox"/> | independent assignments <input type="checkbox"/> | work with mentor <input type="checkbox"/>      |
| other: <input type="checkbox"/>                 |  |  |

### Monitoring of students' work:

- |   |  |   |  |
|---|--|---|--|
| attending classes <input checked="" type="checkbox"/> | research <input type="checkbox"/>          | project <input type="checkbox"/>                          | practical work <input checked="" type="checkbox"/> |
| activities in class <input type="checkbox"/>          | test report <input type="checkbox"/>       | oral exam <input type="checkbox"/>                        | portfolio <input type="checkbox"/>                 |
| seminar work <input type="checkbox"/>                 | experimental work <input type="checkbox"/> | continuous knowledge examination <input type="checkbox"/> |  |

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input type="checkbox"/> Guessing and completion tasks    | <input checked="" type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks         | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks |  |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

Practical work

Other:

**Teaching process evaluation:** Multiple choice tasks

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: lectures, books from Art field, catalogues

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Original graphic I, II, III, IV

Teacher: doc.art .Josip Jozić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Josip Jozić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: Josip Jozić

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III, V

Semester: Summer

Semester number: IV, VI

Possibility of teaching in English: Yes

Course objectives: This teaching subject refers to the so-called original graphic techniques today primarily in the use of artistic expression. The specific language of original graphics, as well as other technologies of pretext systems, is a matter of personal choice in designing graphic media and graphic products. This is the goal of this teaching subject, as well as in the humanistic dimension of the foundations of the practical content of historical sources and culture of the profession.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: The exam can only be accessed by students who have attended complete exercises and successfully completed them and submitted a complete map of the works. The consistency of sketches and performances, performance and originality of the idea are assessed. The overall grade of the course represents the sum of the grades of all papers.

**General And Specific Competence and learning outcomes of the course:**

The specific language of this course, as well as other technologies of presentation systems of original graphics, refers to letterpress printing techniques: linocut. In practice, students get to know black and white linocut in the graphic technique itself, and the preparation of a sketch for a specific technique. In the gravure printing technique, metal printing forms and etching press - and the mechanical dry needle method. The content refers to original graphics that use chemical methods to create a printing form (matrix). In practice, etchings and aquatints are made from these techniques. In the subject, students get to know another technique of original graphics that uses the chemical method of creating a printing form, the reserveage. Students also get to know the usual combinatorics of original graphics (e.g. aquatint + dry needlig).

Course content (Syllabus) on a weekly basis:

1. Preparation and elaboration of working sketches
2. Selection of working sketches and correction of sketches
3. Transfer of sketches to the form
4. Preparation of the form for making an impression
5. Cutting and preparation of paper
6. Preparation of paint and colouring of the form
7. Test print
8. Correction and refinement of the form
9. Test print
10. Printing of editions of 5 prints
11. Drying prints
12. cropping prints
13. cropping and signing of copyright prints
14. evaluation of works
15. Storing copyright prints in the works folder

**Format of instructions:**

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment   
Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Multiple choice tasks

Alternative choice tasks

Connecting and arranging tasks

Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Checking and evaluating work assignments during the semester and handing in the folder, which includes work sketches and author's prints.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** The specific language of original graphics, as well as other technology of presentation systems, is a matter of personal choice of motifs, artistic expression, and the skill of creating author's prints. Only students who have attended the complete exercises and successfully completed them and submitted a complete portfolio of works can take the exam. The compatibility of the sketches and the performance, the execution and the originality of the idea are evaluated. The overall grade of the course represents the sum of the grades of all papers.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Dž. Hozo: Umjetnost multioriginala, Prva književna komora, Mostar, 1988.

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: English for Graphic Engineers and Designers 4

Teacher: Odaberite stavku. Ana Nemec

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+1

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: IV

Possibility of teaching in English: Yes

Course objectives: expand the vocabulary related to the field of study; translate more complex texts from English to Croatian and vice-versa; writing simple and more complex well-unified texts; writing CVs and cover letters; awareness of intellectual property

Enrolment requirements: Skills and competences acquired in the course of high school education

Prerequisite for taking the course exam: attendance, continuous activity

**General And Specific Competence and learning outcomes of the course:**

independent use of ESP vocabulary; proficiency in grammar; translating and summarizing skills

Course content (Syllabus) on a weekly basis:

1. Cohesion: theory
2. Cohesion: analysing texts
3. Intellectual property: reading comprehension
4. Conditionals in English: revision
5. Conditionals: If you were to (theory and exercises)
6. Academic application: writing a CV
7. Writing a CV: listening comprehension





**Student evaluation (survey)**

Other:

**References**

Required: any monolingual dictionary; grammar; course materials

Optional: newspapers and magazines

Name of the course: Optoelectronic systems 1

Teacher: prof. PhD. Lidija Mandić

Associate teachers:

Lectures (L): Lidija Mandić

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Ana Agić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: IV

Possibility of teaching in English: Yes

Course objectives: Get to know the processes of interaction between electromagnetic radiation and matter. Get to know the working principle of semiconductors. Get to know the principle of sensor operation. Get to know the principle of operation of device of generating and detecting light

Enrollment requirements: Physics

Prerequisite for taking the course exam: completed and pass exercises

**General And Specific Competence and learning outcomes of the course:**

knowledge of the interaction of electromagnetic radiation and matter. Knowledge of the operation of devices and their application in graphic process.

Course content (Syllabus) on a weekly basis:

1. Electromagnetic radiation
2. Interaction of electromagnetic radiation with matter
3. Atom model
4. Principle of operation of semiconductors
5. Principle of operation of diodes and characteristics
6. LEDs-principle of operation, materials and application
7. Principle of operation of transistors and their application,

8. Principle of operation of optical detectors
9. Principle of laser operation and application in graphic process
10. Polarization and application
11. Principles of monitor work
12. Overview of different screen technologies and comparison of image reproduction quality on them
13. Basic laws of geometric optics
14. Optical conductor
15. Overview of new materials and technologies

**Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

preliminary exam (lectures) and practical work on the computer, independent work

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** preliminaray exam and independent work

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

### **References**

Required: materials placed on MERLIN

Optional: Kasap, Optoelectronics and photonics , 2001  
Saleh, Teich, Fundamentals of photonics, Wiley, 2007.

Name of the course: Automation and maintenance of graphic arts machinery

Teacher: assoc. prof. PhD. Dubravko Banić

Associate teachers:

Lectures (L): assoc. prof. PhD. Dubravko Banić

Seminar (S): assoc. prof. PhD. Dubravko Banić, Iva Šarčević, B.Sc. Eng

Laboratory (LAB): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+0

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory / Elective

Semester: Winter

Semester number: V

Possibility of teaching in English: No

Course objectives: To acquire basic and professional knowledge in the field of automation, regulation and maintenance of printing machines, familiarization with the basic concepts and methods of automation. Knowing how to analyze the dynamic characteristics of the system. Understand the concept of feedback and its effects on system properties. The student will learn the basic definitions, classifications, implementations of maintenance models and classification of maintenance equipment in graphical technology. The student will know the optimal selection of basic materials for the maintenance of machines in graphic technology and analyze the causes of malfunctions caused by the incorrect use of maintenance materials. In the field of maintenance, students gain knowledge of cost-effective approaches to maintenance. Students will learn about the organization of maintenance service and its structure and will be able to propose an optimal maintenance information system in graphic technology.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: Attendance of classes (80%) and finished project

**General And Specific Competence and learning outcomes of the course:**

Application of basic knowledge in the analysis of technical-technological processes. Knowledge and identification of technological units of graphic production. Planning the sequence of process procedures in graphic technology. Assessment and selection of materials for a specific production process.

Course content (Syllabus) on a weekly basis:

1. Basic definitions and application of automatic regulation in graphics technology.  
/Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
2. Possibilities of influencing the processes of printing machines, which should be maintained at a constant value.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
3. Possibilities of applying measuring sensors in order to regulate printing machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
4. Information systems in the operation of printing machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
5. Control systems for the operation of printing machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
6. Level of automation and regulation in the operation of printing machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)  
Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)
7. Level of automation and regulation in the operation of print finishing machines.  
/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

8. Basic definitions, divisions, implementations of maintenance models in graphic technology.

/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

9. Basic materials used in maintenance in graphic technology.

/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

10. Basic terms and classification of maintenance equipment in graphic technology.

/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

11. Basic concepts and classification of failures and downtimes in graphic technology.

/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

12. Basics of planned and preventive maintenance in graphic technology.

/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)

13. Basics of Total Productive Maintenance in graphic technology.

/Independent preliminary preparation for the lecture and assigned homework on that topic. Lectures – lecture and analysis of multiple competence acquisition examples. (0,17 ECTS)

Seminars – individual and group work on a task concerning the lecture topic and project (0,10 ECTS)





submit original solution for a given topic. 2. To present project orally. Final grade is based on colloquium grade (80%) and project grade (20%).

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Teaching process evaluation:** [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Student evaluation (survey)**

Other: [Kliknite ovdje da biste unijeli tekst.](#)

## **References**

Required: Šurina, T.: Automatic regulation, School book, Zagreb, 1981, Čala, and more authors: Engineering manual, part 4, chapter 9, School book, Zagreb, 2002.

Optional: Branko Novaković: Regulation systems, Školska knjiga, Zagreb, 1985., Nakajima, S: TPM, Introduction to TPM, Productivity Press, 1988. Palmer, D., R: Planning and Control of Maintenance Systems, JohnWiley&sons, 1998. L.R. Higgins: R.K. Mobley: Maintenance Engineering Hand Book, Mc Graw Hill, New York, 2002, sixth edition

Name of the course: Main printing techniques

Teacher: assoc. prof. PhD. Igor Zjakić

Associate teachers:

Lectures (L): Igor Zjakić

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Irena Bates, Krešimir Dragčević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: V

Possibility of teaching in English: Only for foreign students

Course objectives:To teach students the basics of the functioning of the main printing techniques.

Enrollment requirements: Kliknite ovdje da biste unijeli tekst.

Prerequisite for taking the course exam: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**General And Specific Competence and learning outcomes of the course:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Course content (Syllabus) on a weekly basis:

1. Introduction to the subject. Division of printing techniques. Introduction to printing techniques. Letterpress
2. Introduction to offset printing. Principles of sheet fed printing, principle of magazine printing and principle of newspaper printing.
3. Importing device and inclined table in offset printing. Printing principles
4. Printing unit. Printing and dampening devices. Zone buttons. Principles of work.
5. Exposure device, exposure principle.
6. Obtaining a multi-color print in offset printing.
7. Double paper control, transport rollers and suction tentacles. Principle of working.
8. Magazine printing. Technique principles.
9. Printing aggregates in the magazine printing
10. Colloquium
11. Gravure printing. Technique principles.

12. Gravure printing. Technique principles.
13. Basics of flexo printing. Principle of printing.
14. Basics of flexo printing. Principle of printing.
15. Colloquium

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Guessing and completion tasks | <input checked="" type="checkbox"/> Multiple choice tasks |
| <input type="checkbox"/> Alternative choice tasks                 | <input type="checkbox"/> Connecting and arranging tasks   |
| <input type="checkbox"/> Problem solving tasks                    |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### Assessment and evaluation of students' work during classes and on the final exam:

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

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Lectures are divided into two colloquiums, one in the middle of the lecture and the other at the end. By passing both colloquiums and by meeting the obligations from the exercises, a grade is obtained according to the number of points. In case of a fall at the first or both colloquiums, the exam is held in writing and, if necessary, orally

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

### References

Required: S. Bolanča: Glavne tehnike tiska, VGŠ 1997

Optional: H. Kiphan: Handbook of Print media, Springer, 2001.

I. Zjakić: Upravljanje kvalitetom tiska, HSN, 2007.

Name of the course: Industry and the environment

Teacher: assoc. prof. PhD. Ivana Bolanča Mirković

Associate teachers:

Lectures (L): assoc. prof. PhD Ivana Bolanča Mirković

Seminar (S):

Laboratory (LAB):PhD. Marina Vukoje

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: V

Possibility of teaching in English: Yes

Course objectives: The aim of the course is to familiarize students with the impact of graphic technology processes on the environment, and to transfer theoretical knowledge in the field of environmental engineering and its practical application. The further goal of the course is to introduce students to the ecological aspect of cellulose and paper production, paper recycling in relation to other methods of disposal of used graphic products. Students are trained to understand and make sound conclusions in the field of the ecological aspect of conventional printing techniques (offset printing, flexo printing, gravure printing, and screen printing) as well as digital printing techniques (electrophotography and inkjet printing). Students are introduced to the best available techniques in the field of graphic reproduction, as well as the development of printing substrates and inks, including nanotechnology and nanomaterials. The aim is to acquire theoretical knowledge that can be improved through practical work in the laboratory. In the laboratory, units originally related to environmental issues are processed. The goal is for students to achieve information recognition and understanding, as well as to develop generic skills, presentation skills, and teamwork.

Enrollment requirements: No

Prerequisite for taking the course exam: All laboratory practices done.

**General And Specific Competence and learning outcomes of the course:**

Students will be able to analyze the ecological aspect of energy sources and assess the environmental suitability of renewable energy sources. Students will be able to describe and evaluate the ecological aspect of cellulose, paper, recycled paper, and printing inks production. Students will be able to evaluate the environmental impact and health risks of

conventional and digital printing techniques. Students will be able to describe the best available techniques in the field of printing substrates, inks, and printing.

Course content (Syllabus) on a weekly basis:

1. Lectures: Major causes of environmental devastation. Principles of environmental protection. Legal regulations in the field of environmental protection. (ECTS 0.21)  
Exercises: Introduction. Laboratory work rules. (ECTS 0.09)
2. Lecture: Composition and properties of the atmosphere. Air pollution. (ECTS 0.21)  
Exercises: Carbon footprint. (ECTS 0.09)
3. Lecture: Impact of meteorological factors on air pollution. Cycle of discharge of pollutants from the atmosphere. (ECTS 0.21) Exercises: Air quality in the graphic industry. (ECTS 0.09)
4. Lecture: Ecological aspect of conventional printing techniques (offset printing, gravure printing, flexo printing, and screen printing) impact on the environment, health, and safety risks. (ECTS 0.21) Exercises: Chemical deinking flotation, principles, and influencing factors. (ECTS 0.09)
5. Lecture: Ecological aspect of digital printing techniques, impact on the environment, health risks. (ECTS 0.21) Exercises: Disposal of composite materials: composite recycling process. (ECTS 0.09)
6. Lecture: Ecological aspect of the production and application of printing inks. Biodegradability of inks. (ECTS 0.21) Exercises: Recycling of prints using ultrasound. (ECTS 0.09)
7. Lecture: Knowledge check through a colloquium. Exercises: Durability of inks in defined environmental conditions. (ECTS 0.09)
8. Lecture: Production of pulp and paper and its impact on air quality. Methods for air purification. (ECTS 0.21) Exercises: Durability of printing substrates in defined environmental conditions. (ECTS 0.09)
9. Lecture: Process and wastewater. Physical, chemical, and biological indicators of water pollution. (ECTS 0.21) Exercises: Determination of effective concentration of residual ink on laboratory sheets and application of other spectrophotometric methods of analysis. (ECTS 0.09)
10. Lecture: Wastewater from conventional printing techniques. Ecological aspect of CTP technology. (ECTS 0.21) Exercises: Principle of the method and application of image analysis. (ECTS 0.09)
11. Lecture: Wastewater from the production of pulp, paper, and recycled paper. (ECTS 0.21) Exercises: Determination of organic matter in process waters. (ECTS 0.09)





**Teaching process evaluation:** Methods of quality monitoring that ensure the acquisition of output knowledge, skills and competences:

**Student evaluation (survey)** ☒

Other: Evaluation by students (Survey), constant conversation with students

### **References**

Required: M. K. Hill, Understanding Environmental Pollution, 2nd Ed. Cambridge University Press, Cambridge, 2004.

F. Shapiro, Environmental Regulation for Printers, Jelmar Publishing Co., New York, 2003.

M. London, Environment, Health and Sustainable Development, Open University Press, Berkshire, 2011

Optional: M. Z. Jacobson, Atmospheric Pollution, Cambridge University Press, Cambridge, 2002.

Journals: Environmental Science and Technology, LCS Publications Journal of Cleaner Production, Elsevier

Name of the course: Printing Inks

Teacher: asst. prof. PhD. Sonja Jamnicki Hanzer

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB):: asst. prof. PhD. Maja Stržić Jakovljević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate  
Elective

Status of the course: Mandatory /

Semester: Winter

Semester number: V

Possibility of teaching in English: Yes

Course objectives: The aim of the course is to introduce students to the production, composition, and basic properties of printing inks and their proper application in graphic technology. During the course, students acquire knowledge of the properties and special features of printing inks for a particular printing technique. Students will acquire the basic and practical skills necessary to select printing inks for a specific substrate to achieve the desired print quality. Students acquire competencies for carrying out printability and other laboratory tests for specific printing inks.

Enrollment requirements: Students must have prior knowledge of the properties of paper and board substrates (taught in the Paper course) and take this course concurrently with a course dealing with conventional printing techniques.

Prerequisite for taking the course exam: completed laboratory exercises

### **General And Specific Competence and learning outcomes of the course:**

Students will be able to:

- Name the basic components of printing inks;
- Explain the chemical-physical properties and the role of each component of printing inks;
- Explain the rheological properties of printing inks and their influence on print quality;
- Classify and explain different drying mechanisms of printing inks;
- Identify a relationship between the properties of the chosen substrate, chemical composition of the printing ink, its viscosity, layer thickness, printing speed, and other parameters that influence the quality of the final print;
- Determine the optimal combination of ink and substrate for a given print job;

- Explain the properties and composition of inks for different printing techniques;
- Identify possible printing problems caused by inadequate ink properties.

Course content (Syllabus) on a weekly basis:

1. The first lecture introduces students to the content and objectives of the course and defines basic concepts related to printing inks and printing processes.
2. The nature and basic components (raw materials) of printing inks are presented: colorants of printing inks are discussed in detail: dyes, pigments, and extenders.  
1. lab exercise: a short film describing the manufacturing process of offset printing inks is shown; the main raw materials of printing inks - colorants and vehicles are discussed.
3. The role of vehicles (binders) in the composition of printing inks is explained. The main components (raw materials) of vehicles - oils, resins, and solvents - and their chemical and physical properties are discussed in detail.
4. Different types of vehicles (binders) for printing inks are presented according to their chemical and physical properties.  
2. lab exercise: rheological properties (viscosity) of paste and liquid printing inks are tested.
5. Drying agents (siccatives) and various additives for printing inks are covered in detail.
6. The lecture defines the basic rheological properties of printing inks (consistency, viscosity, flow, thickness, and thixotropy). Printing problems that occur when ink properties are inadequate are addressed.  
3. lab exercise: the IGT printability testers available in the lab are presented and students are instructed on how to produce laboratory prints.
7. Different drying methods of the printing inks are explained in detail: physical, chemical, combined (quick setting), and radiation (IR, UV, EB, RF, MW).
8. Offset printing inks - their composition and properties are discussed in detail.  
4. lab exercise: a standardized laboratory test is performed to determine the drying time of newspaper inks.
9. The lecture deals with the composition and general properties of letterpress and flexographic inks.
10. The lecture deals with the composition and general properties of rotogravure inks.  
5. lab exercise: students will be confronted with problems caused by insufficient drying of printing inks in offset printing. A standardized test is performed to determine the blocking resistance of prints.



the option of taking the traditional written and oral examinations during the regular examination periods. The final examination assesses the knowledge acquired in the lectures and laboratory exercises.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Analysis of success in written and oral exams - continuous monitoring of student work. Feedback from students' evaluation of the teacher (anonymous survey)

**Student evaluation (survey)** ☒

Other:

## References

Required:

1. Teacher's lectures published on Merlin E-learning platform
2. Teaching materials for laboratory exercises published on Merlin E-learning platform
3. Ronald E Todd, Printing inks: Formulation principles, manufacture and quality control testing procedures, Pira International, 1994
4. The Printing Ink Manual, Fifth Edition, R.H. Leach, R.J. Pierce (Eds.), Springer, Dordrecht, 2008.

Optional:

1. C. H. Williams, The Printer's Ink Handbook, Mclean Hunter Ltd, Hertfordshire, 1992.
2. N. R. Eldred and T. Scarlett, What the Printer Should Know about Ink, GATF, Pittsburgh, 1990.
3. G. Novak, Graphic materials, University of Ljubljana, Faculty of Science, Ljubljana, 2004.

Name of the course: Original graphic I, II, III, IV

Teacher: doc.art .Josip Jozić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Josip Jozić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: Josip Jozić

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III, V

Semester: Summer

Semester number: IV, VI

Possibility of teaching in English: Yes

Course objectives: This teaching subject refers to the so-called original graphic techniques today primarily in the use of artistic expression. The specific language of original graphics, as well as other technologies of pretext systems, is a matter of personal choice in designing graphic media and graphic products. This is the goal of this teaching subject, as well as in the humanistic dimension of the foundations of the practical content of historical sources and culture of the profession.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: The exam can only be accessed by students who have attended complete exercises and successfully completed them and submitted a complete map of the works. The consistency of sketches and performances, performance and originality of the idea are assessed. The overall grade of the course represents the sum of the grades of all papers.

**General And Specific Competence and learning outcomes of the course:**

The specific language of this course, as well as other technologies of presentation systems of original graphics, refers to letterpress printing techniques: linocut. In practice, students get to know black and white linocut in the graphic technique itself, and the preparation of a sketch for a specific technique. In the gravure printing technique, metal printing forms and etching press - and the mechanical dry needle method. The content refers to original graphics that use chemical methods to create a printing form (matrix). In practice, etchings and aquatints are made from these techniques. In the subject, students get to know another technique of original graphics that uses the chemical method of creating a printing form, the reserveage. Students also get to know the usual combinatorics of original graphics (e.g. aquatint + dry needlig).

Course content (Syllabus) on a weekly basis:

1. Preparation and elaboration of working sketches
2. Selection of working sketches and correction of sketches
3. Transfer of sketches to the form
4. Preparation of the form for making an impression
5. Cutting and preparation of paper
6. Preparation of paint and colouring of the form
7. Test print
8. Correction and refinement of the form
9. Test print
10. Printing of editions of 5 prints
11. Drying prints
12. cropping prints
13. cropping and signing of copyright prints
14. evaluation of works
15. Storing copyright prints in the works folder

**Format of instructions:**

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment   
Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Multiple choice tasks

Alternative choice tasks

Connecting and arranging tasks

Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Checking and evaluating work assignments during the semester and handing in the folder, which includes work sketches and author's prints.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** The specific language of original graphics, as well as other technology of presentation systems, is a matter of personal choice of motifs, artistic expression, and the skill of creating author's prints. Only students who have attended the complete exercises and successfully completed them and submitted a complete portfolio of works can take the exam. The compatibility of the sketches and the performance, the execution and the originality of the idea are evaluated. The overall grade of the course represents the sum of the grades of all papers.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Dž. Hozo: Umjetnost multioriginala, Prva književna komora, Mostar, 1988.

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.



Name of the course: Graphic Design 1

Teacher: prof. PhD. Maja Brozović

Associate teachers:

Lectures (L): prof. PhD. Maja Brozović

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):asst. prof. PhD Josip Bota

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+0+3

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: V

Possibility of teaching in English: Only for foreign students

Course objectives: To obtain the knowledge and acquire the skillset needed in visual design mindful of the user, form and graphic media type. The course is based on the study of the basic elements of the visual structure and their organization into functional optical systems. The analysis of graphic structure comprises of identifying the elementary meanings and data organisation models which follow from the appearance of the text and the readability of the message in accordance to the choice of the shape and size of letterforms as abstract forms and the choice of content and position of pictorial elements as figurative forms. By way of systematic analysis of graphic structure, students will become capable of organizing information in accordance to the type and intent of the message. Structural analysis is considered and conducted on the basis of every graphic media's twofold functionality: operative and persuasive communication. The message can be interpreted according to the goal and users by choosing the appropriate types of sign.

Enrollment requirements: Basic level work in graphic computer programs for image and text processing

Prerequisite for taking the course exam: Attended lectures, finished all exercises, submitted all works designed and realized on exercises in printed form and digital form in the Merlin system

**General and Specific Competence and learning outcomes of the course:**

- interpretation and reinterpretation of visual systems
- adjusting readability of graphic composition
- analysing visual message with regard to objectivity level
- apply an appropriate visual structure considering the purpose of the visual message

- show the principles of composing elements of visual form
- sketch the redesigned unit structure of the graphic media
- solve the optically harmonising newspaper page layout

Course content (Syllabus) on a weekly basis:

1. Visual structure analysis  
Sketch and analyse a newspaper article from the point of view of visual structure (0.27 ECTS)
2. Visual structure analysis  
Reinterpret a newspaper article based on the obtained data about its structure (0.27 ECTS)
3. Increasing the readability of the visual message  
Increase the readability of a newspaper article by intervention in typography (0.27 ECTS)
4. Increasing the readability of the visual message  
Increase the readability of a newspaper article by emphasizing the hierarchy of data (0.27 ECTS)
5. Informational values of the message  
Emphasize informative parts of the message compared to redundant ones (0.27 ECTS)
6. Informational values of the message  
Define the styles of titles, sub-titles, super-titles, text by applying letter scales and selecting illustrative systems (0.27 ECTS)
7. Measuring the meaning of the message in levels of objectivity  
Present the article in operative and persuasive communication (0.27 ECTS)
8. Order and disorder system  
Present the topic of the article from another aspect in relation to the target group (0.27 ECTS)
9. Animation of a visual message  
Animate the obtained content of the article using image information (0.27 ECTS)
10. Stylization of the visual message  
Stylize the content of the article using rational, conventional signs (0.27 ECTS)
11. Principles of composing  
Show the static composition of the article in the dynamic relationship of elements (0.27 ECTS)

12. Color system  
Stratify the hierarchy of information using pairs of contrasting colors (0.27 ECTS)
13. Message redesign  
Redesigning a newspaper article (0.27 ECTS)
14. Optical balance of the graphic media page  
On the newspaper page, achieve an optical balance from the obtained number of articles (0.27 ECTS)
15. Optical balance of the graphic media page  
On the newspaper page, achieve an optical balance from the obtained number of articles (0.27 ECTS)

**Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

The mean value of all grades of practical works realized in exercises, activities in lectures and exercises.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

## **Student evaluation (survey)**

Other: [Kliknite ovdje da biste unijeli tekst.](#)

## **References**

Required:

- Arnheim, R.: Art and Visual Perception - A Psychology of the Creative Eye, University of California Press, 2004.
- Bringhurst, R.: The Elements of Typographic Design: Form and Communication, John Wiley and Sons Inc., New Jersey, 2007.
- Drew, J.T.; Meyer, S.A.: Color Management: A Comprehensive Guide for Graphic Designers, RotoVision, 2008.
- Lidwell, W.; Holden, K; Butler, J.: Univerzalna načela dizajna, MATE d.o.o, Zagreb, 2006.
- Malamed, C.: Visual Language for Designers: Principles for Creating Graphics That People Understand, Rockport Publishers, 2009.
- Mesaroš, F.: Tipografsko oblikovanje, Viša grafička škola u Zagrebu, Zagreb, 1981.
- Pavlek, Z.: Kako izgraditi najbolju marku, M.E.P. Consult., 2008.
- Pettersson, R.: It Depends - Principles and Guidelines, International Institute for Information Design, Tullinge, 2012.
- Ware, C.: Information Visualization, Third Edition: Perception for Design (Interactive Technologies), Elsevier Inc, 2013.
- Wong, W.: Principles of Form and Design, John Wiley & Sons, 1993.

Optional: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Name of the course: Environmental Science and Design

Teacher: assoc. prof. PhD. Ivana Bolanča Mirković

Associate teachers:

Lectures (L): assoc. prof. PhD. Ivana Bolanča Mirković

Seminar (S): assoc. prof. PhD. Ivana Bolanča Mirković

Laboratory (LAB):

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+S

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1+0

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: V

Possibility of teaching in English: Yes

Course objectives: The students are introduced to the global environmental issues, such as air pollution, greenhouse effect, stratospheric ozone depletion, winter and summer smog, water pollution, soil pollution, solid waste, hazardous waste, emission sources, direct and indirect causes of emissions, and design approach in product creation context with the aim of reducing anthropogenic impact on environmental quality. The course content covers the specificities of emissions from the production processes of graphic and related industries, working and user activities with the goal of implementing measures through product design towards the preservation or improvement of environmental quality. The course is designed to better understand environmental protection in the context of professional courses

Enrollment requirements: No prerequisites for enrolling in the course.

Prerequisite for taking the course exam: Submission and positive evaluation of a seminar paper.

**General And Specific Competence and learning outcomes of the course:**

Students will be able to recognize and describe global environmental issues and explain the principles of graphic design in the context of creating products with a lower environmental impact. They will be able to explain the impact of solid waste on the environment and the principles of design in the context of waste reduction. They will be able to explain the principles of design for preventing pollutant emissions. They will be able to list and explain the ecological principles of graphic product design. They will be able to apply design tools in the context of ecological efficiency and differentiate their limitations.

Course content (Syllabus) on a weekly basis:

1. Lecture: Introduction, importance of environmental science, general concepts of environmental protection related to design. (ECTS 0.21) Seminar: Introduction, individual assignments. (ECTS 0.09)
2. Lecture: Design and global environmental issues. Air pollution. Greenhouse effect: emission sources, mechanism of formation, impact on the environment. (ECTS 0.21) Seminar: Alternative product design using global warming indicators. (ECTS 0.09)
3. Lecture: Design and global environmental issues II. Winter smog: emission sources, mechanism of formation, impact on the environment, prevention measures. (ECTS 0.21) Seminar: Product design and prevention of pollutant emissions causing winter smog. (ECTS 0.09)
4. Lecture: Design and global environmental issues III. Summer smog: emission sources, mechanism of formation, impact on the environment, prevention measures. (ECTS 0.21) Seminar: Design and prevention of primary pollutant emissions causing summer smog. (ECTS 0.09)
5. Lecture: Design and global environmental issues IV. Destruction of the ozone layer in the stratosphere: mechanism of the destruction process, impact on the environment. (ECTS 0.21) Seminar: Design and measures for protecting graphic products from global radiation. (ECTS 0.09)
6. Lecture: Design and global environmental issues V. Pollutants in water: sources of pollution primarily in the domain of graphic materials, impact on the environment. (ECTS 0.21) Seminar: Design of graphic products and prevention of water pollution. (ECTS 0.09)
7. Lecture: Design and Global Environmental Issues VI: Solid Waste. Hierarchy of Waste Disposal Methods. (ECTS 0.21) Seminar: Graphic Product Design Settings in the Context of Waste Reduction. (ECTS 0.09)
8. Knowledge Assessment through a Colloquium. Seminar: Designer's Impact on Reducing Pollutants during Production and Use of Products. (ECTS 0.09)
9. Lecture: Toxic Substances in Air and Water, Environmental Impact. (ECTS 0.21) Seminar: Design and Prevention of Emission of Toxic Substances. (ECTS 0.1)
10. Lectures: Ecological Aspects of Non-Renewable Energy Sources. (ECTS 0.21) Seminar: Product Design with Low Energy Consumption through Production and Consumption. (ECTS 0.09)
11. Lectures: Ecological Aspects of Renewable Energy Sources. (ECTS 0.2) Seminar: Energy Efficiency in the Workplace - Ecological Aspect. (ECTS 0.09)

12. Lecture: Ecological Aspect of Transportation. (ECTS 0.21) Seminar: Product Design in the Context of Pollution Reduction during Transportation. (ECTS 0.09)
13. Lecture: Design Support Tools that Increase Environmental Impact Reduction Efficiency. (ECTS 0.21) Seminar: Solving Examples in the Domain of Graphic Product Design. (ECTS 0.09)
14. Lecture: Design Tools in the Context of Ecological Efficiency. (ECTS 0.21) Seminar: Solving Examples in the Domain of Graphic Product Design. (ECTS 0.09)
15. Knowledge Assessment through a Colloquium. Compensation for Justifiably Unheld Student Presentations of Seminar Papers

### Format of instructions:

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### Monitoring of students' work:

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

### Type of written examination:

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other:

### Assessment and evaluation of students' work during classes and on the final exam:

The student's activities will be evaluated during each hour of lectures and seminars. The evaluation assessment of the achievement of the learning outcomes is determined by the evaluation of the seminar paper. At the final exam, the student presents the achieved learning outcomes through answers to essay-type questions.

Other:

**Teaching process evaluation:** Evaluation by students (Survey), constant conversation with students

**Student evaluation (survey)**

Other:

### **References**

Required: I-L. Pepper, C.P. Gerba, M.L. Brusseau, Environmental and Pollution Science, Springer Verlag, London,

2008.; G.T. Miller, S. E. Spoolman, Environmental Science, Brooks/Cole, Canada 2013.;

A.Chick, P. Micklethwaite, Design for Sustainability Change, AVA Publishing S, 2011

Optional: C. Vezzoli, E.Manzini, Design for Environmental Sustainability, Springer Verlag, London, 2008



Name of the course: Graphic programming languages

Teacher: prof. PhD. Klaudio Pap

Associate teachers:

Lectures (L): prof. PhD. Klaudio Pap

Seminar (S):

Laboratory (LAB):Asst.prof. Maja Rudolf, PhD, Asst.prof. Nikolina Stanić  
Loknar

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Elective

Semester: Winter

Semester number: V

Possibility of teaching in English: *Odaberite stavku.*

Course objectives: Training for performing programming tasks using graphical programming languages in graphic engineering. Graphical coordinate space, output coordinate space, and programming of the coordinate grid. Rules for writing commands and parameters in stack-oriented graphical language. Concept of graphic pages and corresponding measuring units. Absolute and relative programming of lines and paths, closing paths and filling them. Creating graphic shapes in multiple layers. Control of line endings, line joining, and line discontinuity. Programming circular and tangential shapes and circular arcs. Bezier curve and its mathematical definition. Types of Bezier curve joining. Joining Bezier curve with tangent curve. Saving and restoring graphic state. Rotations, translations, horizontal and vertical transformations of the coordinate system. Control of object fill and "holes" by programming the orientation of the path clockwise and counterclockwise. Multiple transparencies of objects by even-odd rule of origin ray crossings. Stack memory management. Arithmetic and logical operators in PostScript language (representative of PDL languages). Programming loops in graphical programming languages. Repetition and transformation of graphic shapes. Programming tonal transitions in RGB, CMYK, and HSB color spaces. Grouping graphic shapes. Individual programming manipulation of a letter and converting an envelope to a vector path. Functions of textual strings and data arrays. Program control of font and text in PostScript language. Optimization of memory usage by program stack control.

Enrollment requirements:

Prerequisite for taking the course exam: Attended lectures, completed exercises

### **General And Specific Competence and learning outcomes of the course:**

Evaluation of features of prepress, printing, finishing, and multimedia devices;  
Defining the type and purpose of a message based on the user, form, and type of graphic media;  
Applying high-level structured programming languages  
Using tools and knowledge of technological processes and materials in the design, reproduction, and distribution of visual messages  
Applying techniques for processing and designing different media (images, sound, video, photography, animation)  
Differentiating coordinate system transformations from graphic shape deformations  
Constructing programs for lines, curves, arcs, and other types of vector paths  
Using programming branching, loops, arrays, and functions in a graphic programming language  
Designing programmable graphic elements in different color systems and graphic states  
Creating user procedures for later independent use  
Applying optimization of memory usage through programmatic control of stack memory in printing devices  
Applying programmatic manipulation of individual characters  
Applying programmatic control of fonts and text  
Expanding the capabilities of standard market programs with custom programs for specific purposes

Course content (Syllabus) on a weekly basis:

1. Lecture: Graphic coordinate space, print coordinate space, and programming coordinate grid; Exercises: Programmatic positioning in graphic coordinate space and defining straight paths in it (0.2 ECTS)
2. Lecture: Rules for writing commands and parameters in stack-oriented graphic language, concept of graphic page and associated measurement units; Exercises: Programming control of projected measures and multiple variations of stack writing of graphic command parameters (0.2 ECTS)
3. Lecture: Absolute and relative programming of lines and paths, closing paths and filling them; Exercises: Absolute and relative programming of lines and paths, creating polygons and filling them (0.2 ECTS)
4. Lecture: Control of the final shape of lines, joining lines, and line breaks; Exercises: Programming the final shape of lines, joining lines, and line breaks (0.2 ECTS)
5. Lecture: Programming circular and tangent shapes and circular segments; Exercise: Programmatic implementation of given circular and tangent shapes and circular segments (0.3 ECTS)
6. Lecture: Programming Bezier curves in vector paths; Exercise: Programmatic implementation of a given path using Bezier curves (0.3 ECTS)

7. Lecture: Rotations, translations, horizontal and vertical transformations of the coordinate system; Exercise: Programmatic implementation of object rotation, translation, and reflection, midterm (0.4 ECTS)
8. Lecture: Control of object fill and "holes" with programming of path orientation and control of multiple object transparencies; Exercise: Programmatic implementation of objects with "holes" in multiple possible ways (0.2 ECTS)
9. Lecture: Stack memory management, arithmetic and logical operators in stack-oriented language; Exercise: Use of arithmetic and logical operators with current output of stack memory state (0.2 ECTS)
10. Lecture: Loops in graphic programming languages, repetition and transformation of graphic shapes; Exercise: Repetition, cloning, and transformation of graphic objects (0.2 ECTS)
11. Lecture: Programming tonal transitions in RGB, CMYK, and HSB color spaces; Exercise: Programming color in various color systems and their use on graphic entities (0.2 ECTS)
12. Lecture: Grouping graphic shapes; Exercise: Defining program procedures for groups of graphic shapes and basic manipulations with them (0.3 ECTS)
13. Lecture: Individual program manipulation of a letter character and converting envelope into a vector path; Exercise: Program manipulation of a letter character and converting the envelope into a vector path (0.3 ECTS)
14. Lecture: Functions of text strings and data arrays; Exercise: Programming with a basic set of commands for text strings (0.4 ECTS)
15. Lecture: Programmatic control of fonts and text; Exercise: Programmatic control of fonts and text, final exam (0.4 ECTS)

### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Assessment and evaluation of students' work during classes and on the final exam:**

Normative assessment.

Other:

**Teaching process evaluation:**

**Student evaluation (survey)**

Other:

**References**

Required: . Žiljak, K. Pap, POSTSCRIPT PROGRAMIRANJE GRAFIKE, FS, Zagreb, 1998.  
/2004. Tiskovno izdanje: ISBN: 953 - 199 – 000, Elektr. izdanje: <http://free-zg.htnet.hr/kpap/>  
I. Adobe Systems: „PostScript Language Reference Manual”, Addison-Wesley, 1985 -  
I. Adobe Systems: „PostScript Language Tutorial and Cookbook”, Addison-Wesley, 1985

Optional: H. McGilton, M. Campione: „PostScript by Example”, Addison-Wesley, 1992

Name of the course: Craft bookbinding

Teacher: asst. prof. PhD. Suzana Pasanec Preprotić

Associate teachers:

Lectures (L): Suzana Pasanec Preprotić

Seminar (S):-

Laboratory (LAB):senior researcher, PhD. Gorana Petković

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1L+2LAB

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Elective

Semester: Winter

Semester number: V

Possibility of teaching in English: Yes

Course objectives: The aim of the course is for students to understand and be able to explain different types of book binding. They need to understand and describe different forms of binding from the point of view of the construction of the book shape. Students should be able to construct a book of a typical shape in such a way that its "body and cloak" are actually a book block and cover. They should distinguish and describe contemporary forms and types of book binding according to purpose, type of material and the method of connecting the book block with the cover. It is expected that students after following this subject to be able to choose a binding form in a real situation and equip the book in such a way as to be in the spirit its content. The student will create, construct, and analyse the book as a whole. Based on realization of its conceptual solution, the student will choose the type and form of binding, will use software tools for technical arrangement of the book block and cover, form the printing sheets on the printer and bind the book by hand. It is expected that collaborative learning (in small groups) will contribute in a certain part of the course synthesizing overall knowledge from the subjects Introduction to graphic technology, Chemistry in graphic technology, Tisak 1 and Papir, which students listened to in the undergraduate university study of graphic technology. In this way, students will be trained to express their own opinion, to come up with their own ideas' values and beliefs. In this way, the student acquires engineering, social and communicative skills, so it is able to predict, formulate and develop new knowledge through a wide spectrum of knowledge.

Enrollment requirements: Students should take the courses Introduction to Graphics Technology, Chemistry in Graphic Technology, Paper, Printing 1 and Reproduction Photography at the undergraduate university study of graphic technology for the reason of teaching according to the principle of cooperative learning. Entrance student competencies that are required to perform this course are: Basic and general knowledge of technical-

technological design of the graphic product; Basic and general knowledge about papers and adhesives; Basic and general knowledge about the viscosity of liquids and surface phenomena; Basic and general knowledge about book typography; Basic and general knowledge about page breaking and printing sheet assembly; Basic and general knowledge about the possibilities of folding press/book sheets; Criticism and self-criticism students in order to develop their interpersonal skills through collaborative learning so that students were inclined to teamwork in graduate university studies.

Prerequisite for taking the course exam: completed lectures and exercises

**General And Specific Competence and learning outcomes of the course:**

Professional oral and written expression in Croatian and English; Application of basic and general knowledge in the analysis of technical-technological processes; Knowledge and identification of technological units' graphic production; Classification and explanation of actions and processes within technological units. Planning the sequence of process procedures in graphic technology; Assessment of the quality of the production process and evaluation of the final product; Assessment and selection of materials for a specific production process. Differentiation of the process of basic printing techniques and the application of professional knowledge in the selection of techniques considering the final product; Evaluation of reproduction, finishing and multimedia characteristics device.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture (definition of rights and duties of students, definition of literature) and introduction to course in such a way that students understand the complexity of designing a bookbinding product from idea to completion realization of the finished product (0.03ECTS). Introductory exercise (defining the rights and duties of students); verification of learning outcomes from the Printing course 1 (printing sheet design for binding units: book type and sheet of paper; basic differences between hard and soft cover books; basic differences between seamless and stitched forms of book binding; conceptually solution, design and realization of a bookbinding product (BLOK); designing the press sheet on to which the binding unit is a sheet of paper. Engineering approach in creating a work order for needs design of the bookbinding product (sketch/blueprint, technological scheme, materials used, tools), (0.25ECTS).
2. Conceptual solution, design and realization of the bookbinding product (MUK); printing design sheet for binding unit sheet of paper; designing a printing sheet for one-piece cardboard covers; seamless form of book binding. Engineering approach in creating a work order for design purposes bookbinding product (sketches/draft, technological scheme, used materials and tools), (0.24ECTS)
3. Competences (knowledge, skills) and personal expectations of the student from the course. Collaborative learning in small groups; creating a mental map; blitz colloquium testing general knowledge in graphic technology (13 tasks/techniques to think about and exchange in pairs); public discussion. (0.07ECTS) Conceptual

solution, design, and realization of a bookbinding product (Catalogue binding); designing of the printing sheet for the binding unit sheet of paper, designing the printing sheet for one-piece cardboard covers, seamless form of book binding, canvas tape design. Engineering approach to creating a work order for the design of a bookbinding product (sketch/draft, technological scheme, used materials and tools), (0.27ECTS).

4. Conceptual solution, design, and realization of a bookbinding product (College block); designing printing sheet for the binding unit sheet of paper, designing the printing sheet for page clippings cover, seamless form of book binding. Engineering approach in creating a work order for needs design of the bookbinding product (sketch/blueprint, technological scheme, materials used, tools), (0.17ECTS)
5. Binding design (general and engineering approach) and the importance of knowledge of materials in binding design; case study: making mental maps in small groups; presentation of works. Reflection: Designing the binding of a bookbinding product; blitz colloquium (20 tasks/technique think and exchange in pairs); public discussion. (0.27ECTS) Public presentation of works (block, MUK, catalogue binding, course block), the student presents his works lasting 10 minutes; experientially presents his practical and theoretical knowledge that he has learned in the course; product evaluation (1-10 points) follows the presentation by of students (0.30ECTS).
6. Checking the learning outcomes from the course Printing 1 (designing a binding unit book type for different book formats); design of a book set of minimum scope (4 pages) and design of the method additions (syllable to syllable, syllable to syllable, combined); designing a stitched binding form with a thread a book style of minimal scope is used; project sewing book block with needle and thread across lace (0.25ECTS).
7. Realization of the conceptual solution, design of the bookbinding product (cookbook, didactic picture book, Photo album). Case study; creation of mental maps in small groups of students; presentation and public discussion of works (0.20ECTS). Conceptual solution, design and realization of a bookbinding product for a sewn form of binding (thread, wire); designing different book formats (standing, tall narrow, square); book design block for hard binding for sewn forms (thread, wire through the spine, wire on the side of the spine), (0.33ECTS).
8. Revising the test print sheet for portrait, narrow tall and square formats for the binding unit book syllable. Implementation of professional and theoretical knowledge that students have acquired during designing soft bound books. Discussion on the way students work and instructions for performing the practical part classes (0.13ECTS).
9. Features of the stitched form of book binding. Implementation of acquired practical and theoretical knowledge on exercises; blitz colloquium (12 tasks: think and

exchange technique in pairs); public discussion works (0.13ECTS). Creation of three different stitched forms of book block binding for three different book formats; designing linings. Engineering approach in the creation of a work order for the needs of bookbinding design of the product (sketch/draft, technological scheme, used materials and tools), (0.10ECTS).

10. Verification of learning outcomes from the course Print 1 (designing multi-part hard covers); designing multi-part hard covers for three different stitched forms of binding according to the parameters of the book block. Engineering approach in creating a work order for the needs of designing a bookbinding product (sketch, technological scheme, used materials and tools), (0.12ECTS).
11. Designing multi-part hardcovers for seamless and stitched forms of book binding. Designing technological schemes for making a bookbinding product. Implementation of acquired practical and theoretical knowledge in exercises; blitz colloquium 19 tasks: think and exchange technique in pairs); public discussion works (0.17ECTS). Revision of model (multi-part hard cover). Implementation of professional and theoretical knowledge that is students gained while designing sewn binding forms and multi-part hard covers; experiences that are acquired using different bookbinding materials (cold glue, gauze, thread, wire, natron paper, flat cardboard. Discussion on the students' way of working and instructions for carrying out the practical part of the class (hardcover book), (0.17ECTS).
12. Gluing the book block into multi-part hard covers, pressing the books and evaluating the binding quality. Reflection on the achieved results of bookbinding (0.13ECTS).
13. Survey of the didactic picture book by students. Evaluation of the quality of realization of the conceptual solution and designing four bookbinding products of the same content and format, but different forms of binding, the final thesis of an undergraduate student. Filling in the questionnaire by students, an engineering approach to the evaluation of book binding quality. The questionnaire is an integral part of the experimental one part of the final paper (0.13ECTS). Public presentation of works (project sewing with book block thread, hard binding of a standing book format), the student presents his work for 10 minutes; experientially presents his own practical and legal knowledge that he learned at the course; product rating (1-10) follows presentations by students (0.17ECTS).
14. Students public presentation of works (stitched binding forms with wire, hard book binding for narrow tall and square format), the student presents his work for 10 minutes; experientially presents his practical and theoretical knowledge that he learned in the course; the evaluation of the product (1-10) follows after the presentation by students (0.17ECTS).
15. Lecture and exercises; Public presentation of works (seamless and stitched forms of binding; soft and hard binding books), students present their works for 15 minutes; experientially presents his own practical and theoretical knowledge that he learned in





A. Golden, Making handmade books: 100 bindings, structures & forms, Lark Crafts, New York, 2010.

H. Kipphan, Handbook of Print Media: Print finishing processes, Springer, Berlin, 2001

Optional: A. W. Johnson, The Thames and Hudson Manual of bookbinding, Thames and Hudson, London, 1998.

F. Mesaroš, Tipografski priručnik, Grafički obrazovni centar, Zagreb, 1985.

Name of the course: Quality control

Teacher: prof. PhD. Diana Milčić

Associate teachers:

Lectures (L): Milčić

Seminar (S):Milčić

Laboratory (LAB):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): Odaberite stavku.

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: VI

Possibility of teaching in English: Only for foreign students

Course objectives: Quality control course introduces students to the product and process control. Students will acquire knowledge on planning methods and tools to ensure quality in graphical industry. By the end of the course students will have ability to understand the criteria and standards of applied techniques and methods for assure quality of product, industrial process and any process in company.

Enrollment requirements: No

Prerequisite for taking the course exam: No

**General And Specific Competence and learning outcomes of the course:**

1. Critically evaluate contemporary concepts of quality. 2. Apply quality management tools and methods. 3. Apply statistical techniques for quality improvement and decision making. 4. Use statistical packages to monitor and evaluate process quality. 4. Estimate the appropriateness of the conclusions from the obtained data.

Course content (Syllabus) on a weekly basis:

1. Basic principles of modern quality control and basic terms in the quality field. Development of statistical methods of quality control. Quality definitions.
2. Quality costs. Control costs. Taguchi's philosophy. Taguchi loss function
3. Statistical methods of quality control. Analysis of normally distributed data. Analysis of non-normally distributed data

4. Process capability assessment and analysis. Process capability coefficients. Process stability
5. Choice of control method. Sampling and sampling plans.
6. Sampling plans for attributes. AQL, AOQL and LQ concept. Sampling plans according to HRN ISO 2859:1994
7. Mathematical basis of sampling plans. How to calculate the OC and AOQ curve points. Risk calculation. Supplier Quality Index (Bendix).
8. Sampling plans for variables. Sampling plans according to ISO 3950: 1982. s-method
9. Sampling plans for variables: R-method, sigma-method. Lot-plot test chart.
10. Introduction to SPC. Sensitivity of control charts. Application. Types of variations. Process "under control".
11. Control charts for variables. Shewhart control charts.
12. Control charts for attributes
13. Capability of the measurement system. Determination of R&R using control charts.
14. Quality improvement methods. FMEA analysis.
15. Quality control tools. Checklist. Pareto analysis. Brainstorming. Ishikawa diagram.

**Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment   
 Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Alternative choice tasks

Problem solving tasks

Multiple choice tasks

Connecting and arranging tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Loseph A. De Feo, Juran's Quality Management and Analysis, 2014.; Nancy Tague, Quality toolbox, ASQ Quality Press, Wisconsin 2005; Donna C.S. Summers, Quality, Prentice Hall, New Jersey, 2003

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Small printing techniques

Teacher: assoc. prof. PhD. Igor Majnarić

Associate teachers:

Lectures (L): assoc. prof. PhD. Igor Majnarić

Seminar (S):-

Laboratory (LAB):PhD. Igor Majnarić; PhD. Irena Bates; PhD. Krešimir Dragčević

Type of instructions (L- lectures; S- seminars; LAB -laboratory): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 6

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: VI

Possibility of teaching in English: No

Course objectives: Students deepen the theoretical foundations based on technologies that are not only used in the graphic industry but also have applications in other industrial branches. Therefore, in the graphic industry, it will be used primarily for printing and for generating special graphic products. The course also deals with printing techniques that are capable of achieving high-quality printing on substrates with different chemical compositions (plastics, ceramics, glass, metals, and textiles). The lectures will provide knowledge about all printing techniques that are not common in commercial printing houses, specifically the technique of book printing, screen printing, pad printing, light printing, steel-relief printing, and limo printing. In other words, the course will analyze in more detail the methods of printing on non-standard printing substrates, while applying special printing inks. Students are introduced to the design features of screen printing and pad printing machines, which can print not only on flat surfaces but also on spherical surfaces in thick deposits (crucial for the creation of prints exposed to external atmospheric conditions). During the course, various problems caused by the unwanted interaction of printing substrates and printing inks are pointed out, together with other factors that can be found in the working environment. In addition to screen printing and pad printing, students will independently create prints using letterpress, and steel-relief printing, creating numerous decorative effects (embossing, segmental cutting, foil printing) that are an integral part of exclusive cardboard packaging. At the end of the course, students will theoretically process the basic representatives of alternative digital printing, the application of which is based on a connection with a computer and the creation of a print without the use of standard printing forms. The generated prints on the exercises will be compared with each other, applying various measurement methods to evaluate the print forms and the quality of the reproductions. The evaluation will be performed using

advanced methods of image analysis, with a standard comparison based on densitometric, colorimetric, and spectrophotometric measurement methods.

Prerequisite for enrolling in the course: Attended course Main techniques of printing

Prerequisite for taking the course exam: -

**General And Specific Competence and learning outcomes of the course:**

1. application of graphic engineering knowledge in the field of functional applications, and the ability to apply screen printing and pad printing as relevant printing techniques on different materials. 2. synthesis of knowledge for the implementation of quality control with a detailed analysis of the working procedures of all relevant representatives of specialized decorative printing, as well as assessment and determination of the adequacy of application for other industrial applications (textiles, auto industry...). 3. proposing new and functional solutions for graphic products with critical judgment when choosing consumables (specificity of printing substrates and dyes) to achieve optimal application. 4. development of functional packaging models and rational judgment of quantitative and qualitative profitability of applying "small" (decorative) printing techniques. 5 students will be able to recognize the most important techniques of decorative printing and determine the best one, taking into account the visual effect and productivity in production. 6 after passing the course, students will be able to explain in detail all construction variants of specialized printing machines (screen printing, pad printing, steel-relief printing, sheet printing, light printing, book printing, lenticular printing, holographic printing), together with the basic processes that take place during the generation of a print. This alone will allow for quantitative and qualitative evaluation. 7. for two printing techniques that print on different materials (screen printing and pad printing), students will be able to prepare printing forms and print them with the desired adjustment of the viscosity of the dye. 8. students will be able to critically select adequate consumables (printing base and dyes) for the needs of decorative printing, and accordingly achieve optimal print quality. 9. based on the theory and practice acquired during lectures and exercises, the student will be able to independently evaluate reproduced prints using densitometric and colorimetric measurement methods.

**Course content (Syllabus) on a weekly basis:**

1. Introductory lecture (def. rights and duties of students, def. seminar on small print techniques, def. literature)

Introductory exercise (def. rights and duties of students, def. necessary equipment and literature)

2. Decorative printing systems based on letterpress printing techniques. The difference between manual and typesetting is the preparation of illustrations. Horizontal and vertical pressure preparation. Principles of operation of the fleet and high-speed book printing machines. (0.25 ECTS)

Preparation of paper for printing. Description of the paper conditioning process and air conditioning of the printing area. Effect of humidity on paper. (0.25 ECTS)

3. Systems of decorative printing based on the principle of letterpress printing. Printing using a heated cliché and metalized foil. Construction of shutter and high-speed printing machines adapted for printing with heated foil. Production of finishing processes of grooving, cutting, perforating, and numbering directly on printing machines. (0.25 ECTS) Preparation of dyes for printing. Determining the basic properties of offset ink. Laws of subtractive mixing of transparent dyes. Raster mixing of dyes. Moare. (0.25 ECTS)
4. Lettersetr-dry offset. Principle of operation and characteristics of high offset printing. Jobs printed in this printing technique. Comparisons with book printing and lithographic offset. Carbon printing. Jobs and opportunities. Widespread technique. (0.25 ECTS)Preparation of dyes for printing. Methods of mixing tones in printing. Laboratory mixing of spot shade. Comparison of transparent and covering dyes. (0.25 ECTS)
5. The principle of screen printing. Possibilities of screen printing technique. Screen printing area. Distribution by a degree of automation. Sieve frames. Characteristics of sieves made of natural fiber, synthetic fiber, and metal fiber. Tensioning the sieve on the frame. Template placement. The selection of the template follows the material from which the screen is made, the solvent, and the printing substrate. (0.25 ECTS)

Introduction to screen printing. Preparing the frame, and selecting grids for the printed form. Mounting the screen on the printing machine. (0.25 ECTS)

6. The quality of screen printing prints depends on the quality of the screen mesh. Screen printing squeegees. Preparation of printing substrates and dyes in screen printing. Manual screen printing devices. Printing on semi-automatic machines. Printing on fully automated screen printing machines. Rotary screen printing. Drying prints in screen printing. Printing with special dyes. (0.25 ECTS) Preparation of dyes for screen printing. Selection of screen printing media. Preparation of flatbed screen printing machine. Monochrome printing in the screen printing technique. Drying prints. (0.25 ECTS)

## 7. COLLOQUIUM

8. Working principle of steel relief printing. Area of work of steel relief printing. Possibilities of making a matrix. Creation of a stamp following the printing substrate of the given final product. Printing substrates and dyes for steel relief printing. Handheld devices. Semi-automatic machines. Full automatons. Preparation of automatic printing machines. Print run. Drying prints. (0.25 ECTS)

Introduction to pad printing. Creation and selection of printing pads. Creation and selection of clichés for printing in pad printing.

Preparation of the printing surface for pad printing. (0.25 ECTS)



9. Working principle of indirect gravure printing = pad printing. Pad printing jobs and opportunities. The principle of pad printing using Indirect screen printing. Printing forms for tampon printing. Tampons. Dyes and printing media. Multicolor pad printing. Rotary pad printing. (0.25 ECTS)

Preparation of dyes for pad printing. Preparation of monochrome semi-automatic pad printing machine. Monochrome printing in the pad printing technique. Drying prints and cleaning the printing system. (0.25 ECTS)

10. Lithography = a printing technique used exclusively for the creation of art reproductions. The principle of lithography. Devices and technical possibilities. Sheet metal printing in the wet offset technique. Machines for sheet metal printing. Preparation of the printing substrate for printing. Dyes for litho printing. Test print. Drying prints. (0.25 ECTS)

Introduction to steel relief printing. Preparation of the matrix for printing. They make a pater plate made of a pile of cardboard. Printing and generating a relief print on a manual press. (0.25 ECTS)

11. Light printing, a technology that produces the highest quality graphic prints. Characteristics printing forms for light printing. The principle of making colors without raster. Matching the preparation with the impressions. Qualification of executor. Preparation of the printing form for printing by the machinist. Dyes and printing substrates for photolithography. Light printing machines. Area of activity and its profitability. (0.25 ECTS)

Creation of finishing processes in the technique of book printing. Adjusting the paper transport. Horizontal closing of the printing form with elements for perforating, creasing, and cutting. Performing the numbering process in the book printing technique. (0.25 ECTS)

12. Ink-jet digital printing. Inkjet printing using piezoelectricity. Thermal ink-jet digital printing. Ink-jet digital printing with the help of static electricity. (0.25 ECTS)

Thermal foil printing in the book printing technique. Mounting cliches on the heater. Horizontal closing of the printing form.

Mounting the foil, adjusting the draft value, and printing. (0.25 ECTS)

13. Digital direct printing with powder and liquid toners. The principle of creating an electrophotographic image and a color electrophotographic print. (0.25 ECTS)

Introduction to digital printing. Preparation of files for digital printing. Ripping and adjusting files for printing. Printing and organization of work on electrophotographic machine HP Indigo TurboStream. (0.35 ECTS)

14. Printing of graphic holograms. The principle of realizing the third dimension of the print. Preparation of forms by classical procedure and computer. Production of the printing form. Printing pads for making graphic holograms. Hologram printing



## **References**

Required: H. Kipphan, Hand Book of Print Media, Springer, Berlin, 2001.

Priručnik za sitotiskare, Sefar AG, (Prijevod Kristina Bedić), Hrvatska Udruga Sitotiskata, Zagreb, 1999. S. Hoff, Screen Printing: Contemporary Approach, Delmar Publisher, 1997.

G. A. Nathmann, Nonimpact Printing, Graphic Arts Technical Foundation, Pittsburgh, 1989.

Optional: -

Name of the course: Composition

Teacher: asst. prof. PhD. Tajana Koren Ivančević

Associate teachers:

Lectures (L): Tajana Koren Ivančević

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Tajana Koren Ivančević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+0+2

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: VI

Possibility of teaching in English: Only for foreign students

Course objectives: Students will learn to program text display for print and digital media. Text programming for printed media is performed through PostScript. Character envelope programming. Programming repeating text with the introduction of variables that change their values through a loop. Text programming by given path. Changes on each letter character. Positioning and alignment of text. Filling letters with other elements. Text programming for the web. Introduction of individualized fonts on web pages. Text styling, alignment and positioning. Animation text through HTML and CSS. Character display programming through ActionScript. Possibility of manipulation of the appearance of letters by introducing random numbers. Text input in SVG. Text animation in SVG technology. The possibility of choosing a medium for displaying typography.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: fulfilling obligations in laboratory exercises

**General And Specific Competence and learning outcomes of the course:**

The student will be able to distinguish the media in which typography appears. The student will be able to program the way the typography will be displayed in the print medium. The student will be able to program a way to which typography will be displayed on the web. The student will be able to distinguish and define individual webs technologies for displaying typography. The student will be able to implement typography in animation.

Course content (Syllabus) on a weekly basis:

1. Programming text appearance for print media through PostScript. Checking the programmed text through the GS View browser (0.2 ECTS)
2. Programming text repetition using loops. Introduction of variables. (0.3 ECTS)
3. Filling the letter characters with other elements. Filling the letter path with other elements (0.2 ECTS)
4. Programming the path along which the text is displayed. Manipulation of each character separately. (0.2 ECTS)
5. Text manipulation through random numbers.

Exercises - colloquium (0.5 ECTS)

6. Programming text for display on the web using HTML and CSS (0.2 ECTS)
7. Text styling through CSS. (0.2 ECTS)
8. Transforming text on the web. (0.2 ECTS)
9. Animating text on the web using HTML and CSS (0.2 ECTS)
10. Animating text through ActionScript

Exercises - colloquium (0.5 ECTS)

11. Text manipulation through ActionScript and random numbers. (0.2 ECTS)
12. Displaying text on the web through SVG. (0.2 ECTS)
13. Text animation through SVG. (0.2 ECTS)
14. Interactivity in SVG by mouse over and click (0.2 ECTS)
15. Programming text in SVG using gradients and filters.

Exercises - colloquium (0.6 ECTS)

**Format of instructions:**

- |  |   |  |
|--|---|--|
| lectures <input checked="" type="checkbox"/>               | laboratory <input type="checkbox"/>                         | online <input checked="" type="checkbox"/>           |
| seminars and workshops <input type="checkbox"/>            | multimedia and internet <input checked="" type="checkbox"/> | field work <input type="checkbox"/>                  |
| exercises on computers <input checked="" type="checkbox"/> | independent assignments <input checked="" type="checkbox"/> | work with mentor <input checked="" type="checkbox"/> |
| other: <input type="checkbox"/>                            |   |  |

**Monitoring of students' work:**

- |   |                                   |                                  |  |
|---|-----------------------------------|----------------------------------|--|
| attending classes <input checked="" type="checkbox"/> | research <input type="checkbox"/> | project <input type="checkbox"/> | practical work <input checked="" type="checkbox"/> |
|---|-----------------------------------|----------------------------------|--|

activities in class       test report       oral exam       portfolio   
seminar work       experimental work       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks       | <input checked="" type="checkbox"/> Multiple choice tasks |
| <input checked="" type="checkbox"/> Alternative choice tasks | <input type="checkbox"/> Connecting and arranging tasks   |
| <input checked="" type="checkbox"/> Problem solving tasks    |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Students take three colloquiums during the semester. The written part of the exam can be waived by colloquiums.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Pap, Klaudio; Žiljak, Vilko. Digitalni udžbenik PostScript grafike . Zagreb : FS, 2002. (priručnik). Žiljak, Vilko; Pap, Klaudio. Postscript programiranje. Zagreb : FS d.o.o., 1999. (priručnik). <http://www.w3schools.com/> <http://www.w3.org>

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Bookbinding 1

Teacher: assoc. prof. PhD. Suzana Pasanec Preprotić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): senior researcher PhD. Gorana Petković

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2L+2LAB

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: VI

Possibility of teaching in English: Yes

Course objectives: Students should understand and be able to explain the technical-technological process of book binding according to the criteria its content, i.e. purpose. Students should be able to recognize the basic types of book covers and classify them with respect to the performance of the binding of the book block, they should be able to describe and evaluate the advantages and material defects that have a direct impact on the quality of the final product. Students need be able to interpret and propose actions and processes within technological units in a book bindery. Is expected that after following this course students will be able to choose the best possible option in a real situation of the technical-technological solution of the binding of the book, that it will represent those opinions that will be in operation materials and process procedures. It is expected that collaborative learning (in small groups), u a certain part of the course, contribute to synthesizing the overall knowledge of the subjects that the students have listened to (Chemistry in graphic technology, Printing 1 and Paper) and Graphic machines 2, which they listen to on undergraduate university study of graphic technology. In this way, students will be trained for application of the case analysis method that will enable them to acquire the necessary engineering, social and communication skills. In this way, students will be able to predict, formulate and develop new solutions in bookkeeping.

Enrollment requirements: Prerequisite for enrolling in the course: Basic, general and professional knowledge of technical and technological printing processes are directly in the function of bookbinding production; basic and general knowledge about papers that have a large participation in the classification of book binding performance; basic and general knowledge about other bookbinding materials that are important in bookbinding production; basic and general knowledge of physical chemistry which contribute to the understanding of chemical processes in the evaluation of the quality of book binding in interaction paper with

glue; basic and general knowledge about the working principles of bookbinding machines and the possibility increasing work results through their implementation (line production); analysis of different approaches bookbinding production with regard to the circulation of the publication; student's criticality and self-criticism in order to their interpersonal skills were developed through cooperative learning - so that students would be inclined team work at graduate university studies.

Prerequisite for taking the course exam: completed and colloquial exercises

### **General And Specific Competence and learning outcomes of the course:**

Students will be able to classify books according to their purpose; know how to suggest the type of import unit within technological units with regard to the edition and the form of the binding of the book; know how to identify machines in bookbinders and implement them within technological units; know how to shape a concrete technological binding scheme of the bookbinding product (pad, picture book, monograph, colour sample,...); know how to question total technical and technological resources that should be in function of the quality of the bookbinding product; knowing evaluate the technical-technological process of a certain type of product (block, catalogue, monograph, picture book) on a real example.

Course content (Syllabus) on a weekly basis:

1. Introductory lecture (definition of rights and duties of students, definition of literature) and introduction in bookkeeping, in general (0.07ECTS). Introductory exercise (defining the rights and duties of students); classification of the type of binding according to the purpose of the book; case analysis - creation of mental maps (collaborative learning in small groups), (0.07ECTS).
2. The role of the cutting process in bookbinding; objective-type tasks for evocation and reflection (ERR teaching framework); creating an individual mental map for homework (0.13ECTS). Getting to know the types of import units; the use of import units in technical-technological process for different forms of book binding: case analysis - creation of mental maps in cooperative learning (0.13ECTS).
3. The role of the folding process in bookbinding; objective-type tasks for evocation and reflection (ERR teaching framework); creating an individual mental map for homework (0.17ECTS). Getting to know the types of import units; the use of import units in technical-technological the process for different forms of book binding; case analysis - creation of mental maps and task problem solving (collaborative learning) (0.20ECTS).
4. The role of the addition process in bookkeeping; objective-type tasks for evocation and reflection (ERR teaching framework); creating an individual mental map for homework (0.13ECTS). Map design; performance planning and selection of graphic materials for different packaging shapes of protective folders/boxes for bookbinding products and design features one-piece cardboard covers; case analysis - creation of mental maps (collaborative learning), (0.17ECTS).



5. Forms and types of bookbinding; objective-type tasks for evocation and reflection (ERR-frame teaching); creating an individual mental map for homework (0.20ECTS). Designing folding methods for portrait/landscape, square, narrow-tall book format; performance simulations of binding unit cutting - "trimming on three sides", determining the cutting line and binding on the press sheet, determining the direction of the fiber flow in the binding unit; analysis cases (making patterns), multiple problem-solving tasks (0.23ECTS).
6. The role of materials in bookkeeping; objective-type tasks for evocation and reflection (ERR-frame teaching); creating an individual mental map for homework (0.25ECTS). Designing the method of assembly with regard to the type and scope of the binding unit, and the form of the binding books; case analysis (evaluation of bookbinding products), multiple solving tasks of problems (0.15ECTS).
7. Colloquium I. (objective-type tasks - individually) (0.25ECTS). Designing the method of assembly with regard to the type and scope of the binding unit, and the form of the binding books; case analysis (evaluation of bookbinding products), multiple solving tasks of problems (0.15ECTS).
8. Criterion for choosing the form and type of binding regarding the amount of bookbinding product (craft and publisher's binding); design of binding form in correlation with types and interactions of materials (paper, adhesive), and for the purpose of books; objective type tasks and solving tasks problems/evocation and reflection (ERR-teaching) (0.20ECTS). Designing the assembly method with regard to the type and scope of the binding unit and the form of the binding books; case analysis (evaluation of bookbinding products), multiple solving tasks of problems (0.15ECTS).
9. Visiting experts from the field of bindery production (graphic arts economy); participation students in discussion; connecting the acquired knowledge in class and revising the same in a discussion with expert with the aim of creating new ideas and solutions (0.17ECTS). Part I - Designing book binding forms: seamless, stitched, mechanical; designing the type of binding books: hard, soft and mechanical; features and differences between manual and publisher binding of a book; criterion for selecting the form of binding with regard to the type of binding unit; multiple solving tasks problems in small groups (0.17ECTS).
10. Differences between publishing and manual binding; the specifics of manual binding in the publishing house production of books; systematization of technical-technological operations regarding types and forms book binding, and binding unit; case analysis (evaluation of bookbinding products), multiple problem-solving tasks (0.25ECTS). Part II - Projecting the book with regard to its content (purpose); general systematization terms for different technical-technological units in the bookbinding process; designing technical-technological units depending on the circulation of books; multiple problem-solving tasks in small groups (0.17ECTS).

11. Features of technological units in bookbinding. Designing bindery processes based on knowledge of resources. Case analysis (evaluation of bookbinding products), multiple problem-solving tasks (0.20ECTS). Part III - Designing books for different purposes in correlation with the choice of material (type of paper). Designing technical-technological units for different types of binding when content, scope and form the binding of the book remains unchanged in the same edition. Assessment of the quality of the type and form of binding books. Multiple problem-solving tasks in small groups (0.15ECTS).
12. Optimizing the bookkeeping process; design and planning of technical and technological processes in the purpose of achieving efficient and economically profitable bookbinding production, with optimal consumption of raw materials and labour; case analysis (evaluation of bookbinding products), multiple problem-solving tasks (0.20ECTS). Part IV - Assessment of the quality of the seamless and stitched form of book binding; criteria for selecting the type of paper s considering the purpose of the book; the criterion for choosing the form of binding regarding the properties of the paper used to make a book block; multiple problem-solving tasks in small groups (0.20ECTS).
13. Repetition of the material and preparation for the colloquium (0.11ECTS). Repetition of material and implementation of acquired knowledge through solving problem tasks and tasks based on case analysis. Part 1 - Designing different bookbinding products depending on the purpose (case studies), (0.11ECTS).
14. Colloquium II. (Problem solving tasks/mental map-in pairs), (0.15ECTS). Part 2 - Preparation for the colloquium (designing technical-technological units for different types and form of book binding), (0.25ECTS).
15. Evaluation of the results of colloquium II.; oral examination of the knowledge of students who are dissatisfied grade; evaluation according to the created rubric (criteria for evaluation); process evaluation teaching (survey by students), (0.06ECTS). Colloquium – case analysis (design of only one bookbinding product); evaluation colloquium results; oral examination of the knowledge of students who are dissatisfied with the grade; evaluation according to the created rubric (criteria for evaluation); evaluation of the teaching process (survey by students), (0.16ECTS).

#### **Format of instructions:**

- |   |   |   |
|---|---|---|
| lectures <input checked="" type="checkbox"/>    | laboratory <input checked="" type="checkbox"/>              | online <input type="checkbox"/>           |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/>            | field work <input type="checkbox"/>       |
| exercises on computers <input type="checkbox"/> | independent assignments <input checked="" type="checkbox"/> | work with mentor <input type="checkbox"/> |
| other: <input type="checkbox"/>                 |   |   |

#### **Monitoring of students' work:**

attending classes       research       project       practical work   
activities in class       test report       oral exam       portfolio   
seminar work       experimental work       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Guessing and completion tasks | <input checked="" type="checkbox"/> Multiple choice tasks          |
| <input checked="" type="checkbox"/> Alternative choice tasks      | <input checked="" type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks         |  |

Other:

**Assessment and evaluation of students' work during classes and on the final exam:**

Colloquium (exercises) - evaluation of problem-solving and decision-making skills  
(individual)/Study case Colloquium (lecture) - evaluation of problem-solving and decision-making skills (in pairs) - Mind Map/Case Study

Other

**Teaching process evaluation:** Evaluation by students (Survey)

**Student evaluation (survey)**

Other: Creation of rubrics in which evaluation criteria are determined (scale of 1 - 4)

**References**

Required: Kipphan, „Handbook of Print Media: Print finishing processes“, Springer, Berlin, 2001.

Nastavni materijali na webu Katedre za knjigoveštvo i ambalažu, link:

<http://dorada.grf.unizg.hr/pages/kolegiji/knjigovestvo-1/nastavni-materijali.php>

Nastavni metrijali na <http://moodle.srce.hr/2014-2015/my>

T.J. Tedesco, „Binding, Finishing, Mailing“, GATF Press, Pittsburg, 1999. G. Novak, „Grafični materijali“, Univerza v Ljubljani Naravoslovnotehniška fakulteta, Ljubljana, 2004.

Optional: A. Pizzi, K. L. Mittal, „Handbook of Adhesive Technology“, M. Dekker, New York, 2003.

M. Southworth, D. Southworth, „Quality and Productivity in the Graphic Arts“, Graphic Arts Publishing, New York, 1990.

M. T. Roberts, D. Etherington, „Bookbinding and the conservation of Books“, Library of Congress, Washington, 1982.

Name of the course: Graphic Design 2

Teacher: prof. PhD. Maja Brozović

Associate teachers:

Lectures (L): prof. PhD. Maja Brozović

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):asst. prof. PhD Josip Bota, asst. prof. PhD Dorotea Kovačević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 1+0+3

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: VI

Possibility of teaching in English: Only for foreign students

Course objectives: To obtain the knowledge and acquire the know-how in designing a visual message with respect to specific features of particular graphic media and the corresponding graphic-editorial practice. In the framework of the course students will learn how to organize visual forms into functional visual systems of particular graphic media. Students will analyse specific features of each graphic media in regard to the type and intent of the message, its character/nature and form, as well as technical and technological limitations of each media type in presenting messages. Students are requested to offer the best solutions for presenting this information through various types of graphic media based on the given input. Through active participation in the course lectures and practical application of the presented principles students will get acquainted with characteristics of newspapers and magazines as key representatives of periodical graphic media, picture books as specific educational and entertainment type of media whose visual structure is adjusted to a particular age group, and posters as a representative of outdoor advertisement media.

Enrollment requirements: Basic level work in graphic computer programs for image and text processing

Prerequisite for taking the course exam: Attended lectures, finished all exercises, submitted all works designed and realized on exercises in printed form and digital form in the Merlin system

**General and Specific Competence and learning outcomes of the course:**

- create a conceptual sketch of the hierarchy of optical values of the relationship between the structural elements of the newspaper page

- organise visual hierarchy of information on predefined newspaper format
- planning a coherent system of magazine layout design
- organising grid systems for various magazine content
- suggesting design solutions for effective advertisement communication
- ability of combining aesthetic and technological factors in presenting visual messages by means of outdoor advertisement media
- illustrating and designing picture-book as an educational graphic media format

Course content (Syllabus) on a weekly basis:

1. Organization of the visual structure of the newspaper page  
Sketching the visual structure of the newspaper page with regard to the defined number of articles - raster page (0.27 ECTS)
2. Organization of the visual hierarchy of information of the newspaper page  
Design a visual hierarchy of articles on a newspaper page based on a sketched raster (0.27 ECTS)
3. Designing another newspaper page while maintaining defined parameters (margins, number of columns, text styles, etc.)  
Design the left/right newspaper pages that will form a single entity with the page from the previous exercise (0.27 ECTS)
4. Monochrome newspaper printing: possibilities and limitations in creating information hierarchies  
Design a monochrome newspaper page in relation to the obtained number and importance of articles using the defined parameters from the previous exercise (0.27 ECTS)
5. Newspaper cover page - persuasive communication  
Design the cover page of the newspaper from the obtained number of information with a focus on persuasive communication (0.27 ECTS)
6. Magazine as a graphic media: definition, types of magazines, design specifics  
Present the visual structure of one thematic unit of the magazine through a certain number of pages (0.27 ECTS)
7. Types and application of grid system in thematic unit design of magazines  
Sketch grid system for the journal according to different thematic units (0.27 ECTS)
8. Consistency of the visual hierarchy of individual thematic units with a grid system  
Design two pages of different thematic units and apply different grids while maintaining the visual recognition of the magazine (0.27 ECTS)
9. Introductory pages of the magazine, specifics in the design and presentation of information



Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

The mean value of all grades of practical works realized in exercises, activities in lectures and exercises.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Kliknite ili dodirnite ovdje da biste unijeli tekst.

- R.D. Zakia: Perception and Imaging, Focal Press, New York, 2001.
- G. Ambrose, P. Harns: The Fundamental of Graphic Design, Ava Publishin, Lausanne, Switzerland, 2009.
- A. Twelow: What is Graphic Design for?, RotoVision SA, Mies, Switzerland, 2006.

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Original graphic I, II, III, IV

Teacher: doc.art .Josip Jozić

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB): Josip Jozić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: Josip Jozić

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Winter

Semester number: III, V

Semester: Summer

Semester number: IV, VI

Possibility of teaching in English: Yes

Course objectives: This teaching subject refers to the so-called original graphic techniques today primarily in the use of artistic expression. The specific language of original graphics, as well as other technologies of pretext systems, is a matter of personal choice in designing graphic media and graphic products. This is the goal of this teaching subject, as well as in the humanistic dimension of the foundations of the practical content of historical sources and culture of the profession.

Enrollment requirements: [Kliknite ovdje da biste unijeli tekst.](#)

Prerequisite for taking the course exam: The exam can only be accessed by students who have attended complete exercises and successfully completed them and submitted a complete map of the works. The consistency of sketches and performances, performance and originality of the idea are assessed. The overall grade of the course represents the sum of the grades of all papers.

**General And Specific Competence and learning outcomes of the course:**

The specific language of this course, as well as other technologies of presentation systems of original graphics, refers to letterpress printing techniques: linocut. In practice, students get to know black and white linocut in the graphic technique itself, and the preparation of a sketch for a specific technique. In the gravure printing technique, metal printing forms and etching press - and the mechanical dry needle method. The content refers to original graphics that use chemical methods to create a printing form (matrix). In practice, etchings and aquatints are made from these techniques. In the subject, students get to know another technique of original graphics that uses the chemical method of creating a printing form, the reserveage. Students also get to know the usual combinatorics of original graphics (e.g. aquatint + dry needlig).



Course content (Syllabus) on a weekly basis:

1. Preparation and elaboration of working sketches
2. Selection of working sketches and correction of sketches
3. Transfer of sketches to the form
4. Preparation of the form for making an impression
5. Cutting and preparation of paper
6. Preparation of paint and colouring of the form
7. Test print
8. Correction and refinement of the form
9. Test print
10. Printing of editions of 5 prints
11. Drying prints
12. cropping prints
13. cropping and signing of copyright prints
14. evaluation of works
15. Storing copyright prints in the works folder

**Format of instructions:**

lectures                       laboratory                       online   
seminars and workshops                       multimedia and internet                       field work   
exercises on computers                       independent assignments                       work with mentor   
other:

**Monitoring of students' work:**

attending classes                       research                       project                       practical work   
activities in class                       test report                       oral exam                       portfolio   
seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment   
Objective-type tasks (multiple items can be selected):

Guessing and completion tasks

Multiple choice tasks

Alternative choice tasks

Connecting and arranging tasks

Problem solving tasks

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

Checking and evaluating work assignments during the semester and handing in the folder, which includes work sketches and author's prints.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** The specific language of original graphics, as well as other technology of presentation systems, is a matter of personal choice of motifs, artistic expression, and the skill of creating author's prints. Only students who have attended the complete exercises and successfully completed them and submitted a complete portfolio of works can take the exam. The compatibility of the sketches and the performance, the execution and the originality of the idea are evaluated. The overall grade of the course represents the sum of the grades of all papers.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Dž. Hozo: Umjetnost multioriginala, Prva književna komora, Mostar, 1988.

Optional: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Name of the course: Printing and design

Teacher: prof. PhD. Nikola Mrvac

assoc. prof. PhD. Mile Matijević

Associate teachers:

Lectures (L): prof. Ph.D. Nikola Mrvac; Assoc. Ph.D. Mile Matijević

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Assoc. Ph.D. Mile Matijević; M.Sc. Ivan Pučić

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: IV

Possibility of teaching in English: No

Course objectives: The goal of the course is to enable students to acquire professional competences related to various printing possibilities and different design solutions. In accordance with the above, the focus of the course content is directed towards the study of the diversity of printing conditions and possibilities about the diversity and specificity of individual printing solutions.

Enrollment requirements: Basics of working on a computer in a web 2.0 environment.

Prerequisite for taking the course exam: Class activity, online activity, project assignments, portfolio, presentation of completed activities.

**General And Specific Competence and learning outcomes of the course:**

Students will be able to: 1) create and adapt a design for a specific graphic product, taking into account the various printing possibilities 2) prepare and organize everything necessary to enable the printing of a graphic product 3) qualitatively evaluate different design solutions with regard to the printing possibilities 4) to standardize certain tasks when creating the design of certain graphic products in accordance with the possibilities of printing 5) to present and explain the advantages and disadvantages of certain design solutions, taking into account the available printing technology.

Course content (Syllabus) on a weekly basis:

1. Analysis of possibilities and relationships of individual printing techniques and design solutions. (0.27 ECTS)

2. Relationships between the format of the finished graphic product, the printing technology, the format of the printing machines, the design solution, and the price of the final product. (0.27 ECTS)
3. Economic comparisons of products made in different printing techniques. (0.27 ECTS)
4. Raster reproduction in print. Relationships between types and characteristics of raster, printing techniques and design solutions. (0.27 ECTS)
5. Problems in printing considering different design solutions. (0.27 ECTS)
6. Adaptation of documents for printing. Optimization of the document for printing. Characteristics of documents for printing. (0.27 ECTS)
7. Psychophysical effects. (0.27 ECTS)
8. Background psychophysical effects. Induction. Wrinkling. Expanding. (0.27 ECTS)
9. Adaptational psychophysical effects. (0.27 ECTS)
10. Determining the order of printing in individual print formats. Determining binding lines (back), cutting before and after printing, folding, frontal and side marks, and angles for the bookbinder. Margin size calculation. (0.27 ECTS)
11. Effects that induce the illusion of movement. (0.27 ECTS)
12. Geometrically structural effects of the illusion of rotational movement. (0.27 ECTS)
13. Presentation of the graphic project. A new approach to presentations. (0.27 ECTS)
14. Methods of collecting and analyzing information. Types of organizational structures of the presentation. (0.27 ECTS)
15. Topics chosen by students. (0.27 ECTS)

### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:   
 e-learning, web 2.0 technologies

### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio

seminar work  experimental work  continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: Evaluation of all student activities; seminar work, project tasks, research, presentations, and all other activities that are related to the obligations related to the course and the realization of the expected learning outcomes.

**Assessment and evaluation of students' work during classes and on the final exam:**

Kliknite ili dodirnite ovdje da biste unijeli tekst.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Student evaluation (survey)**

Other: Evaluation of all activities that are recorded, analyzed and improved after each semester, according to the interests and specific needs of each generation. Quality monitoring includes analysis and evaluation of student achievements, seminar papers, project tasks, research activities, presentations and all other activities that are related to the obligations related to the course and the achievement of the expected learning outcomes.

**References**

Required: Nikola Mrvac, Predavanja i vježbe iz kolegija Tisak i dizajn, [www.eva-sms.net](http://www.eva-sms.net), Milković, Mrvac, Vusić, Vizualna psihofizika, Veleučilište u Varaždinu, Varaždin, 2010. Weissman Jerry, Prezentacijom do uspjeha, Mate, Zagreb 2010

Optional: Additional readings, [www.eva-sms.net](http://www.eva-sms.net)

Name of the course: Applied photography 1

Teacher: asst. prof. PhD. Miroslav Mikota

Associate teachers:

Lectures (L): asst. prof. PhD. Miroslav Mikota

Seminar (S):-

Laboratory (LAB): asst. prof. PhD. Miroslav Mikota; Teo Žeželj,  
mag.ing.graph.tech. Ivana Pavlović, mag.ing.graph.tech.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Mandatory

Semester: Summer

Semester number: VI

Possibility of teaching in English: Only for foreign students

Course objectives: After studying the material and performing the exercises, the student will be able to choose and use equipment for recording and processing photos, shoot basic photographic motifs and motifs of the basic areas of applied photography, define, describe and analyze the basic technical and syntactic properties of photography.

Enrollment requirements: -

Prerequisite for taking the course exam: Photo upload, photo evaluation, portfolio.

**General And Specific Competence and learning outcomes of the course:**

After learning, the student will be able to demonstrate knowledge and understanding in the field of photography, use a camera and additional recording equipment, apply his knowledge and understanding in capturing basic photographic motifs and basic motifs of applied photography, apply and demonstrate his knowledge and understanding in the basic processing of photography, apply and demonstrate your knowledge and understanding in basic knowledge of the technique and syntax of photography, apply and demonstrate your knowledge and understanding in the evaluation and selection of photographs.

Course content (Syllabus) on a weekly basis:

1. Introduction, development of photographic technique; Introduction to the practical part
2. Photographic camera; Getting to know the parts of the camera, different types of cameras
3. Lenses; Getting to know different types of lenses and their characteristics

4. Additional equipment of the photographic camera; Familiarization with additional equipment for photography
5. Basics of photography; Depth of field, movement
6. Basic approach to lighting; Basic lighting setup schemes
7. Fundamental specifics of the digital photographic system; Basics of work in a digital photography laboratory
8. Basics of classic photographic systems; Basics of work in a classic photographic laboratory
9. Basics of photographic syntax; Basic rules of photographic syntax when shooting
10. Access to basic photographic motifs 1; Still life
11. Access to basic photographic motifs 2; Portrait
12. Basics of newspaper photography; Photo news
13. Basic propaganda and advertising photos; Technical photography, catalog photography
14. Semantics of photography; Semantics of captured photos
15. Basics of evaluation and selection of photos; Photo evaluation and portfolio creation

**Format of instructions:**

- |   |   |  |
|---|---|--|
| lectures <input checked="" type="checkbox"/>    | laboratory <input checked="" type="checkbox"/>              | online <input checked="" type="checkbox"/>           |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/>            | field work <input checked="" type="checkbox"/>       |
| exercises on computers <input type="checkbox"/> | independent assignments <input checked="" type="checkbox"/> | work with mentor <input checked="" type="checkbox"/> |
| other: <input type="checkbox"/>                 |   |  |

**Monitoring of students' work:**

- |  |  |  |  |
|--|--|--|--|
| attending classes <input type="checkbox"/>   | research <input type="checkbox"/>          | project <input type="checkbox"/>                                     | practical work <input checked="" type="checkbox"/> |
| activities in class <input type="checkbox"/> | test report <input type="checkbox"/>       | oral exam <input type="checkbox"/>                                   | portfolio <input checked="" type="checkbox"/>      |
| seminar work <input type="checkbox"/>        | experimental work <input type="checkbox"/> | continuous knowledge examination <input checked="" type="checkbox"/> |  |

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other:

**Assessment and evaluation of students' work during classes and on the final exam:**

Continuous monitoring of student work based on the system of assessment and self-assessment of photos, portfolio

Other:

**Teaching process evaluation: -**

**Student evaluation (survey)**

Other:

**References**

Required:

Mikota M: Kreacija fotografijom, V. D. T Publishing, Zagreb, 2000.

Ang T: Digitalna fotografija, Znanje, Zagreb, 2004.

Optional:

Kobre K: Photojournalism – the Professionals' approach Focal Press, Oxford, 2008. Langford

M, Fox A, Sawdon Smith R: Langford's Basic Photography, Focal Press, Oxford, 2010.



Name of the course: Qualitative methods of testing color reproduction

Teacher: asst. prof. PhD. Rahela Kulčar

Associate teachers:

Lectures (L): asst. prof. PhD. Rahela Kulčar

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):asst. prof. PhD. Rahela Kulčar

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+1

ECTS credits: 4

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: VI

Possibility of teaching in English: Yes

Course objectives: The goal of the course is to acquire theoretical and practical knowledge about color that enables students to make independent opinions and solutions related to the quality of color reproduction. The student gets acquainted with the basics of the science of color and its experience. The course trains the student to determine color, communicate with color, learn about the characteristics of the type of light, and the possibility of applying colorimetric tests in color evaluation. During the lecture, they learn about visual color assessment and instrumental measurement. Based on the knowledge acquired in the course, students are trained to be able to choose the appropriate color system, color measurement techniques and how to present the results.

Enrollment requirements: No

Prerequisite for taking the course exam: Completed laboratory exercises and passed the colloquium from the exercises.

**General And Specific Competence and learning outcomes of the course:**

The student will be able to connect basic knowledge in the field of color with its multidisciplinary in the field of colorimetry. Categorize devices for measuring color and propose the most adequate measurement method about the type of substrate and justify the choice of device. Critically judge the differences in reproduced colors compared to standard.

Course content (Syllabus) on a weekly basis:

1. Basics of the science of color and its experience
2. Characteristics of the type of light

3. Characteristics of the examined sample
4. The sensation of color (psychophysical experience of the observer)
5. Theories of color vision
6. Simultaneous contrast. Defective color vision
7. Psychophysical characteristics of color
8. Determination of tristimulus (X,Y, Z) values
9. CIE chromaticity diagram
10. Disadvantages of the CIE chromaticity diagram
11. CIELAB color system
12. Determination of total color difference
13. Standards for color measurement (Ostwald system, Munsell system, NCS system)
14. Metamerism
15. Standard measurement geometries. Color measuring devices. Selection of a suitable color measuring device.

**Format of instructions:**

- |   |  |   |
|---|--|---|
| lectures <input checked="" type="checkbox"/>    | laboratory <input checked="" type="checkbox"/>   | online <input type="checkbox"/>           |
| seminars and workshops <input type="checkbox"/> | multimedia and internet <input type="checkbox"/> | field work <input type="checkbox"/>       |
| exercises on computers <input type="checkbox"/> | independent assignments <input type="checkbox"/> | work with mentor <input type="checkbox"/> |
| other: <input type="checkbox"/>                 |  |   |

**Monitoring of students' work:**

- |   |   |  |   |
|---|---|--|---|
| attending classes <input checked="" type="checkbox"/>   | research <input type="checkbox"/>               | project <input type="checkbox"/>                                     | practical work <input type="checkbox"/> |
| activities in class <input checked="" type="checkbox"/> | test report <input checked="" type="checkbox"/> | oral exam <input checked="" type="checkbox"/>                        | portfolio <input type="checkbox"/>      |
| seminar work <input type="checkbox"/>                   | experimental work <input type="checkbox"/>      | continuous knowledge examination <input checked="" type="checkbox"/> |   |

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Guessing and completion tasks | <input checked="" type="checkbox"/> Multiple choice tasks |
| <input type="checkbox"/> Alternative choice tasks                 | <input type="checkbox"/> Connecting and arranging tasks   |
| <input type="checkbox"/> Problem solving tasks                    |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

During classes, students have the opportunity to participate in colloquiums (2 during the semester). If they do not pass or do not take part in the colloquiums, they will take the written and oral exams during the regular exam periods. The student must complete all the exercises and submit the exercise diary to receive a final grade.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** colloquium, independence in exercises, quality of work diary

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: Z. Tkalčević Smetko;Fotosistemi za dobivanje slike,Viša grafička škola,Zagreb,1984. G.G. Field; Color and its Reproduction, Graphic Art Technical Foundation, Pittsburgh,2004. R.W.G. Hunt; The Reproduction of Colour, John Wiley and Sons, Chichester, England,2004. N. Ohta, A.R. Robertson; Colorimetry. Fundamentals and Applications, John Wiley and Sons, England,2005.

Optional: R.S. Berns; Principles of Color Technology. John Wiley and Sons,Third Edition,2000. M. Langford; Advanced Photography, Focal Press, Oxford, 1999; N. Tanhofer; O boji, Akademija dramske umjetnosti Sveučilišta u Zagrebu i Novi Liber d.o.o., Zagreb, 2000.

Name of the course: Polymeric Materials

Teacher: asst. prof. PhD. Sonja Jamnicki Hanzer

Associate teachers:

Lectures (L): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Seminar (S): [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Laboratory (LAB):: asst. prof. PhD.

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+0

ECTS credits: 3

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: VI

Possibility of teaching in English: No

Course objectives: The main goal of the course is to give students basic knowledge of polymers and polymeric materials. Through the course, students will acquire basic knowledge that they can apply when working with numerous polymeric materials in graphic technology, such as rubber and photopolymer printing forms, resins/polymers of printing inks, inkjet inks and toners, substrates (cellulose-based substrates, synthetic papers, boards, films, foils, laminates), adhesives, and packaging.

Enrollment requirements: Passed courses Chemistry 1 and Chemistry 2.

Prerequisite for taking the course exam: Prepared and presented seminar paper.

### **General And Specific Competence and learning outcomes of the course:**

Students will know/be able to:

- Explain the basic terms (mer, polymer, polymerization, polymer material).
- Define and classify polymers according to different chain configurations (according to the way their repeating subunits - mers are linked) and other important parameters.
- Classify and explain the relaxation and deformation states of polymers.
- Define the properties of different polymeric materials (thermoplastics, duromers and elastomers).
- Describe the manufacturing processes of polymeric materials.
- Describe the properties of a specific polymeric material (PE, PP, PS, PVC, PET).
- Evaluate the suitability of a particular biopolymer for the manufacture of a sustainable graphic product.
- Describe the preparation (pretreatment) of polymer films/foils to make them suitable for

printing.

- Select an appropriate printing technique and ink for a specific polymer material.

Course content (Syllabus) on a weekly basis:

1. The first lecture will introduce students to the content and objectives of the course, the basic terms related to polymers will be defined (polymers, macromolecules, repeating subunits - mers, degree of polymerization, homopolymers, copolymers, chain configurations of polymers: linear, branched, cross-linked) etc.
2. Polymerization processes, types (addition polymerization, condensation polymerizations), and examples.
3. Relaxation phenomena of polymers (relaxation stresses, memory effect, creep), deformation states of polymers - thermomechanical curves.
4. Polymeric materials, classification of polymeric materials. The properties of plastic types (thermoplastics, duromers).
5. Additives to plastic materials: processing additives, modifiers of mechanical, surface and optical properties, additives to increase durability and other additives.
6. Principles of polymer processing (extrusion, calendering, coating, casting, injection molding, blow molding ).
7. Polyethylene (PE) - structure and properties, production and application;  
Polystyrene (PS) - structure and properties, production and application
8. Polypropylene (PP) - structure and properties, production and application;  
Polyvinyl chloride (PVC) - structure and properties, production, and application;  
Polyethylene terephthalate (PET) - structure and properties, production and application
9. Elastomers. Natural and artificial rubber and gum. Vulcanization process. The use of rubber in graphic technology.
10. Natural polymeric materials in graphic technology (starch, cellulose, microcrystalline cellulose, microfibrillated cellulose, nanocellulose).
11. Natural polymeric materials in graphic technology (natural cellulose fibers, cellulose derivatives, regenerated cellulose, lignin, natural resins).
12. Bioplastics: plastics from starch, plastics from polylactic acid (PLA), polyhydroxyalkanoates (PHAs), polyhydroxybutyrate (PHB), polyamide 11 (PA 11), biopolyethylene (bioPE). Ecological aspect of biopolymer application: biodegradability, compostability.
13. Adhesives - production, raw materials, classification, and use. Types of adhesives used in graphic technology.

14. New trends in packaging design using biopolymers or biodegradable materials (paper/cardboard and bioplastics) - environmentally sustainable packaging.
15. Printing on polymer films/foils - preparation of material for printing, selection of appropriate printing technique, ink, and drying process.

### **Format of instructions:**

lectures <input checked="" type="checkbox"/>	laboratory <input type="checkbox"/>	online <input checked="" type="checkbox"/>
seminars and workshops <input type="checkbox"/>	multimedia and internet <input type="checkbox"/>	field work <input type="checkbox"/>
exercises on computers <input type="checkbox"/>	independent assignments <input type="checkbox"/>	work with mentor <input checked="" type="checkbox"/>
other: <input type="checkbox"/>		

### **Monitoring of students' work:**

attending classes <input checked="" type="checkbox"/>	research <input type="checkbox"/>	project <input type="checkbox"/>	practical work <input type="checkbox"/>
activities in class <input checked="" type="checkbox"/>	test report <input checked="" type="checkbox"/>	oral exam <input checked="" type="checkbox"/>	portfolio <input type="checkbox"/>
seminar work <input checked="" type="checkbox"/>	experimental work <input type="checkbox"/>	continuous knowledge examination <input checked="" type="checkbox"/>	

### **Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input checked="" type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input checked="" type="checkbox"/> Problem solving tasks         |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

### **Assessment and evaluation of students' work during classes and on the final exam:**

During the lecture period, students have the opportunity to take two midterm written exams, which exempts them from the oral exam. If they fail or don't take this opportunity, they have the option of taking the traditional written and oral examinations during the regular examination periods. In addition, students must complete a seminar paper on the given topic, which will be graded and is a prerequisite for taking the exam. In the final exam, the knowledge acquired in the lectures is evaluated, and the final grade is also influenced by the grade of the seminar paper.

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Analysis of success in written and oral exams - continuous monitoring of student work. Feedback from students' evaluation of the teacher (anonymous survey)

**Student evaluation (survey)**

Other:

**References**

Required:

1. Teacher's lectures published on Merlin E-learning platform.
2. Z. Janović, Polimerizacije i polimeri, Zagreb, HKDI, Zagreb, 1997.
3. A. Rogić, I. Čatić i D. Godec, Polimeri i polimerne tvorevine, Društvo za plastiku i gumu, Zagreb, 2009.

Optional:

1. David Plackett, Biopolymers - new materials for sustainable films and coatings, Chichester : Wiley, 2011.

Name of the course: Application and examination of graphic materials

Teacher: prof. PhD. Branka Lozo

Associate teachers:

Lectures (L): prof. PhD. Branka Lozo

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):PhD. Maja Strižić Jakovljević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+1

ECTS credits: Kliknite ili dodirnite ovdje da biste unijeli tekst.

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: VI

Possibility of teaching in English: Only for foreign students

Course objectives: The aim of the course is to familiarize students with various aspects of functional applications that are achieved by printing, especially ink-jet technology, with an explanation of its advantages as a non-impact technique, to point out the variety of functions that can be achieved through the choice and combination of materials, to introduce students to upcoming trends, to direct them towards own creative ideas.

Enrollment requirements: Attended courses Paper and Printing inks.

Prerequisite for taking the course exam: Completed laboratory practices.

**General And Specific Competence and learning outcomes of the course:**

Students will be able to list and describe different types of 2D codes; Explain the technology of 3D ink-jet printing; List the materials used in 3D printing; Be able to explain what chromogenic inks are and the mechanism of the colour change; Be able to list and explain different types of chromogenic inks; Explain which part of the RFID system is printable; Explain the differences between electronic paper and other screen products and explain the principle of electrophoresis; Find out about other functional applications and development and application possibilities.

Course content (Syllabus) on a weekly basis:

1. Review of content, presentation of various aspects of printed functional applications; definitions of basic terms.
2. Explanation of function and principles of 2D code generation, types, explanation of interactivity.



3. Limits of reading 2D codes and error correction system, intentional design errors as a function of creativity.
4. Electronic book, principle of e-paper screen operation, differences compared to other screen products.
5. The working principle of the e-paper screen, electrophoresis.
6. Explanation of 3D printing technique, types and principles of AM, 3D InkJet printing, development of color printing, differences.
7. The purpose of 3D printing by areas, development and perspectives, examples, 3D scanning, use of 3D printing records.
8. Materials for 3D printing, types of powder, binder function, color function, infiltrators, role and differences by type.
9. The first written intermediate knowledge test.
10. Explanation RFID, parts, printed parts, antennas, other printed electronics, examples.
11. Explanation of the concept of chromogenic inks, types, division according to different criteria, purpose of inks.
12. Thermochromic inks, types and mechanisms of color change, biochromic inks, indicators, types.
13. Bio-paper, explanation of different uses, biocides in/on paper, application.
14. Other examples of functional applications, advantages of InkJet technique, microscreen printing and other examples.
15. Second written knowledge test.

### **Format of instructions:**

lectures                       laboratory                       online   
 seminars and workshops                       multimedia and internet                       field work   
 exercises on computers                       independent assignments                       work with mentor   
 other:

### **Monitoring of students' work:**

attending classes                       research                       project                       practical work   
 activities in class                       test report                       oral exam                       portfolio   
 seminar work                       experimental work                       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |  |   |
|--|---|
| <input type="checkbox"/> Guessing and completion tasks | <input type="checkbox"/> Multiple choice tasks          |
| <input type="checkbox"/> Alternative choice tasks      | <input type="checkbox"/> Connecting and arranging tasks |
| <input type="checkbox"/> Problem solving tasks         |   |

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Assessment and evaluation of students' work during classes and on the final exam:**

Students are offered the option of taking an exam through a knowledge tests (2 or 3 during the semester), if each test is positively evaluated. Students can also take the exam during regular exam periods (written and oral).

Other: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Teaching process evaluation:** [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

**Student evaluation (survey)**

Other: [Kliknite ovdje da biste unijeli tekst.](#)

**References**

Required: 1. Teacher's lectures on the department's website 2. Developments in Printing Technology, Pira International, Leatherhead, 2007 3. Lozo, Branka; Stanić, Maja, 3D Ink Jet Printing, Ed: Stasiak W, James, Springfield: Society for Imaging Science and Technology, USA, 2010 4. Thompson, B., Printing materials: science and technology, Pira International, Leatherhead, 2004 5. Z Corporation, 3D Printing Technology Whitepaper, Z Corporation, Burlington, USA, 2005 Gebhardt, A., Short Course on Rapid Prototyping, Aachen University of Applied Sciences, Aachen, Germany, 2005

Optional: [Kliknite ili dodirnite ovdje da biste unijeli tekst.](#)

Name of the course: Offset printing managing (Colour printing)

Teacher: assoc. prof. PhD. Igor Zjakić

Associate teachers:

Lectures (L): Igor Zjakić

Seminar (S):Kliknite ili dodirnite ovdje da biste unijeli tekst.

Laboratory (LAB):Igor Zjakić, Krešimir Dragčević

Type of instructions (*L- lectures; S- seminars; LAB -laboratory*): L+LAB

Type of instructions presented as number of hours L+S+LAB on a weekly basis: 2+0+2

ECTS credits: 5

Study programme: Undergraduate

Status of the course: Elective

Semester: Summer

Semester number: VI

Possibility of teaching in English: Only for foreign students

Course objectives:To teach students how to obtain and standardize a printing quality in different printing techniques

Enrollment requirements: Kliknite ovdje da biste unijeli tekst.

Prerequisite for taking the course exam: Kliknite ili dodirnite ovdje da biste unijeli tekst.

### **General And Specific Competence and learning outcomes of the course:**

The course provides students with basic knowledge about standardization and quality management of various printing techniques. The subject teaches the principles of reproduction of raster elements, how their deformation affects the reduction of print quality, how print quality is managed with the help of measuring fields, how visual control is used to identify and solve printing problems, then, the subject teaches how to standardizes the printing process and how modern computer systems achieve uniform and high-quality printing. In addition to the above, students learn about hi-fi printing techniques and ways to increase quality in reproduction, as well as ways and methods of varnishing in printing, which achieves a higher quality graphic product.

Course content (Syllabus) on a weekly basis:

1. Introduction to the subject. The importance of quality in printing. The link between technology and design. Expectations and global quality trends. Separation of products by quality. Defining the quality of different printing techniques.
2. Colour in printing, importance of color in commercial purposes, problems of defining quality with customers, principles of multi-color reproduction in printing with technological process.



activities in class       test report       oral exam       portfolio   
seminar work       experimental work       continuous knowledge examination

**Type of written examination:**

Essay type assignment

Objective-type tasks (multiple items can be selected):

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Guessing and completion tasks | <input checked="" type="checkbox"/> Multiple choice tasks |
| <input type="checkbox"/> Alternative choice tasks                 | <input type="checkbox"/> Connecting and arranging tasks   |
| <input type="checkbox"/> Problem solving tasks                    |   |

Other:Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Assessment and evaluation of students' work during classes and on the final exam:**

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

Other: Kliknite ili dodirnite ovdje da biste unijeli tekst.

**Teaching process evaluation:** Assessment and evaluation of students' work during classes and on the final exam:

The exam can be passed through a colloquium in the lecture after the exercises. In case of failure to pass through the colloquium, the exam is taken orally.

**Student evaluation (survey)**

Other: Kliknite ovdje da biste unijeli tekst.

**References**

Required: I. Zjakić: upravljanje kvalitetom ofsetnog tiska. HSN, 2007.

Optional: I. Zjakić: tehničko uređivanje u procesu izrade knjige, HSN, 2013.; H. Kiphan: Handbook of Print media, Springer, 2001.