

LEARNING OUTCOMES PER COURSES
Doctoral Study Program Textile Science and Technology (academic year 2017/2018)

Mandatory courses

No.	Course title	Course head	LEARNING OUTCOMES
1	Selected Topics in Mathematics	Krulić Himmelreich K. / Rodić M.	<ol style="list-style-type: none"> 1. Analyze mathematical problems related to the adopted mathematical concepts of Laplace transform, optimization/linear programming, numerical methods and statistics; 2. Connect different mathematical concepts and results; 3. Establish solutions of mathematical problems related to the adopted mathematical concepts; 4. Compare different methods of problem solving; 5. Mathematically shape a certain situation outside the mathematical context by using the adopted mathematical concepts.
2	Methods of Scientific Work	Dragčević Z. / Jokić M.	<ol style="list-style-type: none"> 1. Analyze and classify methods of scientific research; 2. Categorize and compose the elements of scientific work and the structure of scientific and expert work, and set research hypotheses; 3. Critically evaluate and present the results of browsing relevant databases; 4. Critically evaluate scientific work; 5. Edit and evaluate technical processing of manuscripts.

Elective courses from the area of textile technology

No.	Course title	Course head	LEARNING OUTCOMES
1	Analytical Measurement System	Vojnović B.	<ol style="list-style-type: none"> 1. Predict the appropriate types of verification during method validation; 2. Compare the results obtained at different times and places of testing; 3. Evaluate the measurement uncertainty by knowing the method validation data and quality control; 4. Assess compliance with regulatory restrictions and specifications; 5. Create and manage efficient quality management systems in the laboratory.
2	Anthropometric Systems and Clothing Sizes	Ujević D.	<ol style="list-style-type: none"> 1. Analyze the procedures of accurate human body measurement and select methods of anthropometric measurements; 2. Critically evaluate anthropometric measurements in order to obtain the necessary measures for clothing production;

			<ol style="list-style-type: none"> 3. Assess the importance and necessity of developing clothing sizes; 4. Design and propose new guidelines for the development of clothing sizes system, establish intermediate sizes intervals and suggest types of build; 5. Prepare, analyze and present the obtained original scientific results.
3	Color in Design and Management	Glogar. M.I.	<ol style="list-style-type: none"> 1. Substantiate color as a communication element in design and management; 2. Connect the physiology of visualization with psycho-physical and emotional experience; 3. Critically evaluate and value different color theories and use analysis results as a tool in own artistic and scientific research; 4. Assess the quality and acceptability of color reproduction in different aspects of production; 5. Lead an interdisciplinary scientific and research team, and coordinate the process of cooperation in different social groups.
4	Ecological Approach in Textile Care	Pušić T. / Soljačić I.	<ol style="list-style-type: none"> 1. Analyze potential risks in textile care processes from a human and ecological standpoint; 2. Critically evaluate alternative substances and processes from an ecological standpoint; 3. Predict the effectiveness of the care process based on the share of factors in the Sinner's circle; 4. Evaluate substances based on the analysis of technological and ecological characteristics in accordance with the sustainability strategy; 5. Design an effective system for selecting individual components in complex technological systems.
5	Electromagnetic Waves in Textile Finishing	Bischof S. / Katović D.	<ol style="list-style-type: none"> 1. Assess the technological advantages of environmentally friendly and energy-efficient processing methods by using EM waves; 2. Predict and critically value the shortcomings of alternative processing methods; 3. Evaluate the efficiency of the EM functionalization process; 4. Analyze the obtained results and determine the optimum results for the development of environmentally and economically favorable advanced materials; 5. Evaluate the EM functionalization process in accordance with the sustainable development principles.
6	Enzymes in Textile Finishing and Care	Soljačić I. / Pušić T. / Tarbuk A.	<ol style="list-style-type: none"> 1. Compare the chemistry and properties of enzymes with targeted application; 2. Develop a plan for a new ecological process research depending on the enzyme action mechanism; 3. Select a bioinnovative process with regard to the material and desired properties;

			<ol style="list-style-type: none"> Evaluate the bioinnovativity of the process from an energy and ecological standpoint; Analyze the action of a particular type of enzyme in enzymatic complexes for detergents.
7	Working Processes Ergonomics of Clothing Technologies	Dragčević Z. / Hursa Šajatović A.	<ol style="list-style-type: none"> Analyze the production system and design an appropriate type of workplace; Connect the principles of ergonomics; Suggest new manners of designing work methods and workplaces in the process of clothing production; Classify anthropometric measurements of the human body and degrees of working movement freedom, and design a workplace design proposal; Analyze a designed work method and workplace in accordance with logical sequence of movements systems and the standardization of technological actions and operations in clothing technology, by using modern computer-based modeling and work process simulation methods.
8	Physico-Chemical Processes and Effects of Wet Textile Finishing	Soljačić I. / Grancarić A.M. / Tarbuk A.	<ol style="list-style-type: none"> Apply the acquired knowledge of intersurface phenomena such as wettability, capillarity and adsorption to improve numerous operations in wet textile finishing; Select the material surface modification process with regard to the raw material composition and desired properties (mercerization, cationization, zeolites, hydrolysis); Design scientific research depending on the action mechanisms of substances (FWA, zeolites etc.) to achieve protective properties; Control highly valuable equipment to determine intersurface phenomena and create new methods for the development of new knowledge; Apply the developed methods for new knowledge.
9	Handling Functions in Clothing Technology	Nikolić G.	Not performed
10	Industrial Engineering	Dragčević Z.	<ol style="list-style-type: none"> Analyze the methods of industrial engineering; Plan the production process, propose the rationalization of technological operations and production processes; Combine the methods of work systems and industrial processes simulation for the purpose of rationalization; Analyze the process of production structures; Develop the optimal production structure in clothes production processes.
11	Integrated Systems in Intelligent Clothing	Rogale D.	<ol style="list-style-type: none"> Suggest the basic structure of smart or intelligent clothing; Develop an intelligent behavior algorithm; Integrate nanotechnological systems into smart and

			<p>intelligent clothing;</p> <ol style="list-style-type: none"> Critically evaluate the methods of signal conversion and data interpretation; Critically evaluate published original scientific results of other authors from the field of intelligent clothing.
12	Garment Engineering Design	Geršak J.	<ol style="list-style-type: none"> Create and evaluate new facts and theories in the field of scientific research of fabric mechanics in transformation processes; Design a scientific research of fabric mechanics and research the selected issues in order to create new hypotheses and scientific discoveries of clothing design and simulation of their fall and draping; Independently manage scientific and research activities in the development of new ideas; Write an original scientific paper in internationally reviewed journals; Develop new methods and instruments needed to develop new knowledge.
13	Chemistry of Materials and Nanotechnology	Pavlović G.	<ol style="list-style-type: none"> Categorize materials; Compare material types and their properties and application; Determine methods for the preparation of nanomaterials (particularly nanotubes); Evaluate the application of materials based on their properties and structure; Critically evaluate the ecological aspect of nanomaterials application.
14	Textile Wasterwater Chemistry	Vojnović B.	<ol style="list-style-type: none"> Connect the structure and chemical properties of textile industry wastewater with their impact on the equilibrium processes in the environment; Analyze the causal relationship of pollutants from the textile industry wastewater on the quality of the environment and natural receivers, and the possibilities of reducing environmental pollution; Plan the monitoring of the impact of specific textile industry wastewater pollutants on the environment by analytical techniques and methods for determining major groups of organic and inorganic pollutants, and compare them with the legislation and regulations in Croatia, Europe and the world; Connect the theoretical knowledge with the measurement results, compare the measurement results of specific parameters by different analytical methods, and recommend the wastewater treatment method; Predict new methods and technologies for textile industry wastewater treatment in accordance with green technologies, sustainable development guidelines and the circular economy principles.
15	Chemical Modification of	Katović D. / Bischof S.	<ol style="list-style-type: none"> Assess the technological advantages of environmentally friendly chemical modification

	Cellulose Materials		<p>methods;</p> <ol style="list-style-type: none"> Evaluate the input parameters and the efficiency of the chemical modification process; Analyze the obtained results and determine the environmentally and economically most advantageous substances and procedures of chemical modification; Critically evaluate the process of chemical modification in accordance with the sustainable development principles; Evaluate and independently present the results of own research in the field of chemical modification of textile materials.
16	Air Pollution Control in Textile Production	Katović D. / Flinčec Grgac S.	<ol style="list-style-type: none"> Select an advanced instrumental method for analyzing the impact of developmental components and finished products on air quality and the environment; Develop a method for evaluating all input parameters in the process of developing textiles and finished products; Evaluate the obtained results and select the best ones in order to develop materials with multifunctional properties and minimal environmental impact; Critically evaluate air pollution generated by the development, use and decomposition of materials (textiles and leather); Create new scientific and research guidelines in the process of obtaining textiles and value-added leather with an emphasis on environmental protection.
17	Cooperative Environmental Management Systems	Koprivanec N.	Not performed
18	Mechanics of Fibrous Composites	Vujasinović E. / Hui D.	<ol style="list-style-type: none"> Determine the changes in properties of fiber-reinforced composites with regard to the types of acting forces, constituent materials and external factors; Predict the behavior of fiber-reinforced composites in use on the basis of objective measurement and evaluation of their mechanical properties; Compare the research results with simulations (predictions) of mechanical properties to improve accuracy and/or determine the most appropriate mathematical model; Design a fiber-reinforced composite with regard to the desired mechanical properties during use; Prepare and present the results of own research in the field of the mechanical properties of fiber-reinforced composites.
19	Methods of Computer-based	Petrak S.	<ol style="list-style-type: none"> In collaboration with the mentor, design a scientific research methodology in the field of computer-

	3D Garment Construction		<p>based 2D/3D functional clothing design;</p> <ol style="list-style-type: none"> 2. Critically evaluate the influence of anthropometric characteristics of the body in dynamic conditions on the clothing functionality, with the aim of formulating new hypotheses and scientific discoveries; 3. Formulate the conclusions of the clothing functionality research based on the interdependence of the scanned 3D model of the body and the physical and mechanical material properties; 4. Self-evaluate research results as well as scientific papers of other authors in the field of computer 2D/3D clothing design; 5. Prepare and argumentatively present the scientific research results at an international scientific congress.
20	Measurement Methods and Analysis of Process Parameters	Rogale D.	<ol style="list-style-type: none"> 1. Propose measurement methods for determining the value of certain process parameters in clothing technology; 2. Assess the value of process parameters in clothing technology; 3. Critically evaluate the influence of the technical equipment of sewing machines on the parameters and methods of performing technological operations; 4. Design a software for monitoring the value of technological operations' process parameters of clothes sewing during performing characteristic operations on machines of different technical equipment; 5. Critically analyze the published original scientific results of other authors from the field of process parameters in clothing technology.
21	Multifunctional Dyes in Application	Parac-Osterman Đ.	Not performed
22	Nanostructures	Lelas K.	<ol style="list-style-type: none"> 1. Analyze the basic concepts of nanophysics; 2. Identify various applications of nanotechnology; 3. Evaluate and compare smart materials and their physical properties; 4. Connect nanophysics with textile industry; 5. Critically analyze published scientific papers of other authors from the field of nanophysics.
23	New Dyes and Advanced Technologies in the 21st Century	Sutlović A.	<ol style="list-style-type: none"> 1. Critically evaluate innovations in the field of chemical dyes structure and their dyeing properties based on the collected expert literature; 2. Evaluate the collected information and compare new technological ideas with the current knowledge; 3. Develop a personal professional and ethical authority in evaluating information through the preparation of a seminar paper;

			<ol style="list-style-type: none"> 4. Conduct complex communication with other scientists, coordinate the process of cooperation in different social groups; 5. Create new forms of communication and collaborative processes via e-learning during the presentation or publication of a part of the seminar paper topic.
24	New Sizing Procedures	Kovačević S. / Schwarz I.	<ol style="list-style-type: none"> 1. Independently and in collaboration with other scientists design scientific research in the field of sizing; 2. Critically evaluate the economic and environmental side of sizing and know how to distinguish the opportunities for improvement, innovation and patenting; 3. Self-assess the problem of the sizing process in order to set new hypotheses and scientific discoveries; 4. Critically analyze other scientific achievements and know how to compare them with your own, in order to improve and develop new sizing procedures; 5. Present the results of own research in the area of sizing process.
25	Numerical Methods in Textile Engineering	Šomođi Ž.	<ol style="list-style-type: none"> 1. Present three methods for approximate solution of transcendental equation with one unknown and rank them according to numeric efficiency on a selected example; 2. Compare the secant and tangent method in terms of advantages and disadvantages with reference to the concept of quadratic convergence; 3. Present the differential equation derivation of beam bending with small displacements and its numerical solution by applying the finite differentials method; 4. Compare the numerical efficiency of two methods for solving the linear equations algebraic system (Gaussian elimination and LU decomposition) on the example of a band matrix system; 5. Choose the optimal process of flexible workpiece in the technological process according to the given criterion by applying a discrete flexion system solution.
26	Clothing Artifacts - Methods of Analysis and Attribution	Simončič K.N.	<ol style="list-style-type: none"> 1. Analyze a clothing artifact; 2. Review impacts and related examples; 3. Identify characteristic stylistic motifs, production techniques and clothing forms; 4. Critically evaluate the existing materials; 5. Compile the final report of cultural-artistic and technical analysis.
27	Application of Low-Temperature Plasmas in Textile Treatment	Ercegović Ražić S./ Milošević S.	<ol style="list-style-type: none"> 1. Develop a stance on the types of plasmas and the mechanism of their action depending on the process parameters; 2. Connect the dependencies of specific and complex plasma-chemical reactions in interaction with the

			<p>surface of the textile substrate;</p> <ol style="list-style-type: none"> Determine the plasma processes that occur as a result of plasma and substrate interaction by using reliable analysis methods; Evaluate and compare the achieved results after plasma treatment and results obtained by reliable surface properties analysis methods; Critically evaluate the feasibility and ecological and economic viability of introducing new technologies with the purpose of creating value-added products and developing product competitiveness.
28	Process Parameters of Knitwear Production	Vrljićak Z.	<ol style="list-style-type: none"> Substantiate opinion in a debate with other researchers in the field of knitwear production and successfully defend the stance during public announcement; Critically analyze and evaluate the published original scientific results of other authors in the field of knitwear production and accept their findings and achievements; Critically evaluate the economic viability of new and modern machines for making certain knitwear patterns; Independently select modern machines for the production of certain knitwear patterns; Write a complete own research project in the field of contemporary knitwear production.
29	Design of Spun Yarn Structures	Skenderi Z.	<ol style="list-style-type: none"> Analyze the main parameters of designing the structures of spun ring, compact and rotor yarns, as well as the fiber configuration in them; Determine the structure of gimped yarn produced on a hollow spindle; Evaluate the parameters of the structure and properties of elastic yarns produced on the ring spinner and the yarn produced by the aerodynamic spinning process; Analyze fancy yarns with variations of mass and twists; Evaluate periodic and non-periodic errors in spun yarns, and the correlation of structures and physical-mechanical properties of yarns.
30	Design of Woven Fabric Structure	Penava Ž.	<ol style="list-style-type: none"> Shape fabric according to the defined parameters by using CAD/CAM software; Analyze fabric development with regard to technical-technological requirements; Evaluate the advantages of certain types of fabric in specific application conditions; Propose guidelines for scientific research in the field of CAD/CAM systems; Independently present the results of own research in the field of fabric design.
31	Rheology	Mijović B.	<ol style="list-style-type: none"> Mathematically analyze rheological models of textile materials;

			<ol style="list-style-type: none"> 2. Formulate the concept of two-dimensional and three-dimensional textile materials; 3. Critically analyze the elastic, viscoelastic and plastic behavior of textile materials; 4. In cooperation with the mentor, develop a scientific research in the field of rheology, and give a critical review of the results; 5. Write and publish a scientific paper in co-authorship with the mentor in an internationally reviewed journal or at a scientific congress from the field of rheology.
32	Structure and Properties of Dyes	Racané L.	<ol style="list-style-type: none"> 1. Compare different dyes classifications; 2. Evaluate the possible chromatic phenomena based on the dye structure; 3. Predict possible multipurpose usability properties of dyes based on structure and chemical properties; 4. Evaluate dyes and methods of their preparation from the sustainable development standpoint; 5. Design new chromophore molecules.
33	Structures and Properties of Nonwovens	Skenderi Z. / Kopitar D.	<ol style="list-style-type: none"> 1. Analyze the types of nonwovens and the areas of their application; 2. Evaluate the properties and main parameters of nonwovens of isotropic and anisotropic structure; 3. Compare the basic functions of nonwovens based on the results obtained by standard test methods; 4. Select natural and/or artificial fiber raw materials for nonwovens production and nonwovens production technologies; 5. Evaluate the structural and technological parameters of fleece formed by mechanical process and fleece produced by the chemical spinning process, and composites based on nonwovens.
34	Sophisticated Approach to Garment and Footwear Production	Ujević D.	<ol style="list-style-type: none"> 1. Critically analyze and self-assess research results as well as scientific papers by other authors in the field of contemporary industrial garment and footwear production; 2. Develop garment and footwear production processes through training in the field of management and leadership in complex production conditions; 3. Evaluate substances based on the analysis of technological parameters with the aim of optimizing the process in accordance with the sustainability strategy; 4. Design an efficient system with sophisticated approach and methodology of production processes improvement (E-training); 5. Prepare and argumentatively present the scientific research results in international scientific journals and at international scientific congresses.
35	Spectroscopic Characterization of Dyes and	Racané L.	<ol style="list-style-type: none"> 1. Connect the principles of certain spectroscopic methods (UV/Vis, IR, NMR and MS) with instruments;

	Pigments		<ol style="list-style-type: none"> 2. Analyze the structural characteristics of dyes by spectroscopic methods; 3. Evaluate the applicability of certain spectroscopic methods to different dye types; 4. Select a suitable spectroscopic method for obtaining desired structural information about dyes; 5. Present the results obtained by certain spectroscopic methods.
36	Contemporary Digital Printing	Majnarić I.	<ol style="list-style-type: none"> 1. Conduct a printing process based on computerized dyeing on textile substrates in an organized and independent manner, know the stages of the preparatory process (functional coating and thermal processing); 2. Design the standard and non-standard measuring devices for correction and dyeing intensity monitoring (to ensure the exactness of the application and the uniformity of the textile articles production); 3. Anticipate all possible errors in printing, and on the basis of measurements performed on various textile substrates, value data and suggest the conclusions that will enable graphic reproduction repeatability (photos and color tones); 4. On the basis of a detailed analysis, judge how each of the structural solutions of Inkjet heads affects the application of the coating i.e. how the droplets forming mechanism forms a print; 5. Solve unpredictable problems in digital printing on textiles, diagnose dyeing problems by using colorimetric and densitometric measurement methods and applying standard and non-standard procedures (image analysis).
37	Technical Textiles in Separation Processes	Somogyi Škoc M.	<ol style="list-style-type: none"> 1. Analyze the importance of technical textiles in separation processes; 2. Select the technical textile for mechanical, mass and thermal transport processes; 3. Assess the possibility of objective valuation of technical textiles in the most common forms of separation; 4. Design and propose filtering processes with an emphasis on the two basic groups of filtration processes; 5. Evaluate the structural features of certain types of technical textiles and predict their effectiveness in separation processes.
38	Textile for Ultraviolet Radiation Protection	Tomljenović A.	<ol style="list-style-type: none"> 1. Evaluate relevant factors for achieving the sufficient or desired UV protective performance of textiles - from micro to macro level; 2. Evaluate and categorize the UV protective performance of textile materials and finished products made from those materials; 3. Create high performance UV protective textile products, taking into account the functionality of

			<p>textile materials and the functional design of the finished product;</p> <ol style="list-style-type: none"> 4. In cooperation with the course head, design a scientific research in the area of textiles for UV protection and research the selected matter; 5. In co-authorship, write and publish a scientific paper in an internationally reviewed journal, and prepare and publicly present results at an international scientific congress.
39	Theoretical Analysis of Knitted Fabrics and Knitting Process	Potočić Matković V.M.	<ol style="list-style-type: none"> 1. Design a scientific research in the area of interdependence of the knitting process, the structure and properties of the knitted fabrics, in cooperation with the course head; 2. Critically evaluate published scientific papers from a selected area related to the interdependence of the knitting process, the structure and properties of knitted fabrics; 3. Measure the knitted fabrics properties related to the selected research area; 4. Formulate conclusions of the theoretical and practical research of the selected area of interdependence of the knitting process, structure and properties of knitted fabrics; 5. Prepare and present research results in the form of a seminar paper and a PowerPoint presentation.
40	Theoretical Analyses in the Yarn Preparation Process and Fabric Production	Kovačević S.	<ol style="list-style-type: none"> 1. Design a scientific research on yarn preparation and weaving, and research the selected issue in order to set new hypotheses and scientific discoveries in the field of fabrics preparation and production; 2. Write and publish scientific papers in internationally reviewed journals from the field of fabrics preparation and production, as well as work and cost studies in textile and mechanical technology; 3. Prepare and present scientific research at domestic and international congresses; 4. Evaluate the results of scientific research in the field of fabrics preparation and production; 5. Critically analyze and evaluate scientific research of other scientists at public congresses from the field of weaving.
41	Thermal Insulation Properties of Clothing	Firšt Rogale S.	<ol style="list-style-type: none"> 1. Propose measuring methods for determining certain thermal insulation properties of clothing; 2. Establish the conditions for conducting measurements of the thermal insulation properties of clothing according to standards; 3. Review the influence of structural parameters on the thermal insulation properties of clothing; 4. Determine the thermal insulation properties of clothing from the aspect of price, weight, availability; 5. Critically evaluate published original scientific

			results of other authors from the field of thermal insulation properties of clothing.
42	Topological Invariants in Designing Functional Clothing	Bogović S.	<ol style="list-style-type: none"> 1. Analyze and organize data obtained on the basis of human body scans; 2. Develop the structure of garments for persons with special needs or protective clothing adapted to body types and specific requirements; 3. Compare different computational methods based on topological invariants that can be used to design clothing; 4. Determine the most appropriate computational method that will allow the best adjustment of the cut to a specific body shape; 5. Present the results of own research.
43	Textile and Clothing Comfort and Assessment	Ercegović Ražić S.	<ol style="list-style-type: none"> 1. Formulate the concept of textile and clothing comfort based on the scientific knowledge about the comfort phenomenon; 2. Analyze and connect the microclimate influencing factors with fiber properties and textile structures; 3. Develop the methodology of objective evaluation of the complex properties of subjective experience; 4. Propose new fibers and complex structures for comfortable clothing; 5. Evaluate direct and indirect methods for assessing the comfort of clothing textiles.
44	Control Systems with Micropneumatics	Nikolić G. / Čubrić G.	<ol style="list-style-type: none"> 1. Select the elements of combinational and sequential logic equations; 2. Analyze the application of micropneumatic elements in clothing and other articles made from textile materials; 3. Propose new directions for micropneumatic elements application; 4. Generate control systems with micropneumatics on machinery in the textile and garment industry; 5. Evaluate the viability of micropneumatic elements in automated lines.
45	Biodegradable Polymer Fibres	Vujasinović E.	<ol style="list-style-type: none"> 1. Develop a critical attitude towards new types of biodegradable polymers and their suitability for fiber production; 2. Establish the connection between the chemical structure of biodegradable fibers and their properties in use; 3. Objectively evaluate new fibers and predict their most appropriate use in terms of sustainable development; 4. Assess the lifecycle of biodegradable fiber textiles; 5. Write a review scientific paper based on an analytical critical review of scientific achievements in the field.
46	Fibres in Forensic Science	Vujasinović E.	<ol style="list-style-type: none"> 1. Critically evaluate scientific works in the field of forensics and forensic testing of textiles; 2. Assess the suitability of certain non-destructive

			<p>methods of materials testing for precise fiber identification;</p> <ol style="list-style-type: none"> Evaluate the results of forensic fiber analysis and determine their significance in investigative, criminal and/or judicial proceedings; Identify a fiber/textile regardless of its condition (age, damage level, etc.); Prepare and present the research results, with the possibility of expressing critical and substantiated opinion during a public announcement discussion.
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General elective courses

No.	Course title	Course head	LEARNING OUTCOMES
1	Industrial Energetics	Mihelić-Bogdanić A.	<ol style="list-style-type: none"> Identify and critically evaluate knowledge on the scope of energetics, energy processes and energy application and management in industrial processes on the basis of which the critical evaluation of the reliability of theoretical assumptions, scientific results and research evidence will be possible; Analyze scientific research of innovative solutions for energy supply and/or management in industrial processes; critically evaluate recent scientific literature and practical application from the rational use aspect, energy efficiency increase, economic efficiency and ecological acceptability in order to create new scientific knowledge; value the possibilities of applying renewable energy sources; Prepare and present a seminar paper on the topic from the field of energy supply and management in industrial processes with a critical review of practical and scientific application; Critically evaluate the possibilities of applying waste heat, cogeneration, hybrid systems based on energy balance, and propose savings that result in process efficiency increase; Write, publish and/or present, as the author/co-author, a scientific paper in nationally/internationally reviewed journals or at a domestic/international scientific congress.
2	Intelligent Algorithms	Rolich T.	<ol style="list-style-type: none"> Evaluate optimization methods; Identify the evolutionary algorithms principles; Assess different types of selection, mutation and recombination in genetic algorithms and evolution strategies; Conclude which optimization problems can be solved by using evolutionary algorithms; Develop software in Octave that solves evolutionary algorithm optimization problems.
3	Creativity in	Salopek	<ol style="list-style-type: none"> Analyze the phases of the creative process and

	Technology and Design	Čubrić I.	<p>identify the key differences between the design process and the creative process;</p> <ol style="list-style-type: none"> 2. Present special features of creativity stimulation methods and illustrate the possibilities of application in technology and design; 3. Self-assess the optimal method of creativity stimulation for a particular case and substantiate the selection; 4. Self-evaluate new initiatives for the development of creativity and other generic skills; 5. Critically evaluate the possibilities of using information and communication technologies for measuring, evaluating and valuing creativity.
4	Computer Design Methodology of Experiments	Rezić I.	<ol style="list-style-type: none"> 1. In collaboration with the course head, design a scientific or artistic research and selected issues in order to create observed systems models (modeling, predicting and optimizing parameters of artistic or scientific research such as predicting trends in the fashion and textile industry, optimizing the materials production or processing process, predicting the attractiveness of certain textile patterns and finished models, etc.); 2. Design own experiments in artistic and scientific research and examine the set hypothesis about the ideal selected experiment design for a certain monitored system; 3. Justify the modification of the obtained models by applying complex mathematical functions and testing the accuracy of the obtained model; 4. Prepare and present a statement on the results obtained by applying experimental design in scientific or artistic research to other students and scientists; 5. Write a comprehensive seminar paper in the conducted research field and defend stances on the set hypotheses with substantiated opinions in discussion with colleagues during a public announcement.
5	Computer Graphic	Rolich T.	<ol style="list-style-type: none"> 1. Identify the mathematical foundations of computer graphics and computer display; 2. Compare raster and vector graphics image; 3. Present the methods applied when processing images and photos in Adobe Photoshop; 4. Present the methods applied when making drawings and illustrations in CorelDRAW; 5. Present the methods applied when making drawings and illustrations in Adobe Illustrator.
6	Computers in Process Control	Hudec G.	<ol style="list-style-type: none"> 1. The students will be able to critically evaluate the technological aspects of the flexible production systems classification; 2. The students will recognize the concept of fractals as an example of the Markov chain and the possibility of their application in designing innovative design

			<p>solutions;</p> <ol style="list-style-type: none"> The students will be able, at an informational level, to link the concepts of processes and the mathematical interpretation of stochastic processes; The students will be able to choose the option of basic concepts of computer application in flexible production systems management; The students will be able to formulate fuzzy management concepts and apply fuzzy logic in managing systems from the field of textile technology.
7	Futures Trading	Ujević D. / Lazibat T.	<ol style="list-style-type: none"> Critically evaluate published scientific papers in the field of futures trading of textiles, leather and footwear; Evaluate the meaning of futures trading in textile science and technology and evaluate it on that basis; Predict the state of textiles, leather and footwear on European and world stock exchanges; Analyze and identify problems that may arise in dealing with futures trading; Write and publish a scientific paper in a journal or present a paper at a scientific congress from the field of futures trading.
8	Supramolecular Chemistry and Nanochemistry	Cetina M.	<ol style="list-style-type: none"> Critically analyze and evaluate published scientific papers from the field of supramolecular chemistry and nanochemistry; Evaluate the meaning of non-covalent interactions in textile science and technology and evaluate them on that basis; Predict the strength of interactions that can be created in composite materials; Compare interactions in supramolecular gels that are significant for textile science and technology; As an author, write and publish a scientific paper in an internationally reviewed journal from the field of supramolecular chemistry or nanochemistry.
9	Intellectual Property Rights	Bihar Ž.	<ol style="list-style-type: none"> Categorize the forms of creative work of an individual within the intellectual property structure; Select the manner of intellectual property protection in the form of a patent, trademark or industrial design, and separate it from trade secrets, copyrights and similar rights where protection includes non-disclosure and/or automation; Formulate problems that may arise in intellectual property activities for a given potential new product or new service; Create optimal protection methods for a potential new product or new service and accordingly create a set of queries to databases (public registers) of patents, trademarks and industrial design for the purpose of assessing the probability of obtaining protection of this intellectual property; Write an analytical essay on the intellectual property

			protection for a selected independent “Textile Project” with regard to the commercial aspects and competition that operates in that market niche – through product positioning problem.
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Zagreb, 17 October 2018

Council of the Doctoral Study Program Textile Science and Technology

Prof. Stana Kovačević, PhD, Head of the Council of the Doctoral Study Program Textile Science and Technology