

University of Zagreb
Faculty of Textile Technology



DOCTORAL STUDY TEXTILE SCIENCE AND TECHNOLOGY

Brochure

Zagreb, April 2019

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DOCTORAL STUDY PROGRAMME OF TEXTILE SCIENCE AND TECHNOLOGY, BROCHURE

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Number of lecturers at the study programme: **52**

Number of mentors at the doctoral study programme: **25**

Name and surname of the head of the institution of higher education:

Prof. Gordana Pavlović, PhD, Dean

The name of the bank and the number of the account through which the higher education institution operates: **Zagrebačka banka d.d., IBAN: HR4223600001101271363**

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Foreword

The modern society is unimaginable without critical reflection, without answering all the questions that are being asked, without the presence in the community, and especially without the scientific and artistic research that shape our lives. The changes in the world around us are extremely fast, especially in science and technology, where extremely significant and fast development is accomplished by applying new insights and new technologies based on them. This speed of change and generation of knowledge are growing every day. Today, excellence in science is the only answer to societal and economic challenges. The contemporary global science today is not an end in itself, its primary mission and purpose is the overall improvement of the civilization and the economy, improvement of living conditions and lifespan of humans.

One of the European initiatives and national goals is the modernization of the labour market by facilitating the mobility of the workforce, the lifelong development of skills with the goal of increasing the participation in the workforce and improved relationship between supply and demand on the labour market.

Today, the specific challenges of university education and research are directed at internationalization, connectivity with national and international institutions, multidisciplinary approach, research innovation, connectivity with the businesses and lifelong education.

The Faculty of Textile Technology (TTF) has a specific position within the University of Zagreb and the entire academic community in the Republic of Croatia because it is the only institution of higher education that performs the teaching and research activity in the technical field of textile technology and the art field of fashion design. This creates an additional responsibility for the Faculty of Textile Technology because the national framework does not offer the elements of competition and comparison.

In the contemporary world, the research in the field of textile technology and science primarily involves an approach that is at the same time interdisciplinary, multidisciplinary and transdisciplinary. At TTF we employ the scientists and artists whose research activity belongs to different fields: technical field, natural sciences, social sciences and humanities and art, but is applied in the context of textile design and fashion. The synergy of research and higher education teaching process implies the transfer of knowledge in the student-teacher interaction. The internationalization of the research and teaching work at TTF, as well as the interdisciplinary networking, enable the greater effectiveness of courses to students, while also enabling the horizontal and vertical mobility.

The Postgraduate Doctoral Study of Textile Science and Technology is the continuation of the graduate study that combines the theoretical knowledge, research work and experience in problem-solving based on the familiarity with the contemporary production systems. This study in the scientific area of technical sciences and scientific field of textile technology is performed by the University of Zagreb Faculty of Textile Technology. The teachers from other components of the University of Zagreb (Faculty of Graphic Arts, Faculty of Economics and Business and Faculty of Chemical Engineering and Technology) also participate in the implementation of the study, as well as the teachers from foreign universities. The study is based on the research in the fields of textile-mechanical engineering, sciences of the materials, textile chemistry and technology and clothing technology, and is directed at the researched and development of advanced

technologies, materials and innovative products with an emphasis on human ecology, quality and functionality of the product.

The curriculum of the doctoral study prepares the doctoral students for work in research institutions, institutions with a partial share of research activities, public sector and business. After completing the study, the students will be trained in teamwork and independent management on national, bilateral and European scientific projects in the research field of the doctoral study. The acquired knowledge and research potential enable them to continue the scientific research work after the completion of the study through post-doctoral specialization. The PhD's employed by businesses will be capable of improving the existing technological processes, introducing new technologies and innovative products in line with the modern trends in the field of textile technology, and beyond.

On behalf of all employees of the Faculty of Textile Technology, I address our future doctoral students with our basic idea and message: we are here for you, to provide you with the best education possible, in accordance with the scientific and research competencies.

Our mission is to inspire your energy, creativity, ability to learn and to direct them toward the formation of a free-thinking, young, educated expert who possesses the competencies and responsibility on the labour market and who can contribute to the development of society. We believe that we can achieve these goals through collective activities and work. Therefore, I invite you to direct the stated interest in TTF toward the achievement of goals such as these, because science and art are the strength, purpose and initiator of all social changes. We invite you to join us on this journey, to become better, more recognizable and more successful, to show the invention in education and research necessary to improve our society and global civilization and to assume the responsibility. We wish a warm welcome to our talented, inspiring and inventive future doctoral students! We are here for you and because of you.

University of Zagreb
Faculty of Textile Technology
Dean

A handwritten signature in blue ink, reading "Gordana Pavlović". The signature is written in a cursive style with a distinct loop at the end of the last name.

Prof. Gordana Pavlović, PhD

Introduction

The Postgraduate Doctoral Study of Textile Science and Technology (TST) has been conceived with the aim of connecting fundamental knowledge, science, innovativeness and knowledge of advanced technologies. The purpose of the study is to enhance the knowledge in textile technology, including associated areas, especially STEM (Science, Technology, Engineering and Mathematics). It should be pointed out that global development in the area of technical sciences and engineering is focused on the research of materials, particularly on the application of biotechnology and nanotechnology. Composite materials, smart textiles, functional textiles, protective and intelligent clothing are at the peak of interest in novel R&D.

The postgraduate doctoral study programme of Textile Science and Technology (QR code 1, page 121) clearly defines the research profile of TST programme where research topics are in line with the leading EU topics (Textile Flagships for Europe - TFE), proposed by the European Technology Platform.

Following our research excellence and long-time experience, TTF has identified topics, aimed at the further improvement of scientific excellence through the knowledge triangle (innovation-science-education) capable of increasing the competitiveness of the EU economy. Priority topics for research at TTF, which are at the same time the topics of the TST doctoral study programme, are shown in Figure 1.

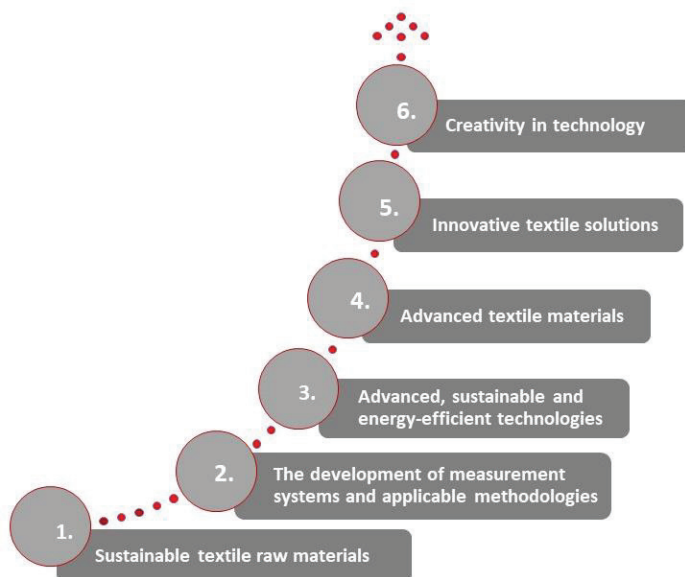


Figure 1: Priority research topics of the TST doctoral study programme

On a global scale, a great importance for raising the triangle of knowledge is given to the dissemination of knowledge and the interpretation of scientific contributions. Through its programme, the postgraduate doctoral study programme of TST provides the young researchers with high-quality training that is necessary for the dissemination of results obtained through research, both via organized classes and the presentation of the results to the wider public. This approach consolidates the values of scientific research work and from it stems the desire to

assemble a larger number of young scientists who will contribute, through hard work, thoroughness and scientific curiosity, to the development of highly-valuable textile products that occupy a significant place in all branches of human activity.

Doctoral study programme

The postgraduate university study programme of Textile Science and Technology has been integrated into the Faculty strategic documents that were accepted in 2014: Research Strategy of the University of Zagreb Faculty of Textile Technology for the period 2014-2020 and the Development Strategy of the University of Zagreb Faculty of Textile Technology for the period 2014-2020. In accordance with the TTF mission, scientific activities have been aimed at fulfilling the needs of social and economic development, while the teaching process has been matched to the needs of the labour market and the general needs of the society.

The programme is research oriented. 30 ECTS credits out of 180 (16.7%) are obtained by passing 2 obligatory and 6 elective courses. In addition to the PhD student's independent research work on the topic of their doctoral thesis, students obtain 18 ECTS credits for 3 project tasks, which consist of individual work on different research topics. 62 ECTS credits are obtained for published research work (published papers in journals, conferences, books, patents) and 70 ECTS credits are obtained for the doctoral thesis.

Doctoral studies are, according to TTF's Development strategy for 2014-2020, based on the capacity, critical mass and diversity of research, which makes doctoral students active participants in the research projects. Critical mass does not necessarily mean an extensive growth in the number of doctoral student researchers. It mostly concerns the quality of the research and the usage of modern scientific equipment available at TTF. TTF encourages attaining the highest possible level of learning outcome for the doctoral students in the course of their studies, developing mutual trust among doctoral students and their teachers, as well as developing ethics in science as an important basis of education. Throughout the course of their doctoral study, TTF offers professional development and individual progress to doctoral students, together with their gaining of skills in pursuing and understanding research ethics. This includes top-quality mentorship and the competence of TTF mentors and mentors from other Croatian and foreign institutions of higher education, which offer interdisciplinarity, mobility between institutions and collaboration with other universities. A high level of knowledge in textile technology enables the doctoral students to be involved in development projects of innovative and highly sophisticated technologies, which are a necessary basis for prosperity and increased competitiveness of the economy.

The following awards also serve as motivation for doctoral students to invest additional effort into scientific research:

1. Annual Dean's Award for Excellence for doctoral students, awarded on the Faculty Day.

2. Annual grant for research results, where the student is exempt from paying the tuition fee.
3. Annual award for best scientific work in the field of textile technology, awarded as part of the competition of the Textile Science Research Centre (TSRC).

The mobility of doctoral students is encouraged, and they are offered the opportunity to write a part of their doctoral theses at some other institution of higher education. Through well-planned education, the students are also encouraged to develop their cognitive abilities, primarily through their research within projects, but also through the ability to present the results of their research, their impact and application in the textile industry. TTF encourages the planning and monitoring of the duration of students' education process (higher passing rate), as well as monitoring each of the PhD students' careers after their graduation from the study programme.

The Quality Management System at the doctoral study programme

Fifty-two (52) teachers hold classes at the university postgraduate doctoral study of Textile Science and Technology, which ensures a favourable ratio of the scientific-teaching staff and doctoral students (1:1.2). The mentors of doctoral students exhibit high-level of competence, which can be observed in the number of projects in which they participate and the number of published papers relevant for the area and field of the doctoral study of Textile Science and Technology.

Continuous improvement of the quality of the doctoral study is actively performed by the following methods:

- Tracking the mentor competencies,
- Tracking and improving the teaching process at the doctoral study,
- Encouraging the research productivity of doctoral students,
- Including the doctoral students in the research projects,
- Providing scholarships and rewarding the doctoral students,
- Encouraging the cognitive skills of doctoral students,
- Encouraging mobility and postdoctoral specializations.

The Faculty organizes the educational and inspirational workshops for mentors and doctoral students, by which it invests additional efforts to improve the quality of the work of the mentors and efficiency of the doctoral students. The Faculty is continuously engaged on strengthening the human potentials, modernization of the premises and equipment that represent the basis for development, quality, innovations, creativity, new knowledge and successfulness of the teaching process and research work. The capital equipment is procured mostly through the funds of national (CSF, CIT projects) and international projects (FP7, H2020 and E! projects). The Faculty annually monitors the investments in medium and small equipment that are financed through the national projects (CSF projects) and funds of the University of Zagreb program contracts with

Ministry of Science and Education. The availability of this high-quality equipment implies great potential and opens additional options for the development of research profiles. It should be emphasized that the Faculty is recognised for the number of registered patents, development of the equipment and methods of testing that represent the basis for future research and development of the textile profession. As an integral part of the improvement of the quality of the research work at the doctoral study, it's also worth mentioning the monitoring of innovations and scientific achievements on a global scale. Besides the reference literature (dictionaries, encyclopaedias, manuals, lexicons...), most of the library material consists of scientific and professional publications that cover the broader field of technical sciences, particularly the textile technology.

International recognition of the doctoral study programme

The Faculty of Textile Technology is an internationally recognized educational and scientific institution in the field of textile engineering and technology, as well as fashion design, with significant involvement in all segments of international cooperation. The Faculty of Textile Technology has a leading position in the region maintained through continuous cooperation with related educational and scientific institutions within the European Research Area (ERA) and the European Higher Education Area (EHEA). With its strong international influence, the Faculty contributes to the overall strategic objective of the University of Zagreb – University internationalization.

The Faculty of Textile Technology encourages mobility of teaching and non-teaching staff by always being open to inter-institutional co-operation, and thus to two-way mobility, ensuring further advancement of the doctoral study. The support for international co-operation and mobility for students, as well as for the teaching and non-teaching staff, is ensured through the Faculty International Relations Office (IRO TTF). The Faculty offers information on mobility for the doctoral study programme students in a systematic way, by using various channels; it encourages their mobility and regularly organises mobility for the Faculty PhD students. Mobility is mainly carried out through the following: the ERASMUS+ programme, in which TTF has been participating since 2009, agreements with 29 institutions from 15 different countries, the CEEPUS (Central European Exchange Program for University Studies) programme in which TTF has been included since 1996 via a network of 9 members, but also via other forms of mobility, such as bilateral mobility, academic mobility and other, with the aim of the exchange of teaching and non-teaching staff and students of all levels of study, for the purpose of scientific, professional and educational training. TTF PhD students are also directed to seek additional sources of PhD funding through H2020, UKF (Unity Through Knowledge Fund) and CSF (Croatian Science Foundation), which enable them to perform a part of their scientific research work in laboratories of co-operative institutions, thus obtaining additional experiences.

In all of its activities, the Faculty of Textile Technology respects the Code of Conduct for the Recruitment of Researchers and implements the principles of the European Charter for Researchers.

Comprehensive international recognition of the Faculty of Textile Technology is achieved through the following activities:

- a) Work on international projects, through which experiences are exchanged, areas of activity and relevance of the work broadened, and scientific inter-institutional co-operation improved, with the aim of the improvement of scientific research and professional development
- b) The establishment of international cooperation by signing international contracts and co-operation agreements
- c) Taking part in the European Technology Platform (ETP), directly connected with the topics and priorities of general research programmes - Textile Flagships for Europe (TFE); participation of Faculty teachers and researchers in expert groups making decisions on priority research topics within the European Research Area (ERA)
- d) Membership in numerous international associations such as: AUTEX, URATEX, TEXTRANET, DAAAM, IFKT, AIC, ICTC, AATCC
- e) Active participation of the Faculty teachers in international societies and councils
- f) The organization of the international scientific conference titled International Textile, Clothing & Design Conference (ITC&DC) and the Textile Science and Economy Forum (TZG), and the co-organization of seven national and international conferences, where eminent international and European experts meet and present their recent scientific research and professional achievements.

The development of international co-operation, including research co-operation and mobility, has a positive trend, indicating a high level of international recognition of the Faculty of Textile Technology.

Admission requirements

Applicants who have completed graduate study with a grade point average (GPA) of 3.51 (in the rating system 5 – 10, the average rating is 7.51) can enrol in the Postgraduate University Study Programme of Textile Science and Technology. The admission of the candidates with a lower GPA is possible with a recommendation letter from two professors from their alma mater. Entrants who have completed other related university or undergraduate studies in the Republic of Croatia, or university graduate or undergraduate studies abroad, may enrol in the postgraduate university study programme in accordance with the Statute of the University of Zagreb and under the terms of enrolment into the Postgraduate University Study Programme of Textile Science and Technology. Candidates who have a foreign higher education qualification or degree will need to undergo the process of academic diploma recognition.

For the recognition of foreign higher education qualifications, one can contact:

Trg Republike Hrvatske 14, 10000 Zagreb

Phone + 385 (1) 45 64 272, Fax: + 385 (1) 45 64 274

e-mail: akadured@unizg.hr

Contact person: Davor Mavrić

(QR code 2, page 121)

The postgraduate doctoral study lasts for six (6) semesters. The cost of the study programme amounts to HRK 7.000,00 (seven thousand) per semester. If the study is funded by a company or an institution, the applicant will be required to submit a document confirming the settlement of expenses.

For foreign students (non-residents of the Republic of Croatia), there will be no admission fee for the doctoral study during the academic years 2019/2020 and 2020/2021.

The requirements for admission are determined by the Doctoral Study Council, in accordance with current regulations (the Regulations on doctoral studies at the University of Zagreb and the Regulations on the doctoral study at TTF). The public call for the admission to the doctoral study programme is announced at least six months prior to the beginning of the academic year in daily newspapers and on web pages. The criteria for evaluating the applicants include their results at the graduate studies, the interest shown for research and published papers, recommendations by professors and a potential supervisor, as well as their suggestion of the research area. An interview with the applicant is an obligatory part of the admission procedure, while the applicants are also obliged to prove their knowledge of English language, thus proving their ability to take courses in that language. All the necessary requirements for completion of the study on time are clearly defined at the admission. Application forms must be submitted by 1st of October, sent or delivered to the following address:

UNIVERSITY OF ZAGREB FACULTY OF TEXTILE TECHNOLOGY,
Student Administration Office, HR-10000 Zagreb, Prilaz baruna Filipovića 28a

Further information available via:

Phone: +385 (1) 3712 530 or e-mail: referada@ttf.hr

PhD students' obligations and rights

At admission, each student has to choose and state in writing whether he/she will study as a full-time or part-time student.

- Full-time students are those who dedicate their full working time to fulfilling the obligations of the doctoral study programme.

Full-time doctoral study lasts for three years. The Doctoral Study Council may decide to extend the study to five years in exceptional cases, if there are justifiable reasons.

- A part-time student is obliged to submit a statement saying that the working time at his/her disposal enables him/her to fulfil the obligations from the study plan.

Part-time doctoral study lasts for a maximum of five years and can be extended, by a decision of the Doctoral Study Council and for justified reasons, to seven years.

The Protocol states the obligations and rights of the students of the doctoral study programme of Textile Science and Technology (TST). (QR code 3, page 121)

The students of the doctoral study of TST are obliged to:

- Carry out research on the chosen subject in cooperation with their thesis supervisors
- Participate in classes organized within the doctoral study programme and receive credits for selected curriculum lectures according to the conditions stated by the lecturer and the Faculty (the list of obligatory lectures is updated and published before commencement of each term on the Faculty website)
- Submit written reports on their progress to the Doctoral Study Council - once a year (the DR.SC.-o4 form),
- Present oral reports on their progress in preparing their doctoral thesis during the annual Report Session for Doctoral Studies - at the request of the Doctoral Study Council on annual basis,
- Publish at least one scientific paper in a journal indexed in the Science Citation Index (Current Contents is recommended) connected to the PhD topic, where the student is the first author (one paper can qualify only for one doctoral student) prior to the doctoral thesis defence,
- Fulfil the scientific and financial obligations of the doctoral study regularly and on time.

Every doctoral student has the following rights:

- Propose enrolment into specific courses of the doctoral study programme,
- Use all the research resources at the Faculty, in agreement with the supervisor and person in charge for the equipment,
- Suggest the topic for his/her doctoral thesis,
- Propose his/her supervisor/study advisor,
- Change his/her supervisor and/or thesis topic, at a written request and a statement of the previous supervisor, using the appropriate Form (DR.SC.-o6) prescribed by the University,
- Elect his/her representative in Doctoral Study Council.

More information can be found in the Regulations on doctoral studies at the University of Zagreb. (QR code 4, page 121)

Competences acquired throughout the doctoral study programme of Textile Science and Technology

The goal of the doctoral study programme "Textile Science and Technology" is to train doctoral students in the following core competencies:

- The ability to apply the acquired knowledge and to develop new skills in the field of textile technology and related fields.
- Understanding the methodology of scientific work and research and its application in the field of textile technology and related fields.
- The ability to design developmental, applicative and research projects in the field of textile technology, including creative, innovative and original approach to research.
- The ability of team work and independent management of developmental, applicative and research projects in the field of textile technology.
- The ability of critical analysis, evaluation and self-evaluation of research results.
- Developed skill to apply original, independent, critical and analytical thinking in research work.
- Developed generic (transferable) skills and specific scientific skills applicable in professional and research work.
- The ability to solve complex problems, the improvement of the existing and development of new innovative solutions with the purpose of improvement in the field of textile technology.
- Assuming ethical and social responsibility and willingness to face new challenges of the society and the economy.

The structure and organization of the doctoral study programme

The structure of the Postgraduate Doctoral Study Programme of Textile Science and Technology with points sum of all obligations is presented in Table 1. Upon completion of the doctoral study programme, the student acquires at least 180 ECTS credits. The doctoral study programme is carried out through mandatory and optional courses, project tasks and the publication of research papers. All courses of the doctoral study programme last one semester. Mandatory and elective courses consist of 15 or 30 teaching hours and by passing the exams, the student acquires 2 or 4 ECTS credits (per course). Project tasks consist of 50 teaching hours in the IIIrd, IVth and Vth semester, and each carries 6 ECTS credits. The candidates are obligated to earn at least 62 ECTS credits in the course of their study by publishing papers.

Table 1. The structure of the study, mandatory and elective courses, project tasks and the publication of research papers from the field of research

Semester	No. of ECTS credits per semester						The minimum number of ECTS credits
	I	II	III	IV	V	VI	
Mandatory courses (2 courses)	4	2	-	-	-	-	6
Elective courses (5 courses)	4	8	4	4	-	-	20
General elective courses (1 course)	4						4
Project tasks	-	-	6	6	6	-	18
Research field papers							min 62
Doctoral dissertation / PhD thesis							70
	Sum of credits						180

COURSES

MANDATORY COURSES

SCIENTIFIC WORK METHODS

ZVONKO DRAGČEVIĆ

Credit hours: 15

ECTS: 2

Knowledge verification: oral exam

Precondition for testing: writing a paper

Lecture type: lectures, practice

Exercise type: audio practice

COURSE CONTENT

The definition of science and scientific work. The significance of scientific and professional work for the development of Croatia and inclusion in the international environment. Communication in science. The paradigm of today's methods of communication in science. Scientific activity and research. The classification of scientific methods. Methods of scientific research in the field of technical sciences. Scientific research technology. The elements of scientific research. The structure of the scientific and expert part. Journal as a key medium for scientific communication. Secondary information sources. Relevant databases: Chemical Abstracts, World Textile, Compendex, Science Citation Index (SCI-expanded), JCR - Journal Citation Index - evaluation. Relevant database search. Full-text of databases - ScienceDirect, Springer, Wiley, Blackwell etc. The evaluation of scientific work. Technical analysis of manuscripts.

THE AIM OF THE COURSE

The aim of this course is to introduce students to teaching methods and technology of scientific and professional work, and to the significance of publishing their research results. A significant prerequisite of successfulness of scientific work is the browsing of relevant literature in order to take note of actual problems in making research plans and to consider where scientific work could be published so as to be made available to the world's scientific and professional public.

SELECTED TOPICS IN MATHEMATICS

MIRNA RODIĆ / KRISTINA KRULIĆ HIMMELREICH

Credit hours: 30

ECTS: 4

Knowledge verification: seminars, oral exam

Precondition for testing: solved problem tasks

Lecture type: lectures, seminars

Exercise type: seminars

COURSE CONTENT

Linear programming (optimization) and its applications. Laplace transform and its applications. Selected topics in numerical methods and their applications. Selected topics in statistics and their applications.

THE AIM OF THE COURSE

The aim of this course is to analyse and solve mathematical problems related to the adopted mathematical concepts of Laplace transform, linear programming (optimization), numerical methods and statistics, to compare different methods of problem solving and – by using adopted mathematical concepts – to make a mathematical model that describes and solves a certain practical situation outside the mathematical context.

ELECTIVE COURSES

ANALYTICAL MEASUREMENT SYSTEM

BRANKA VOJNOVIĆ

Credit hours: 15

ECTS: 2

Knowledge verification: oral exam

Precondition for testing: Analytical chemistry

Lecture type: lectures

Exercise type: -

COURSE CONTENT

Analytical process. The statistical control of the analytical system. Laboratory organization according to the quality system. Laboratory competence. The proper selection of analytical methods. Proper sampling and sampling plan. The separation and isolation of analytes. Traceability. Calibration. Signal processing. Method selection, verification and validation. The evaluation of measurement uncertainty. Ensuring the validity of results. Reporting and the interpretation of analysis results. The determination of trace analytes in textile materials and auxiliaries.

THE AIM OF THE COURSE

The students will be able to select and optimize analytical procedures, perform them, validate the method, evaluate measurement uncertainty, ensure the quality of results and correctly interpret the results.

ANTHROPOMETRIC SYSTEMS AND CLOTHING SIZES

DARKO UJEVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: written exam, seminar

Precondition for testing: no

Lecture type: lectures - 15 hours, practice -10 hours, seminars -5 hours

Exercise type: audio practice, laboratory practice, seminars

COURSE CONTENT

The definition of anthropometrics and applied anthropometrics. Body measurements. Anthropometric tools. 3D body scanner. Sampling. The historical development of anthropometric tools and clothing sizing. The standardization of the clothing sizing system. The definition of figure types. The interrelationships of body parts. The selection of basic body dimensions. Clothing sizes intervals. Methodology and the statistical analysis of subjects in anthropometric measurements processing.

THE AIM OF THE COURSE

Basic principles, terms and definitions related to anthropometrics. Procedures of accurate measurement of the human body. Systematic approach and selection of a representative sample population. Statistical methods. Systems for determining garment sizes. Methods of measuring the male and female body. The standardization of the system for determining garment sizes.

COLOUR IN DESIGN AND MANAGEMENT

MARTINIA IRA GLOGAR

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: attendance, evaluated seminar paper

Lecture type: lectures

Exercise type: seminars

COURSE CONTENT

The content of the course defines the relationship of the terms dyed and coloured. It analyses in detail the basic theoretical directions in colour theory and colour science development, and the historical overview of colour theories is given. The course deals with the following: colour as the basic parameter of visual experience, the influence of colour on the psycho-physical reaction of the observer, the interaction of colour and the influence of the environment on the experience of colour, the dominant factors of visual perception and objective colour evaluation, the role and importance of colour in fashion, the positive and negative impact of metamerism. Colour harmony, basic colour contrasts, theory of complementary ratios, the role and importance of colour in management and promotional presentations, the influence of lightness and Chroma on colour experience, colour as a message carrier, colour and trademark, the overview of the most important colour order systems, the objective evaluation of colour differences and its importance in fashion and management.

THE AIM OF THE COURSE

The principles of colour, environment and visual perception, attribute to the quality of management, primarily in fashion design. Acquiring knowledge on the colour quality definition and the importance of colour matching in colour reproduction in multimedia. Acquiring knowledge on the principles of using colour as a message carrier and the key tool for communication with the observers in creating a presentable environment in fashion and design. Acquiring knowledge on complete colour managing, based on knowledge of light and colour surface interaction, theories of colour contrasts and their effect on observers.

ECOLOGICAL APPROACH IN TEXTILE CARE

TANJA PUŠIĆ / IVO SOLJAČIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral examination

Precondition for testing: seminar

Lecture type: lectures, consultations (if number of candidates is less than 5)

Exercise type: -

COURSE CONTENT

Biodegradability and chemical structure of surfactants and other ingredients in detergents. Triphosphates. Zeolites. Eutrophication problems in water. Enzymes as alternative environmental protection substances for harmful chemicals in texcare. Hygiene in washing. Antibacterial and antimildew protection. DEO-effect. The role of bleach-active compounds and activators in washing. Textiles and the influence of washing residues on textiles on the skin. Solvents in dry-cleaning. The toxicological risk of applied solvents (maximal allowed concentrations-MAC and critical allowed concentration-CAC). Chemical degradability and biodegradability of solvents. The danger of some chemicals. Accumulation in the atmosphere (freons and the ozone layer). Boosters and environmental requirements. Alternative solvents: Green Earth and LCO₂. Wet cleaning. Environmental and toxicological requirements for the dry-cleaning equipment. Solvent emission. Law regulations in Texcare.

THE AIM OF THE COURSE

Scientific education and better understanding of environmental protection and risk reduction of textile care processes. The development of novel detergent formulations as well as dry-cleaning solvents. The modification of textile materials in textile care processes and characterization methods. The optimization and innovations in washing and dry-cleaning – technological and environmental aspect.

ELECTROMAGNETIC WAVES IN TEXTILE FINISHING

SANDRA BISCHOF / DRAGO KATOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: accepted seminar paper

Lecture type: lectures, practice

Exercise type: laboratory practice

COURSE CONTENT

Electromagnetic (EM) waves, their properties and application in the drying processes. Drying of textiles with radiowaves, microwaves and infrared waves. Mechanism involved in classical conduction/convection methods compared to those of microwaves. The effects of microwaves on pre-treatment, dyeing and finishing processes. The influence of microwaves on the human body.

THE AIM OF THE COURSE

Scientific approach in the field of microwave technology application.

ENZYMES IN FINISHING AND TEXTCARE PROCESSES

TANJA PUŠIĆ / ANITA TARBUK / IVO SOLJAČIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: seminar paper

Lecture type: lectures, consultations (if number of candidates is less than 5)

Exercise type: -

COURSE CONTENT

The environmental impact of enzymes. The mechanism of action-biocatalysts. Pectinases. Celulases. Lipases. Proteases. Peroxidases. Enzymatic mixtures. The optimization of processes. Effects in finishing processes – the preparation for bleaching and dyeing. Enzymes in cloth finishing (denim). Enzymes in washing – the improvement of primary effects, energy saving-low temperature washing processes.

THE AIM OF THE COURSE

Better understanding of the mechanism and properties of enzymes, their role and importance in the finishing and textile care washing. The activity and action mechanism of enzymes: amylases, pectinases, celulases, lipases, proteases, mannanases, peroxidases etc. Efficiency in bleaching and dyeing. Bioinnovation in washing process – highly efficient enzymes for enhanced primary performance, energy consumption reduction and low temperature processes.

WORKING PROCESS ERGONOMICS IN GARMENT TECHNOLOGY

ZVONKO DRAGČEVIĆ / ANICA HURSA ŠAJATOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: writing a paper

Lecture type: lectures, seminars

Exercise type: audio practice, laboratory practice

COURSE CONTENT

Processing and mounting manufacturing systems. Closed and open, combined and complex types of workplaces. Individual and team work. Modular workplaces. Industrial ergonomics. Microergonomics. Sensory, informational, adaptive and effector systems. Engineering anthropometry. Static and dynamic anthropometry. The degrees of freedom and the control of movements in work. 3D cyclograms of movement. Working process biomechanics. Workloads testing methods. Human error factor. Increasing working efficiency. Models and methods of training. MTM-2 and MTM-3. Systems of the logical sequence of movements. Standardization of sub-operations and operations in garment technology. Designing the work method and workplace. Computer-aided modelling and simulation of the work process.

THE AIM OF THE COURSE

Mastering this programme will enable the students to adopt a scientific approach to the research of higher work efficiency, based on reduced workload in the man-machine-environment system. A systematically developed sets of logical sequence of movements and the standardisation of sub-operations and operations in garment technology will result in the design of more adequate work methods and workplaces, in accordance with the engineering and technological prerequisites for the manufacturing process.

PHYSIO-CHEMICAL PROCESSES AND EFFECTS OF WET TEXTILE FINISHING

IVO SOLJAČIĆ / ANA MARIJA GRANCARIĆ / ANITA TARBUK

Credit hours: 30

ECTS: 4

Knowledge verification: seminar

Precondition for testing: completed laboratory practice

Lecture type: lectures, practice

Exercise type: laboratory practise, seminars

COURSE CONTENT

The fundamental principles of photochemistry; fluorescence and phosphorescence. Quenching of fluorescence and its influence on whitening effects. Phosphorescence, superimposed fluorescent and phosphorescent effects. Mass, momentum, energy and heat balances, dimensionless numbers, Newton's law, momentum equations, rheology, laminar flow, turbulent flow, Poiseuille equation, Navier-Stokes equation, flow in textile pores, pore size distribution, Washburn equation, heat transfer, the first and second Fourier's law, heat conduction, heat convection, stationary and instationairy heat flow, heat transfer coefficients, mass transfer, the first and second Fick's law, molecular diffusion, Stokes-Einstein equation, convective mass transfer, mass transfer coefficients. Systematic approach to wet processing of textiles, the origin and classification of electrokinetic effects, the measurement of zeta potential, point of zero charge, isoelectric point, specific amount of charge. The application of electrokinetic potential, the measurement of electrokinetic parameters. Wettability, capillarity, adsorption; surface free energy of solids, theory, thin-layer wicking technique, contact angle, hydrophylity and hydrophobicity.

THE AIM OF THE COURSE

Physical chemical fundamentals and knowledge needed for the better understanding and the development of the numerous unit operations of different wet textile treatments in textile pre-treatment and finishing processes. On the basis of these fundamentals, textile materials undergo chemical, physical, physical-chemical and biological processes. The efficiency of all these processes depends mostly on the transport and interface phenomena that include the wetting, capillarity and adsorption phenomena.

INDUSTRIAL ENGINEERING

ZVONKO DRAGČEVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: writing a paper

Lecture type: lectures, seminars

Exercise type: audio practice, laboratory practice

COURSE CONTENT

The organization of the industrial engineering sector. Methods of industrial engineering. JIT strategy. Techniques of scientific research and optimisation. Rationalising manufacture. Toyota system. Processes and operations planning. The development and maintenance of exact standards. Informational and communication management. Engineering ethics. Strategic dimensions of computer systems. Methods of working systems and industrial processes simulation. Programming simulations systems. The presentation of the systematic manufacturing structure analysis process.

THE AIM OF THE COURSE

The course content is applicable in the wide area of manufacturing and business operations, primarily for the research and development of manufacturing systems and processes, as well as for the introduction of new manufacturing concepts and manufacturing excellence. The application of contemporary industrial engineering methods will offer a scientific approach to the planning and optimisation of the processes as early as in the manufacturing systems design phase.

INTEGRATED SYSTEMS IN INTELLIGENT CLOTHING

DUBRAVKO ROGALE

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: attendance at lectures, seminars and practices

Lecture type: lectures, seminars

Exercise type: practice

COURSE CONTENT

Sensors and sensor integration into garment parts. Temperature, pressure, acceleration, location, force, humidity, breathing, heartbeat, blood pressure, respiration, gases sensors and special sensors. The integration of measurement systems, data acquisition, analogic digital converter, conversion methods and data interpretation. Intelligent behaviour algorithms. Microcomputers and microcontrollers systems in intelligent clothing, storage, circuits, input/output channels, communication with the environment, programming. Characteristic actuators and their integration into the system. The integration of the electroenergetic power supply system into intelligent clothing. The integration of the telemetry and telecommunication system. Integrated systems of active thermal protection of intelligent clothing; monitoring systems for health and body condition. Connecting the GPS, GSM and other specialized systems with the integrated systems in intelligent clothing.

THE AIM OF THE COURSE

The familiarization of students with the most modern scientific research area of clothing technologies – the construction and production of intelligent clothing. All contemporary integration methods of nanotechnological systems – sensors, microcomputers and microcontrollers, intelligent behaviour algorithms, intelligent clothing actuators – are studied in the course.

GARMENT ENGINEERING DESIGN

JELKA GERŠAK

Credit hours: 30

ECTS: 4

Knowledge verification: seminars / oral exam

Precondition for testing: passed exams in basic courses of general technical subjects
successfully completed exercises and project work

Lecture type: lectures / workshops – project work

Exercise type: laboratory practice – individual research work

COURSE CONTENT

The key functions of clothing engineering design. Clothing design based on the mechanical properties of textile materials. The influence of the fabric's mechanics on their reshaping and on clothing appearance quality. Formability. Elastic potential. Draping as an aesthetic performance of clothing appearance. Clothing appearance and fit. The impact of fabric mechanical properties on clothing fit, the visual form of the 3D shape, the quality of fitting, and the visual appearance of produced seams as the criterion of clothing appearance quality. Engineering design of clothing in terms of the thermo-physiological, skin-sensory, mechanical and ergonomic comfort. Qualitative evaluation and prediction of fabric behaviour in clothing manufacturing processes, desired form design – 3D shape and clothing appearance, the simulation of drape ability and the prediction of clothing appearance quality by using the measured data of the mechanical properties of fabrics. The peculiarity of the engineering design of functional and intelligent clothing. Strategic approach to new product development in smart clothing.

THE AIM OF THE COURSE

The students familiarize themselves with key functions of clothing engineering design and fabric mechanics in regards to complex textile structures. The content provides: (i) the opportunity to develop skills in making and testing hypotheses, developing new theories, planning and conducting experiments; developing practical research skills and learning new state-of-the-art techniques used in clothing science research; (ii) the opportunity to expand the students' knowledge of their research area, including its theoretical foundations and the specific techniques used to study it; and (iii) an environment in which the students can develop skills in written work, oral presentation and the publishing of the results of their research. Mastering the specific knowledge will enable the students to adopt a scientific approach to the research of the development of systematic planning, synthesizing parts or ideas into a whole, and optimizing clothing and/or clothing systems.

CHEMISTRY OF MATERIALS AND NANOTECHNOLOGY

GORDANA PAVLOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: preliminary exam

Precondition for testing: inorganic and physical chemistry knowledge, materials science

Lecture type: lectures - 20 hours

Exercise type: seminars - 10 hours

COURSE CONTENT

Solid state chemistry and materials, the definition and types of materials: metals, ceramics, polymers, composites, types of chemical forces in solids - supramolecular chemistry, crystal structures of metals, ceramics structure, silicate ceramics, carbon: fullerene, diamond, graphite, allotropism and polymorphism, phase diagrams. Methods of the preparation, features, structure and applications of zeolites, nanostructured materials and their dimensionality, nanotubes: classes, characteristics and application, nanomachines and devices, chemical properties of substances at nanoscale, self-assembling and molecular recognition in nanomaterials, the design of materials of predicted features, chemical methods of preparation of nanomaterials, methods of examination of the properties of nanomaterials, application of nanomaterials, nanomaterials in textile industry, carbynes and fibres. The ecological and ethical impact of nanotechnology applications, nanomaterials as drugs, nanomaterials in electronic industry, perspectives of nanotechnology development.

THE AIM OF THE COURSE

Nanoscience and nanotechnology are interdisciplinary and comprehensive disciplines based on subjects from the fields of physics, chemistry, electronics. Nanotechnology is one of the most propulsive scientific and technological area of the 21st century. It penetrates the areas of electronics, robotics, new drugs design as well as the textile industry. Nowadays, scientists look at the molecular level and explore the manner in which atoms and molecules can be assembled into a material of desired functional characteristics (the tailoring of materials).

TEXTILE WASTEWATER CHEMISTRY

BRANKA VOJNOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: analytical chemistry, industrial waters and wastewaters; submitted and approved seminar

Lecture type: lectures, seminar

Exercise type: -

COURSE CONTENT

Textile industry and the environment. Physical, chemical and biological properties of textile industry effluents. The chemical analysis of wastewater by optimal physical-chemical methods of analysis before and after wastewater treatment. Chemical reactions, equilibrium and wastewater processes. National and European legislation and regulations on all types of water and wastewaters; international standards with special reference to the textile industry wastewaters. Major pollutants related to legislation and water use. The sources and effects of water pollutants in the textile industry. The characterization and classification of wastewaters. Water pollution depending on the type of processed textile materials and the potential impact on the environment with a focus on sustainable development. Standards for water quality monitoring. The importance of methods for monitoring the parameters that characterize the textile industry wastewaters, their monitoring in various processes and the interpretation of the analysis results. Water consumption in technological processing of textiles and the analysis and characterization of wastewater after each process. Main wastewater treatment: mechanical, chemical, physical-chemical, biochemical treatment. Methods of decolourization after fabrics dyeing. The development of new methods for pollutants reduction. The implementation of advanced oxidation processes to effluents treatment. The analysis of treatment procedures according to the type of pollutant and treatment effectiveness. The possibility of the recovery and recycling of textile industry wastewaters. The management of the sludge from a wastewater treatment plan.

THE AIM OF THE COURSE

The students will learn about the principles of textile wastewaters treatment, sources and environmental effects of individual textile pollutants and the development of new methods for reducing and purifying pollutants. The students will learn about water and wastewaters legislation in Croatia and EU, standards and standard methods for monitoring/characterisation of water and wastewaters. Emphasis is placed on the interpretation of the analysis results.

CHEMICAL MODIFICATION OF CELLULOSE MATERIALS

SANDRA BISCHOF / DRAGO KATOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: accepted seminar

Lecture type: lectures, seminars, practice

Exercise type: laboratory practice, seminars

COURSE CONTENT

Chemical modification processes with the application of environmentally friendly agents and methods. Different reaction mechanisms between the reactant and cellulose molecules (textile or wood). The purpose is to obtain a high-performance material of excellent durability. Improvements in the following characteristics: dimensional stability, water and oil repellency, fire retardancy (FR) and antimicrobial characteristics.

THE AIM OF THE COURSE

Scientific approach in the field of chemical modification of cellulose materials.

AIR POLLUTION CONTROL IN TEXTILE PRODUCTION

DRAGO KATOVIĆ / SANDRA FLINČEC GRGAC

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminars

Precondition for testing: no

Lecture type: lectures, seminars

Exercise type: seminars

COURSE CONTENT

Air pollution categories. Textile processing emissions. Exhaust air control during textile production. The toxicity of developed products. The problem of free formaldehyde release in textile finishing processes. Mechanisms of free formaldehyde release into water and air. The influence of treatment parameters on the decrease of emissions. FTIR identification and the quantification of the gaseous products produced by pyrolysis. Measurement of dust particles generation from the textiles surface.

THE AIM OF THE COURSE

The scientific approach of students to solving the environmental problem of emissions of harmful substances in the context of the lifecycle of textiles.

COOPERATIVE ENVIRONMENTAL MANAGEMENT SYSTEMS

NATALIJA KOPRIVANAC

Course summary: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: no

Lecture type: lectures

Exercise type: seminars

COURSE CONTENT

Water pollution prevention in textile industry with an emphasis on technological processes of dyeing. Methodology and techniques. Life Cycle Assessment (LCA). Primary and secondary treatment processes, conventional biological and alternative processes. Separation systems and recycling. Risk assessment and management. Compliance with environmental management systems. Eco Management and Audit Scheme (EMAS); Occupational Health and Safety Management System (OHSAS) 18001. Compliance with legislation. Cleaner production, principles, methodology and eco-efficiency. Public policy and communication. The concept of integrated environmental management.

THE AIM OF THE COURSE

Introduction to the proactive approach in solving the environmental protection problems. At the same time, application of preventive strategies for the environmental protection of production processes.

FIBROUS COMPOSITES MECHANICS

EDITA VUJASINOVIĆ / DAVID HUI

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminar

Precondition for testing: no

Lecture type: lectures, seminars, practice

Exercise type: audio practice, laboratory practice, seminars

COURSE CONTENT

The fundamental principles of the mechanics of composite materials. In-depth study of stress-strain, bending, torsional, dynamic and rheological behaviour of fibre-reinforced composites. Failure criteria for these materials. The effect of material defects, design deficiencies and incorrect processing on the origin and cause of fracture. The underlying principles of design and the manufacturing of fibre-reinforced composites to meet specific needs in mechanical and other behaviours.

THE AIM OF THE COURSE

The students will gain a good understanding of the properties of commercial composite systems, the principles of composite mechanics and grounding in design methods. They should be able to conduct preliminary stress analyses and design fibre reinforced composites to meet performance and cost constraints.

METHODS OF COMPUTER-BASED 3D GARMENT CONSTRUCTION

SLAVENKA PETRAK

Credit hours: 30

ECTS: 4

Knowledge verification: seminar, oral exam

Precondition for testing: regularly completed exercises, submitted and approved seminar

Lecture type: lectures - 15 hours, practice - 10 hours, seminars - 5 hours

Exercise type: laboratory practice

COURSE CONTENT

The study of 2D and 3D garment construction methods and mathematical models for pattern alterations. The research of the parameters of contemporary CAD/CAM systems by developing computer-based 3D garment models, from the 2D design stage of textiles and clothing, complete block pattern development, 3D model simulation and visualization to the manufacturing process itself. The research of the influence of the anthropometric body characteristics on the computer garment prototype development process. Research of the dynamic anthropometry and the influence of dimensional body change on functional garment fit. Implementation of computer-based 3D body models in the CAD system for the purpose of the development of garment prototypes, as a result of 3D body scanning. Studying the parametric body models and customization possibilities. The research and development of parametrization methods for computer block patterns modifications according to different body sizes, shapes, statures and postures. Studying the 3D construction methods for the development of tight fit clothing based on the transformation of separated 3D body surfaces into flat 2D cutting parts. Studying the impact of the 2D/3D CAD systems application on the performance of garment manufacturers in terms of global business.

THE AIM OF THE COURSE

The students will gain a comprehensive understanding of techniques and methodologies in the field of 3D CAD systems and their application in garment construction and simulation processes. They will be able to critically analyse the influence of simulation parameters on 3D garment prototypes and argue correlations between applied properties and simulation results. They will be able to understand and manage the impact of the dynamic anthropometry of body characteristics on garment construction and independently implement required modifications of block patterns. They will be able to undertake research tasks in the field of the development of parametric garment prototypes for automatic adjustment according to different anthropometric characteristics.

MEASUREMENT METHODS AND THE ANALYSIS OF PROCESS PARAMETERS

DUBRAVKO ROGALE

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: attendance at lectures, seminars and practices

Lecture type: lectures, seminars

Exercise type: practice

COURSE CONTENT

Measuring systems for determining the values of process parameters in the technological processes of garment cutting, joining and finishing. Sensors and measurement methods for determining the operating speed of machine parts, material feeding, forces, penetration force, angle acceleration and workpiece acceleration, friction, power and energy. Measuring signal conditioning, measuring amplifiers, filters, the conversion of measurement data, the synchronization of measurement and control computer systems, data storage. Measurement data processing, statistical and numerical methods. The development and application of measurement systems for characteristic technological procedures of garment production. The integration of the measurement system with the designed workplace in the laboratory environment and production process. The development of program support for measurement, acquisition and data processing, the calculation and analysis of process parameters. The procedure for determining new process parameters in conventional production processes. The research, measurements and analysis of process parameters in contemporary technological cutting processes by NC units, laser and ultrasonic instruments and hot patterns, laminating joining processes, ultrasonic, conduction and convection of heat.

THE AIM OF THE COURSE

The students will become familiar with scientific research methods of determining process parameters of the technological procedures of garment manufacturing, with elements of measuring systems, measurement methods and numerical analysis of process parameters. The students will familiarize themselves with research methodology and acquire knowledge of individual research work in determining, measuring and analysing process parameters.

MULTIFUNCTIONAL DYES IN APPLICATION

ĐURĐICA PARAC-OSTERMAN

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminar

Precondition for testing: no

Lecture type: lectures, practice

Exercise type: practice

COURSE CONTENT

The basics of photochromism. The phenomena of reversible colour change. The physio-chemical and spectral properties of photochromic, thermochromic, solvatochromic, ionochromic, electrochromic and other dyes and mechanism systems. The selection of analytical methods of multifunctionality testing. The selection and modification of application methods according to substrate. Statistical testing of the "colour at the right time" concept. The causes and analysis of degradation products, with emphasis on the application type. Passive, textile sensors through the application of multifunctional dyes. The basics of pattern design for passive textiles. The classification of sensors based on the application area (medical textiles, children's clothing, military clothing etc.).

THE AIM OF THE COURSE

The production of textiles in the future should be aimed towards specialty and multifunctional products of high added value. The production process in the future should be sustainable and eco-friendly, and at the same time technologically innovative. One possibility of achieving the set goals is through the use of multifunctional dyes, which are defined by their chemical constitution and may be used in a wide variety of applications (medical textiles, children's clothing, military camouflage uniforms...).

NANOSTRUCTURES

KARLO LELAS

Credit hours: 30

ECTS: 4

Knowledge verification: seminar, oral exam

Precondition for testing: attendance at lectures and seminars

Lecture type: lectures, seminars

Exercise type: seminars

COURSE CONTENT

Introduction to nanoworld. Molecular mechanics and nanostructures. Nanotechnology and various applications. Physical properties of smart materials. Smart fibres, sheets, polymers and smart structures.

THE AIM OF THE COURSE

The aim is to introduce students to nanotechnology and to emphasize the importance of understanding the physical basis of nanotechnology for successful application in textile industry.

NEW DYES AND ADVANCED TECHNOLOGIES IN THE 21ST CENTURY

ANA SUTLOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral

Precondition for testing: written seminar

Lecture type: consultation and discussion

COURSE CONTENT

New technologies and postulates of the ecological approach to production based on sustainable development. The conservation of energy (heat storage, air purification, etc.), economic and environmental reasons (low bath volumes, small number of additives required for the dyeing process), minimum water pollution, bath recycling. High added value - new dyeing processes, new textile pre-treatment processes, new dyes. New dyes with special properties (thermochromic, photochromic and other with multifunctional properties). The environmental and toxicological analysis of dyes in accordance with legislation. New dyes must follow legislative requirements for safe use and environmental protection (dyes with great stability, with minimum level of water pollution, biodegradable). Critical approach to new dyeing technologies (nanotechnology, the application of microcapsules, enzymatic textile pre-treatment, plasma pre-treatment, the application of microwaves etc.). Application of new technology in the analysis of dyes, management of dyeing production processes (automation, robotization) and control system (PID, fuzzy logic, neural networks and sliding control modes). Dyeing process based on the Quick Response strategy, which is based on the following basic postulates: reproducibility, energy efficiency, cost effectiveness and total quality management (TQM).

THE AIM OF THE COURSE

The critical evaluation of innovations in the chemical structure of dyes and their dyeing properties based on the collected professional literature. The evaluation of the collected information and comparison of new technological ideas with the present knowledge. Development of personal professional and ethical authority in evaluating information through seminar work preparation. Maintaining complex communication with other scientists; coordinating the cooperation process in different social groups. Creating new forms of communication and collaborative processes through e-learning during the presentation or publication of some of the seminar work topics.

NEW SIZING PROCEDURES

STANA KOVAČEVIĆ / IVANA SCHWARZ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminars

Precondition for testing: completed exercises

Lecture type: lectures, practice, seminars

Exercise type: laboratory practice

COURSE CONTENT

The content of the course includes the analysis of the entire sizing procedure as one of the most complex phases in the woven fabric production. The aim of the course is to achieve a scientific approach of the students to finding the optimal sizing procedure by using new technical and technological solutions. The aim of the course is to analyse the procedures of sizing process in economic and ecological terms and research these aspects. The aim is to analyse the influential parameters of the sizing process, the optimization of the sizing process and the influence of the sizing process itself on further woven fabric processing, as well as on the quality of finished fabrics.

THE AIM OF THE COURSE

The course objectives are to analyse the existing and explore new sizing procedure, such as the pre-wetting sizing procedure, emphasizing the advantages and disadvantages. The aim of the course is to find and select the most suitable sizes, as well as to optimize the recipes and sizing conditions according to the woven fabric structural parameters. The aim is to investigate the impact of faults in the previous phases of processing and eliminate them in new sizing processes. The aim is to investigate the impact of size on the utilization of weaving machines, the workload of workers and the quality of finished woven fabrics.

NUMERICAL METHODS IN TEXTILE ENGINEERING

ŽELJKO ŠOMOĐI

Credit hours: 30

ECTS: 4

Knowledge verification: written exam, oral exam, seminars

Precondition for testing: completed exercises

Lecture type: lectures, practice, seminars

Exercise type: laboratory practice

COURSE CONTENT

Methods for approximate solution of equations: secant, tangent and general iteration methods. Approximate extreme search. Numerical optimisation in the example of clothes reinforcements. Finite difference method: the approximation of derivatives by finite differences. The application of differential equations of beam and plate bending in numerical solutions. Examples of computer programme modelling and analysis. Application in the modelling and optimisation of grip geometry in automated transport of textile products. Finite element method: the principles of continuum discretization, the general stiffness matrix of a finite element, the formation of and solving global equation system. Details on the stiffness matrices of a finite element for beam bending analysis, and of a triangular finite element for plane stress analysis (CST). Example of a finite element computer programme. Modelling and analysis in examples of reinforcements in textile and elastic homogenisation of a perforated membrane.

THE AIM OF THE COURSE

Familiarisation with the up-to-date numerical methods in engineering and the application thereof to some typical mechanical problems in textile and clothing technology.

CLOTHING ARTEFACTS - METHODS OF ANALYSIS AND ATTRIBUTION

KATARINA NINA SIMONČIČ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam and seminar paper

Precondition for testing: class attendance

Lecture type: formal lecture

Exercise type: research on specific artefact in a museum

COURSE CONTENT

The introduction and historical overview of historical artefacts analysis methods. Managing clothing artefacts from their discovery to the conservation institute. Documenting clothing artefacts: category, typology and attribution. Use of archival data and historical analysis.

The methods of analysis are applied through exercises on examples of clothing artefacts of different stylistic periods. The interpretations of the results are based on an inter-disciplinary approach. The course specifically discusses problems derived from comparative analysis. Comprehensive analysis covering the content of the artefacts, its historical and present-day reception.

THE AIM OF THE COURSE

Analysing clothing and textile artefacts.

Reviewing influences and related examples and making a section of related features.

Determining the characteristic style of ornaments, craft techniques and forms of fashion constructions.

Critically evaluating the existing material and artefacts.

Compiling a final report based on art historical and technical analysis.

APPLICATION OF LOW-TEMPERATURE PLASMAS IN TEXTILE TREATMENT

SANJA ERCEGOVIĆ RAŽIĆ / SLOBODAN MILOŠEVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminars

Precondition for testing: diploma supplement of graduation from a study programme in fundamental and technical sciences

Lecture type: lectures, seminars, practice

Exercise type: laboratory practice, seminars

COURSE CONTENT

The classification of plasmas (the differences of natural and laboratory plasma - depending on pressure: low-pressure and atmospheric). Plasma phenomena in nature. Mechanisms of plasma generation and plasma behaviour depending on parameters – generator frequency (MF, RF, LF), pressure, power, gases and time. Basic processes - ionization and recombination processes (in respect to weak and highly ionized plasma, i.e. thermodynamic equilibrium, types of collisions between charged (electron) and neutral particles in plasma). Specific and complex plasma-chemical reactions as a result of plasma particles collision and interaction with the contact surface. The application of such reactions to the research and understanding of specific reactions generated by the interaction of plasma-textile surface that have not yet been fully explored. Major effects of plasma on substrates, depending on the plasma mode and gases used – fine surface cleaning, activation, surface etching, functionalization, graft-polymerization, cross and coating deposition (polymerization). Plasma diagnostic – different diagnostic tools can be used, depending on the specific requirements – driving current and voltage waveforms, electrical probing, mass spectrometry and optical emission spectroscopy. Low-pressure plasma – specificity and applicability depending on system characteristics and treated substrate specificity. The evaluation and assessment of achieved effects by sophisticated methods of the analysis of surface and obtained properties. The specificity of atmospheric plasma technology and application in the treatment of textile materials.

THE AIM OF THE COURSE

Theoretical knowledge about the possibilities of applying new plasma technologies in the modification of textile materials. Practical knowledge in working with low-pressure and atmospheric plasma systems for targeted treatments of textile materials. The competence and ability of independent action by applying low-temperature plasma technology in textile and other industries.

PROCESS PARAMETERS OF KNITWEAR PRODUCTION

ZLATKO VRLJIČAK

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminars

Precondition for testing: attendance of lectures, evaluated

Lecture type: lectures, seminars, practice

Exercise type: audio practice, laboratory practice, seminars

COURSE CONTENT

Needle forces in loop formation. Needle loads in the knitting process. The relationship between the force of thread feeding to the knitting needle and the force of fabric takedown. The measurement of tensile and pressure forces of the latch needle in loop formation. Yarn feeding mechanisms. Yarn tension in knitting. Knitted fabric geometry. Main characteristics of the knit structure and the methods of their calculation. Forces in knitting zone in relative knitting technique. The simulation of the knitting process on the computer.

THE AIM OF THE COURSE

The students will familiarize themselves with various parameters in the production of knitted fabrics. After passing the exam, the students will be expected to construct a new product using different scientific methods. The new product should be acceptable on the market.

DESIGNING SPUN YARN STRUCTURE

ZENUN SKENDERI

Credit hours: 30

ECTS: 4

Knowledge verification: oral exams

Precondition for testing: laboratory practice

Lecture type: lectures, seminars, practice

Exercise type: laboratory practice

COURSE CONTENT

The main design parameters of the spun ring and rotor yarn structure, and mathematical expressions for their determination. Yarn fibres configuration. Wrapped yarn produced on a spinning machine with a hollow spindle. Wrapped yarn structure. The design of structures and properties of elastic yarn produced on a ring spinning machine. Structural parameters of the yarn produced by aerodynamic spinning process. Fancy yarns with variations in mass and twist. The structure and properties of compact yarn. Periodic and non-periodic deficiencies in spun yarns. The correlation of the structure and physical-mechanical properties of yarn.

THE AIM OF THE COURSE

The aim of the course is that the students acquire practical and theoretical knowledge on designing the structure of spun, elastic and fancy yarns, as well as their physical properties.

DESIGN OF WOVEN FABRIC STRUCTURES

ŽELJKO PENAVAL

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: seminar

Lecture type: lectures

Exercise type: audio practice, laboratory practice, seminars

COURSE CONTENT

The impact of anisotropy and direction of action of external load on the mechanical properties of woven fabrics. The determination of elastic constants (elasticity modulus, shear modulus and Poisson's ratio) for arbitrary chosen direction of axial force action. The elasticity modulus, shear modulus and Poisson's ratio of woven fabrics are determined experimentally in the laboratory. The calculation of the initial elasticity modulus in relation to an arbitrarily selected coordinate system. The determination of shear angle, shear forces and shear stresses of woven fabric. The analysis of pure shear behaviour of woven fabrics by picture frame test. The concept and determination of the values of breaking force, elongation at break, contraction at break, work to rupture for woven fabrics that are loaded with tensile force. Impact action direction of tensile force on the anisotropy degree and anisotropy coefficient of woven fabrics and coated fabrics. The prediction criterion of fabric tensile strength in arbitrary directions. Calculation of normal and shear stresses in woven fabrics subjected to certain loads. Comparison between real and conventional operating stress diagram for woven fabrics. The measurement of the dynamic change of fabric thickness and lateral contraction during stretching process. The analysis of pull-out force of yarn from fabric. Strain potential energy of fabrics in pure shear. Strain potential energy of fabrics at axial load. Designing fabrics with specific mechanical properties and construction parameters using the CAD/CAM system.

THE AIM OF THE COURSE

The development of capabilities to construct the most complex types of fabric based on minimal given parameters. The acquisition of knowledge on how to determine necessary elements in the process of fabric production by analysing the construction parameters and mechanical properties of fabric. Independent fabric production according to given parameters and utility values based on the acquired knowledge of the CAD-CAM system application method. Independent presentation of the results of own research in the field of fabric design.

RHEOLOGY

BUDIMIR MIJOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: seminar

Lecture type: lectures

Exercise type: audio practice, laboratory practice, seminars

COURSE CONTENT

Tensors and rheology. Continuum concept. Stress vector, stress tensor and finite strain tensor. Plane stress and plane strain. Hyperelasticity and linear elasticity. Linear viscoelasticity behaviour. Two-dimensional elasticity. Rheological models (Maxwell model, Kelvin model, Alfrey model). Creep and relaxation. Three-dimensional model. Isotropy and anisotropy. Textiles microstructure. Micro-scale, mezzo-scale and macro-scale. Mechanical characteristics of textile materials, strength, tenacity and heat permeability. Inhomogeneous cross-section of textile material. The use of rheological models for fibres, yarns, woven fabrics, knitted fabrics, technical and nonwoven fabrics.

THE AIM OF THE COURSE

Training the students of the doctoral study programme to be able to analyse rheological models of textile materials on their own. They should be able to analyse 2D and 3D models of textile materials.

SOPHISTICATED APPROACH TO GARMENT AND FOOTWEAR PRODUCTION

DARKO UJEVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: written exam, seminar, oral exam

Precondition for testing: no

Lecture type: lectures - 15 hours, practice -10 hours, seminars -5 hours

Exercise type: seminars

COURSE CONTENT

The development and application of a new production philosophy with the implementation of necessary scientific and professional knowledge in the manufacturing business system. E-training and training necessary to master new knowledge and technologies. A sophisticated approach and the methodology of improving clothing production. Modern aspects of technical preparation. The planning and control of overall manufacturing processes.

Methods for increasing productivity and absolute quality. Product manufacturing. Motivational factors. Communication processes. Complete consideration and mutual study of important aspects in the system: collection planning, prototyping, preparing regulations, constructions, design and marketing. Setting goals and efficient implementation. Production manager education.

THE AIM OF THE COURSE

Complete education in the field of scientific and professional terms necessary for management in complex conditions of garment production. Technical and technological basis of modern industrial clothing production.

STRUCTURES AND PROPERTIES OF NONWOVEN FABRIC

ZENUN SKENDERI / DRAGANA KOPITAR

Credit hours: 30

ECTS: 4

Knowledge verification: oral exams, seminars

Precondition for testing: completed exercises

Lecture type: lectures, seminars

Exercise type: laboratory practice

COURSE CONTENT

The types and fields of usage of nonwoven fabric. Raw materials for nonwoven fabric manufacturing. The basic functions of nonwoven fabric. Manufacturing technologies of nonwoven fabrics. Isotropic and anisotropic structures of nonwoven fabric. Structures and technical-technological parameters of webs made by mechanical, aerodynamical as well as spunbond web forming processes. Methods of web bonding. Composite structures based on nonwoven fabrics.

THE AIM OF THE COURSE

The aim of the course is that the students acquire practical and theoretical knowledge of designing nonwoven fabrics used in different fields, especially in civil engineering, protection, defence and medicine.

CONTEMPORARY DIGITAL PRINTING

IGOR MAJNARIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: seminar + oral exam

Precondition for testing: no

Lecture type: e-learning, oral consultation

Exercise type: e-learning, oral consultation

COURSE CONTENT

Theoretical propositions of digital printing techniques and technological conditions of their functioning. The Computer to Plate technology with special emphasis on the Computer to Press. Technology of contactless InkJet printing based on the principle of static electricity, piezo electricity, thermal system and InkJet with dry toner. The connection between Inkjet printing and conventional screen printing via the printing form design system in textile printing. Hybrid printing techniques. The emphasis is on the possibility of personalization of each particular product.

THE AIM OF THE COURSE

The course gives theoretical propositions of digital printing techniques and technological conditions of their functioning. The emphasis is on the possibility of personalization of each particular product. The students will get acquainted with the preparation of digital data files for digital printing techniques, as well as gain the ability to achieve accurate colour tones. Such results are consistent with the FOGRA PSD standard.

TECHNICAL TEXTILES IN SEPARATION PROCESSES

MAJA SOMOGYI ŠKOC

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: written seminar

Lecture type: formal lecture with the elements of practical and reports

Exercise type: seminar

COURSE CONTENT

The classification and theory of separation processes; stationary and nonstationary separation processes; the involvement of technical textiles in mechanical, mass and heat transfer; the characteristics and the possibility of an objective evaluation of technical textiles in membrane separation, drain, filtration, absorption, acoustic insulation processes, for application in medicine, industry, civil engineering, environmental protection.

Fundamental definitions and terms related to the detailed explanation of the filtration process, advantages and disadvantages, filtration apparatus, emphasis on the two fundamental groups of filtration processes.

Through individual experimental work performed during laboratory exercises, the structural peculiarities of each individual type of technical textiles with the testing of their efficiency during separation process according to international standards and own developed methods will be analysed.

THE AIM OF THE COURSE

Analysing the importance of technical textiles in separation.

Selecting technical textiles for the process of mechanical, mass and thermal transport.

Assessing the possibility of an objective valuation of technical textiles in the most common forms of separation. Designing and proposing a filtering process with an emphasis on the two basic groups of filtration procedures.

Evaluating the structural features of certain types of technical textiles and predicting their effectiveness in separation processes.

TEXTILES FOR ULTRAVIOLET RADIATION PROTECTION

ANTONETA TOMLJENović

Credit hours: 30

ECTS: 4

Knowledge verification: written seminar, oral exam

Precondition for testing: no

Lecture type: lectures, seminars

Exercise type: laboratory practice

COURSE CONTENT

Atmospheric changes and thinning of the Earth's ozone layer. Solar radiation spectrum. The influence of ultraviolet (UV) radiation on human health. Methods of protection against UV radiation. The testing and labelling of UV protection efficiency of textiles. Types of UV-protective textiles: UV-protective clothing, headwear, sunshades - fixed and portable for personal protection. Functional requirements: fabrics functionality; functional design of finished products. Elements relevant for obtaining UV-protective textiles: UV-protective properties of fibres; the modification of synthetic fibres with the purpose of improving the UV protection properties; the influence of fabric structure; the influence of fabrics layering, creasing and surface irregularities; unconventional treatments of fabrics (ultrasound, microwave, laser); functional finishing – UV-absorbing finishes, functionalisation with inorganic nanoparticles; impact of wearing and care on the durability of the efficiency of UV-protective textiles. Functional design of finished products - requirements for body coverage: the design and model of UV-protective clothing, protective headwear and sunshades.

THE AIM OF THE COURSE

Understanding all relevant factors essential for designing UV-protective textiles. Acquiring knowledge about the specific requirements for quality, testing and evaluation of various UV-protective fabrics and finished products.

THEORETICAL ANALYSIS OF KNITTED FABRICS AND KNITTING PROCESS

VESNA MARIJA POTOČIĆ MATKOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral or written exam

Precondition for testing: seminar

Lecture type: lectures

Exercise type: laboratory practice

COURSE CONTENT

Warp and weft knitted fabrics geometry. Knitting process effect on knitted fabrics parameters. The influence of knitting and knitted fabrics structure on the relaxation, shrinkage and the dimensional stability of knitted fabrics. The influence of knitting process and knitted fabrics structure on the uniaxial and multiaxial extension of knitted fabrics, tensile strength, spherical tear, the anisotropy of knitted fabrics.

THE AIM OF THE COURSE

The purpose of the course is to give students a basic framework of research in knitting and thus enhance the practical application of scientific research in manufacturing.

THEORETICAL ANALYSIS IN THE PROCESS OF YARN PREPARATION AND FABRIC MAKING

STANA KOVAČEVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminars

Precondition for testing: completed exercises

Lecture type: lectures, practice, seminars

Exercise type: laboratory practice

COURSE CONTENT

Detailed knowledge of the process of fabric making according to type and application. The analysis of technical and technological parameters during the fabric making process, and their influence on fabric quality. The significance of the optimization of size selection and the analysis of substance balance. Knowledge of the causes of changing yarn and fabric parameters caused by the process of yarn preparation and weaving, and their possible effects as deficiencies in the fabric.

THE AIM OF THE COURSE

The influence of yarn parameters on the cost-efficiency of weaving and fabric quality. The analysis of technical-technological parameters in warping. The optimization of size selection, parameters control in the sizing process. The analysis of substance balance in the sizing process. Interlacing point theory. The analysis of parameters affecting yarn consumption and thread tension in the fabric. Shed geometry and the most optimal solutions for a specific weave type and thread tension. Analysis of weft insertion and beat-up. New systems of multi-phase weaving. Analysis of fabric deficiencies.

THERMOINSULATION PROPERTIES OF CLOTHING

SNJEŽANA FIRŠT ROGALE

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: attendance at lectures, seminars and practices

Lecture type: lectures, seminars

Exercise type: practice

COURSE CONTENT

Parameters of thermal insulation properties of clothing. Measurement methods and standards for determining the thermal properties of intelligent, protective and conventional clothing. The measurement of the thermal insulation and thermal resistance of textile materials, composites and clothing. Objective measurements and subjective reviews of the ease of wearing clothes. Thermal properties of joins on clothing made by sewing, thermal joining by using conduction and convection, high-frequency and ultrasonic techniques. The impact of construction properties of clothing on thermal insulation properties of clothing. The measurement of thermal contact resistance of textile formations to determine data for the engineering design of clothing. The measurement of conduction-convection properties of the materials incorporated in clothing by using a hot plate. The overview of features and development of thermal manikins for clothing thermal insulation properties research. The measurement of thermal resistance of intelligent, protective and conventional clothing by using a patented measuring system for determining static and dynamic thermal properties of composites and clothing (the so-called thermal manikin) and specialized software. Measuring method for the determination of the weighed body surface temperature by the application of the four, eight and fourteen thermometers method, measuring temperature gradients of clothing layers, the relative humidity inside the microclimate areas in clothing and the heart rate of the wearer, and their comparison to standardized subjective evaluations. Smart and intelligent clothing with thermal protection properties of too low or too high ambient temperature.

THE AIM OF THE COURSE

The aim of the course is that the students acquire basic knowledge of thermoinsulation properties of clothing and adopt and understand the most relevant scientific and technical terminology in the mentioned areas: The aim is also to acquaint students with modern measuring methods and standards for determining the thermal properties of clothing, and with the impact of construction properties of clothing on the thermal insulation properties of intelligent, protective and conventional clothing

TOPOLOGICAL INVARIANTS IN DESIGNING FUNCTIONAL CLOTHING

SLAVICA BOGOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: no

Lecture type: lectures, seminars

Exercise type: seminars

COURSE CONTENT

Homeomorphisms and topological invariants that can be applied in the design of garments and tailored parts (the number of components, cut points, point indexes, unicursal curves, Jordan's theorem, Euler's theorem, Euler's characteristic and bonding operations) will be studied.

3D body analysis will be performed by 3D scanning as an input layer for the study of topological invariants. The obtained results will be used as a basis for designing clothing primarily for people with special needs, and protective clothing tailored to the specific body type, protection degree and specific requirements based on topological invariants.

The course will analyse and compare the features and results of existing and new computer-based methods based on topological invariants for better tailoring adapted to the body shape and better function of the garment or clothing system.

THE AIM OF THE COURSE

The aim of the course is to develop a computerized method of constructing patterns based on digitized human bodies, by using a scientific approach and studying topological invariants.

TEXTILE AND CLOTHING COMFORT AND ITS ASSESSMENT

SANJA ERCEGOVIĆ RAŽIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: diploma supplement of graduation from a study programme in fundamental and technical sciences

Lecture type: lectures

Exercise type: laboratory practice and seminars

COURSE CONTENT

Definitions and different components of comfort: the physiological, physical-chemical and psychological aspect. The human/clothes system - physical processes in clothing and surrounding environment, physiological processes in the human body, neurophysiological processes by which sensory signals are formulated. The significance of the microclimate characteristics between skin and clothing. Important factors and elements: moisture and water sorption and transfer, water vapour and air permeability, thermal conductivity and dynamic heat, skin contact characteristics, static electricity, fibre and fabric handle. New comfortable fibres and textile structures, multifunctional textile materials. The predictability of clothing comfort performance. Methods of textile comfort methods testing and assessment (Human Perception Analysis, HPA).

THE AIM OF THE COURSE

Scientific knowledge of the comfort phenomenon and comfort mechanism, their factors and elements. Knowledge of contemporary trends in the development of test methods and the evaluation of the possibility of complex and not easily measurable textile performances, such as clothing comfort.

CONTROL SYSTEMS WITH MICROPNEUMATICS

GOJKO NIKOLIĆ / GORAN ČUBRIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: written exam, seminar

Precondition for testing: passed exams related to automation and pneumatics

Lecture type: lectures, seminars

Exercise type: audio practice, laboratory practice

COURSE CONTENT

The overview of different solutions of pneumatic miniature (nano and pico) pneumatic elements (fluidic), the theory of their function, symbolism, mathematical models of control systems, the application of minipneumatic control elements, problems and advantages, the application on intelligent textile products, the application of control systems of machines and automated clothing manufacturing lines.

THE AIM OF THE COURSE

Familiarization with miniature (nano and pico) pneumatic (fluidic) elements and making control schemes with these elements based on combination and sequential logic equations. Demonstrating the application on intelligent clothing and other articles made of fabric. Familiarization with development directions and application of control systems on clothing manufacturing machines.

BIODEGRADABLE FIBRES

EDITA VUJASINOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminar

Precondition for testing: Fibres I

Lecture type: lectures

Exercise type: audio practice, seminars

COURSE CONTENT

The goals and challenges of biodegradable polymers in environmental engineering. The systematization of natural and synthetic biodegradable fibres according to chemical composition and characteristic properties. Conventional biodegradable fibres made from polysaccharides, proteins, polyurethane, polyethers, polyesters and polyanhydrides. Fibres from biomass, fibre products of micro-organisms and insects. Fibre products of genetically modified organisms. The production, structure and characterization of biopolymers. The possibilities of structure/property relation programming. Predictable properties of biodegradable fibres. Stability and factors of fibre decomposition. Fibre decomposition evaluation methods. Usage properties and the application of biodegradable polymers; vision of the future development of fibres for biodegradable products.

THE AIM OF THE COURSE

A critical attitude towards various new kinds of biodegradable fibres is developed. Contemporary overview of nonconventional fibre sources, possibilities of their production and appropriateness. The obtained knowledge may be applied to make concepts or to initialize tasks that will generate new knowledge, applications and understanding in the field of textile engineering.

FIBRES IN FORENSIC SCIENCE

EDITA VUJASINOVIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: preliminary exam, written exam, oral exam

Precondition for testing: no

Lecture type: lectures, practice

Exercise type: laboratory practice

COURSE CONTENT

Introduction to the forensic science and the forensic examination of fibres and hair. Proper acts and procedures of the treatment of fibres from the crime scene to the laboratory (crime scene assessment and processing, evidence collection techniques and storage, avoiding contamination, protocols of fibre examination). Details of the forensic analysis of fibres (the review of the structural peculiarities of each individual fibre and hair, the tasks of forensic fibre microscopy, instruments and technology needed to establish fibres/hair origin and identity). The interpretation of fibres evidence and their significance in crime investigations and/or court proceedings.

THE AIM OF THE COURSE

The students will obtain knowledge about methodology and techniques of fibres and hair forensic examination, which will enable them to take an active role in an interdisciplinary team of forensic scientists in the acquisition of evidence and solving a crime.

GENERAL ELECTIVE COURSES

INDUSTRIAL ENERGETICS

ALKA MIHELIĆ - BOGDANIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam

Precondition for testing: seminar paper

Lecture type: lectures

Exercise type: seminar

COURSE CONTENT

Energetics development trends; interaction between technology and management; energy demand: availability, cost-effectiveness, environmental impact; energy consumption in various textile processes: type, quality, parameters relevant for the process, project and operating values; energy management: process flow scheme, the type and places of energy consumption, losses, energy conservation; energy technologies: the evaluation of the existing and the development of new technologies; heat recovery with regard to energy, cost-effectiveness and ecology; possibilities for optimization: alternative resources, both renewable and non-renewable, availability and cost-effectiveness; cogeneration in textile industry; thermal and chemical environmental pollution; integral systems and plants analysis, energy supply, heat recovery network; process examples: Energy structure optimization results, i.e. energy efficiency and energy savings in various textile processes.

THE AIM OF THE COURSE

The Industrial Energetics course is focused on science and technology, energy efficiency and savings with the aim of environmental protection. In textile industry, energy in the form of heat and electricity is lost without any attempt to save it. The aim of this course is to study the complete list of various possibilities of improvement. The Industrial Energetics course provides a basic engineering foundation for understanding the interaction between textile technology and management. The possibility for new technologies application and alternative renewable sources should be found.

INTELLIGENT ALGORITHMS

TOMISLAV ROLICH

Credit hours: 30

ECTS: 4

Knowledge verification: seminars and projects

Precondition for testing: passed exams in *Computing* and *Computer Programming* courses

Lecture type: oral presentations and e-learning

Exercise type: practical work

COURSE CONTENT

Biological evolution (the mechanism of evolution, genotype and phenotype, natural selection). Evolutionary algorithms (basic algorithm, individual, population, fitness, mutation). Evolutionary algorithms (recombination, selection, genotype and phenotype, the convergence of the evolutionary algorithm). Evolutionary strategies (basic algorithm, the recombination of evolutionary strategies). Evolutionary strategy $(1+1)$ -ES. Evolutionary strategy $(\mu+1)$ -ES. Evolutionary strategy $(\mu+\lambda)$ -ES. Evolutionary strategy (μ,λ) -ES. Selection (the main features of selection, selection types, static and dynamic selection, protective and exterminated selection, elite and complete selection, generational and substitute selection, proportional selection). Selection (fitness mapping, explicit mapping procedures, exponential mapping, dynamic linear mapping, window mapping). Selection (implicit procedures for the mapping of the fitness function, sampling with replacement and sampling without replacement, deterministic sampling, stochastic universal sampling, selection by assignment). Recombination (general characteristics of recombination operators, discrete recombination, one-point crossover, one-point crossover with permutation, inversion). Recombination (multiple point crossover, multiple point crossover with cross-marking, uniform crossover, parameter uniform crossover, crossover with more than two parents, diagonal crossing). Continuous recombination (the canonical form of continuous crossover, rectangular crossover, extended rectangular crossover, heuristic crossover, simplex crossover, geometric crossover, continuous crossover with preservation of alleles). Permutation recombination (partial crossover, straight crossover, circular crossover, edge crossover, positional crossover, crossover with maximum preservation).

THE AIM OF THE COURSE

The aim is to train students to apply intelligent algorithms in solving practical optimization tasks. The aim is also to direct students in a variety of intelligent algorithms and areas of their application.

CREATIVITY IN TECHNOLOGY AND DESIGN

IVANA SALOPEK ČUBRIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: oral exam, seminar

Precondition for testing: no

Lecture type: lectures + seminars

Exercise type: seminars

COURSE CONTENT

The fundamental determinants of generic skills and classification according to ModEs (Modernizing of higher education through soft skills). The European Commission guidelines for the development of generic skills: "The new Skills Agenda for Europe". The analysis of generic skills and an overview of initiatives. Creativity as the key skill in textile technology and design.

The creative process concept – the analysis of developed models and stages of the process. Key differences between the design process and the creative process. Methods for stimulating creativity (6-3-5 method, biomimicry, 9 squares method, basic and reverse brainstorming, collaborative sketching/C-sketches, Delphi method, Scamper method). The application of methods for stimulation of creativity in resolving specific problems that arise in the design and production of textiles.

Introduction to the C-K theory (Concept-Knowledge theory) - basic principles, concepts, disjunction/conjunction, the meaning of "design square". The analysis of the application of the C-K theory to increase creativity in industrial practice.

Defining the SAGRADA model (SAmpling, GRAding, Displaying and Acknowledging) and an overview of the main stages. Application of the SAGRADA model to evaluate creativity in design and technology. The use of information and communication technologies for measurement, assessment, standardization and evaluation of creativity, focusing on the possibilities and constraints.

THE AIM OF THE COURSE

The scientific approach to understanding creativity as an important generic skill in technology and design. The development of a critical attitude towards the methods of the stimulation of creativity, and application of the models of its evaluation.

METHODOLOGY OF EXPERIMENT DESIGN

IVA REZIĆ

Credit hours: 30

ECTS: 4

Knowledge verification: seminar and oral exam

Precondition for testing: seminar work

Lecture type: webinar and personal

Exercise type: case studies

COURSE CONTENT

The "Methodology of experiment design" course consists of the following modules: Complex systems. Comparative experiments. Basic concepts in statistical analysis. Statistical analysis. T-test, F test. The basics of working in the computer software "Experiment Design". Factorial design. Full factorial design. The fractional factor design of the experiment. Optimization methods. Response surface method (RSM). Mixed design. Experiment design checks. Central composite design. Box-Behnken design. Choosing the optimal design of an experiment. Complex systems and the application of optimal design. The application of the reaction surface method in optimizing and anticipating the behaviour of complex systems.

THE AIM OF THE COURSE

The aim of the course is to enable students to work in the experimental design program, to apply it in labs for chemical analysis and testing, and in planning fashion shows, textile design and market research. A student who attends lectures, writes a seminar and passes his/her exam will acquire sufficient knowledge and practical experience for independent work in the software for statistical data processing by experiment design method. Moreover, a student who attends lectures, writes a seminar and passes the exam will be able to understand the importance and significance of the proper implementation of the statistical processing and data analysis process, determine the steps of statistical analysis depending on the application of the method, check the validity of the method through statistical tests, apply classical methods of statistical data processing, analyse the results obtained and implement the optimization steps, as well as to predict the behaviour of complex systems.

COMPUTER GRAPHICS

TOMISLAV ROLICH

Credit hours: 30

ECTS: 4

Knowledge verification: seminars and projects

Precondition for testing: passed exams in *Computing* and *Applied Computing* courses

Lecture type: oral presentations and e-learning

Exercise type: practical work

COURSE CONTENT

Hardware equipment for computer graphics (monitors, printers, plotters, etc.). The mathematical foundations of computer graphics. 2D drawing algorithms: Bezier curves, B-Curves, DDA, Bresenham. Polygonal filling (flood fill - seed fill, line-clipping, polygon clipping, halftoning, dithering). Computer colour spaces (RGB, HSV, CMY(K), RGB <-> HSV etc.). Raster imagery and formats, 2D animation, graphic standards. Paint brushes and art tools (brushes palette, brush features, wet edges, brush shades, air brush, brush history, eraser, pencil). Digital painting and retouching (foreground and background colour, colour selection, colour menu, colour palette, patterns, dripping, mixing, smudge, focusing tools, blur, sharpening). Layers and masks (layer layout, layer order, layer removal, multi-layer layout, layer blending, layer effects, apply mask, use mask, layer masks, edit mask layer and channels). Adding text to an image (text tools, character palette, paragraph palette, text settings, shadow creation, letter cuts and fills, adding gloss, text distortion). Special effects and useful tricks (inserting images in letters, semi-transparent fonts, "Matrix" shading effect, perspective shadow, adjusting shadow to layer, colour changing, collage, fading, focusing, tattooing with Photoshop). Black-and-white photo corrections (blur-off compensation, digital noise removal, shadow correction, red-eye correction, skin tone correction, prints, better automated colour correction). Formatting tool, cutting tool, eraser tool, rotation tool and text input tool. Distorted display tool and drag tool, transparency tool, interactive filler tool, cross section, clipboard, and unified objects.

THE AIM OF THE COURSE

The aim is to train students to independently design 2D drawings, 3D models, animations, and technical documentation on a computer. The aim is also to direct them to the foundation of computer graphics, areas of application, and limitations of individual procedures.

COMPUTER IN PROCESS CONTROL

GORAN HUDEC

Credit hours: 30

ECTS: 4

Knowledge verification: seminars, oral exam

Precondition for testing: no

Lecture type: lectures, seminars

Exercise type: seminars

COURSE CONTENT

The definitions and classifications of flexible manufacturing systems. Stochastic processes. The concept of process. Poisson process. Markov processes. Transition probabilities. The transition probabilities matrix. Fractals as an example of Markov chain and the possibility of their application in design. Mathematical models. The dynamic and static characteristics of the system. Linear and nonlinear systems. Algorithms for the control of flexible manufacturing systems. The process of connecting a digital computer with a measuring device. Hardware standards. Drivers for instrumentation. Fuzzy control, neural networks, self-learning management systems, expert systems. Fuzzy logic, fuzzy sets, membership function, fuzzy operations. Fuzzy sets in management systems. Examples from the field of textile technology.

THE AIM OF THE COURSE

The student will learn about different process description approaches and their implementation, restrictions and advantages in view of textile technology applications.

SUPRAMOLECULAR CHEMISTRY AND NANOCHEMISTRY

MARIO CETINA

Credit hours: 30

ECTS: 4

Knowledge verification: written exam

Precondition for testing: no

Lecture type: lectures/seminars

Exercise type: -

COURSE CONTENT

Supramolecular chemistry. Selectivity, complementarity and cooperativity. Non-covalent interactions: hydrogen bonds, C–H... π and π ... π interactions, hydrophobic, electrostatic and halogen interactions etc. Molecules and ions with cavities and other types of receptors, which can form host-guest complexes. Self-assembling and molecular recognition and their significance for biological systems and textile science and technology (nanofibers, electrostatic self-assembled nanolayer films, carbon nanotubes etc.). Crystal engineering – the design and synthesis of new structures with desired properties based on an understanding and exploitation of non-covalent interactions. Nanochemistry – the synthesis of nanostructures and nanomaterials by molecular self-assembling. The application of nanochemistry: nanodevices, surfactants, micelles, liquid crystals, nanoparticles, nanotubes, fibres, gels, polymers etc.

THE AIM OF THE COURSE

Supramolecular chemistry applies molecular recognition processes which rest heavily on the understanding of the recognition properties of the functional groups involved in non-covalent interactions. Nanochemistry is a branch of chemistry which aims at the synthesis of organic and inorganic structures and materials of nanometric size, which display novel physical and chemical properties, thus enabling their diverse application. including in textile science and technology. The aim of this course is to introduce the PhD students to the basic knowledge of supramolecular chemistry and nanochemistry.

FUTURES TRADING

DARKO UJEVIĆ / TONČI LAZIBAT

Credit hours: 30

ECTS: 4

Knowledge verification: written exam, seminar, oral exam

Precondition for testing: written seminar paper

Lecture type: lectures - 15 hours, seminars -15 hours

Exercise type: seminar

COURSE CONTENT

The idea and history of futures trading. Stock exchange division and organization. The characteristics of trading commodities at stock exchanges and auctions. Commodities quality - categorization, quality classes, commodities identification, symbols. Leading world stock exchanges. World stock exchanges and commodities relevant to the textile and clothing industry. The specificities of textile, clothing and leather trading. The role of the standardization of futures trading. Margin system. The characteristics of futures contracts. Futures prices. Trading strategies at commodities exchanges. Hedging as a protection instrument against commercial risks in the textile and clothing industry. The fundamental analysis of futures prices. Supply and demand factors in the textile and clothing industry. Technical analysis of futures prices with special reference to the commodities determining the prices of the textile and clothing industry. The largest world futures markets and trading specificities.

THE AIM OF THE COURSE

Acquiring the fundamentals and knowledge necessary to know futures trading, stock exchanges and commodities relevant for the textile and clothing industry. The introduction to the fundamentals of futures contracts and trading strategies. An overview of the world's futures markets and the specificities of trading with reference to the commodities determining the prices in the textile and clothing industry.

INTELLECTUAL PROPERTY RIGHTS

ŽELJKO BIHAR

Course summary: 30

ECTS: 4

Knowledge verification: preliminary exam, written exam

Precondition for testing: positively graded seminar

Lecture type: lectures, seminars, practice

Exercise type: laboratory practice

COURSE CONTENT

Introduction into the intellectual property

Differences between industrial property and the author's and related rights

Patents, trademark, industrial designs – levers for the SME development

Patent – legal issues

Patent – technical aspect; databases searches

Trademarks – legal issues

Trademarks – databases searches

Nonstandard trademarks

Industrial designs – legal issues

Industrial designs – technical aspect; databases searches

Software

Author's and related rights

Trade secret

Valuation of the intellectual property

Business intelligence and intellectual property

THE AIM OF THE COURSE

Qualifying the students for the recognition of various intellectual property (IP) forms; checking the IP status; the recognition of possible problems with IP forms transactions in the real world.

CURRICULA VITARUM OF PROFESSORS



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CURRICULUM VITAE

Sandra Bischof is a professor of textile science at the Department of Textile Chemistry and Ecology of TTF, and she is currently the head of the Textile Science and Research Centre. She graduated in 1990 at the Faculty of Technology and acquired her master's degree in 1994, and her PhD in 2001 from the University of Zagreb Faculty of Textile Technology. In the period from September 1990 to September 1991, she was employed at the textile mill Pamučna industrija Duga Resa, where she gained industrial expertise. She has been employed at the Faculty of Textile Technology (TTF) since September of 1991.

Her educational, scientific and professional fields are: the chemical modification of cellulose materials (textile, wood and paper), the development and application of environmentally friendly agents and methods, eco-design, the surface modification of textiles, the characterisation and application of nanomaterials, advanced materials and advanced technology, bio-economy.

In academic years 2001/2002 and 2002/2003, she was awarded 2 OAED scholarships for research secondment at the Institut für Textilchemie und Textilphysik of Leopold Franzens Universität Innsbruck, in the total duration of 6 months. In the academic year 2008/2009, she was invited by Prof. C.Q. Yang to a 1-month research secondment at the University of Georgia, Department of Textiles, Merchandising and Interiors, Athens, GA, USA.

In the period from March 2009 to March 2012, she was coordinating the FP7-REGPOT-2008-1-229801 project, entitled Unlocking the Croatian Textile Research Potentials (T-Pot), which was funded by almost 1 mil. €. Currently, she is leading the KK.01.1.1.02.0024 project entitled Modernisation of the Textile Science Research Centre Infrastructure (MI-TSRC) funded by almost 1.5 mil. €, and lasting from May 2018 to May 2021.

Since 2007, Prof. Bischof has been the Croatian top expert in the field of textile finishing and a part of the Thematic Expert Group (TEG) 3. Since 2014, she has been working in group 2 of the Textile Flagships for Europe (TFE) of the European Technology Platform for the Future of Textiles and Clothing, organised by the European Apparel and Textile Organisation (EURATEX, Brussels).

Prof. Bischof has been a reviewer of FP7 projects for NMP (Nanosciences, Nanotechnologies, Materials and New Production Technologies) and RTD (Research and Technological Development) areas. She has been continuously hired for project evaluations and monitoring by Research Executive Agency (REA) since 2008.



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CURRICULUM VITAE

Slavica Bogović was born on March 31st, 1968 in Stuttgart, Germany. She graduated from the Faculty of Technology of University of Zagreb in 1991. From July 1991 to December 1992, she worked in knitwear company "Nada Dimić" on quality control and technologist jobs. Since 1992, she has been employed in the Department of Clothing Technology at the Faculty of Textile Technology, University of Zagreb. In May 2000, she acquired her master's degree at the Faculty of Textile Technology, University of Zagreb. In July 2012, she acquired her PhD degree at the Faculty of Textile Technology, University of Zagreb, with the thesis "Clothing construction adapted to physical deformities by using topological invariants", and under the mentorship of Prof. D. Rogale.

Her research activity encompasses the fields of technical sciences, computer construction of clothing, garment construction, garment pattern modelling. She was the co-author of the book titled "Computer systems for construction preparation in clothing industry". She has published 5 chapters in books, 4 original scientific papers, 16 scientific papers at international conferences, 3 expert papers, and 6 scientific papers at national conferences. She has collaborated on the preparation of one study and technological-economic project for Croatian economy. She has collaborated on the preparation of the computer system program module for the design and construction of clothing by Lectra Systemes, which is intended for the Croatian market (1995).

She was the head of a bilateral project with Slovenia titled "New technologies in the development of protective clothing in a virtual environment" (2016-2017), she was an associate on 4 university grants and projects co-funded by the Croatian Science Foundation, and she was also an associate on the European project FP7- REGPOT-2008-1-229801: T-Pot: Unlocking the Croatian Textile Research Potentials, as well as on 3 scientific projects. She has been the head of the Centre for e-Learning at the Faculty of Textile Technology of the University of Zagreb since 2016, and a member of the Ethics Committee.



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CURRICULUM VITAE

Mario Cetina was born on April 26th 1962 in Samobor (Croatia), where he attended primary and secondary school. In 1986, he obtained his bachelor's degree in Textile-Chemical Engineering at the Faculty of Technology, University of Zagreb, Croatia. After graduation, he was hired as a teaching assistant on the course "General chemistry" at the Institute for Textile and Clothing of the Faculty of Technology (now Faculty of Textile Technology). He acquired his master of science degree at the Faculty of Technology in June 1990 in the field of chemical engineering, and his PhD in chemistry in July 2001 at the Faculty of Chemical Engineering and Technology, University of Zagreb. Since 1990, he has worked as the assistant, and since 2001 as the senior assistant on the course "General Chemistry" at the Faculty of Textile Technology. Since February 2007, he has been in charge for courses "General Chemistry" and "General Chemistry Laboratory Exercises" which are a part of undergraduate university study programme „Textile Technology and Engineering“, firstly as the assistant professor, then as the associate professor from April 2012, and as the full professor since from March 2019. He has also been in charge of the course "Physical Chemistry" at the undergraduate university study programme „Textile Technology and Engineering“ since academic year 2011/2012, and of the course "Supramolecular Chemistry and Nanochemistry" at the doctoral study programme "Textile Science and Technology" since the academic year 2012/2013.

His research interests include X-ray structure analysis, crystal engineering, as well as supramolecular chemistry and nanochemistry, and their application in textile science and technology. Until now, he has published 75 original scientific papers in journals indexed on the Web of Science, and has personally participated on 20 international and 18 domestic scientific conferences. He was a plenary lecturer at the international conference "The Twentieth Croatian-Slovenian Crystallographic Meeting", which was held in 2011 in Baška, Croatia. In the period from January to July 2010 and February to July 2013, he was a visiting scientist at the Department of Chemistry, Nanoscience Centre, University of Jyväskylä, Jyväskylä, Finland. He has participated in the organization of numerous scientific conferences, e.g. he was the secretary of the Programme Committee and a member of the Organizing Committee of the "29th European Crystallographic Meeting" which was held in 2015 in Rovinj.



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CURRICULUM VITAE

Assist. Prof. Goran Čubrić, PhD, was born in 1974 in Zagreb. After graduating in 2000, he was employed at company Heruc as a production organizer of a work unit, where he acquired a remarkable technological experience. In June 2003, he was hired as a specialized associate at the Faculty of Textile Technology, where his job included holding practical classes in sewing process and exercises in the groups of courses relating to machinery and automation. He was hired as an assistant in 2006 at the Faculty of Textile Technology and started the postgraduate study of Textile Science and Technology. He acquired his PhD in December of 2012. He was awarded the position of an assistant professor in June 2015.

His research and scientific work are directed towards technical sciences and the field of clothing technology. As a researcher, he has actively participated in the implementation of the research project "Intelligent clothing and environment" and two technology projects – "Clothing with adaptive thermal insulation properties" and "Adaptive anti-bedsores mattress", both funded by the Croatian Institute of Technology. He also worked as a researcher on European LLP project "Grading soft skills - GRASS" (2014-2016), and work package leader on the project "Development of standards of qualification and undergraduate programmes at TTF" (2015-2016).

As co-author, he has published one book chapter, one university textbook (Robots and their application in textile and clothing technology), 5 original research papers published in journals which are indexed in the CC and SCI, 2 research papers published in journals which are included in other major bibliographic databases, 25 scientific papers published as part of international symposia, and two papers published as part of national symposia.

In the area of machinery automation in garment technology, he is engaged in research related to taking hold, transferring and positioning textile materials with vacuum gripper and robot application in the textile and garment industry. Another area of research is intelligent clothing (thermally adaptive clothing) on which he wrote his dissertation. In the dissertation, he examined the mechanical properties of the material from which intelligent clothing articles are made, the change of the characteristics of body measure and body surface area during extreme movements and the use of thermal imaging to evaluate thermally adaptive clothing.



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CURRICULUM VITAE

He was born in Zagreb in 1946. He graduated from the Faculty of Technology, University of Zagreb in 1971, and he received his master's degree in the field of chemical engineering in 1976, and his PhD in the field of chemistry in 1981. He became an assistant professor in technical field, chemical engineering branch in 1984, associate professor in 1990 and full professor in textile technology in 1999. He was awarded the full professor position for the second time (permanent title) in 2005. He organizes lessons and heads the courses in Industrial engineering, Working process ergonomics in garment technology and Methods of scientific work at the post-graduate doctoral scientific study programme. The areas of his special research interest are industrial engineering, work and time study, ergonomics, protective materials and clothing. He has published 84 original scientific papers, 24 reviews and 11 professional papers in the field, together with 8 chapters in a scientific book. He has also registered 9 patents at the Croatian Patent Office. He was the vice-dean of the Faculty of Technology (1987-1991) and of the Faculty of Textile Technology (1991-1996), and head of the Department of Clothing Technology several times. He was the organiser of all 6 international scientific conferences in textile technology ITC&DC 2002-2012, as well as the guest editor of the international journal IJCST 2003, 2005 and 2007. He is a member of the Croatian Academy of Engineering.



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CURRICULUM VITAE

Sanja Ercegović Ražić was born in 1975 in Šibenik. Upon completing grammar school, she successfully graduated from the Faculty of Textile Technology, University of Zagreb in 2000. In 2001, she was hired at the Faculty of Textile Technology as a researcher, and in 2005 she acquired her master's degree. She acquired her doctor's degree and the title of a doctor in 2010. In March of 2011, she was elected to the position of a scientific associate. She was hired to the position of an assistant professor and senior scientific associate in 2013, for a group of courses related to textile testing, production and modifications of man-made fibres and environmental management. She has worked as a researcher on 12 research projects and scientific grants, 2 professional projects, and, as an expert, she was involved in professional work related to quality testing of textile products (an expert witness at the main hearing in 2013 (Zadar County Court) in criminal proceedings related to the fire tragedy on Kornati in 2007)). In 2008, she established the Plasma Treatment Laboratory at the Faculty. In 2009, she attended training courses at the Centre of Technological Innovation Leitat, Terrassa (ES), and at the University of Ljubljana, Faculty of Natural Sciences, Department of Textile (SI). She was the editor of the Conference Proceedings of the 11th scientific-professional conference Textile Science and Economy 2018. She has also published 2 book chapters, 11 scientific papers, 5 professional papers, and participated in over 40 scientific and professional conferences (4 times as an invited speaker). She has mentored 11 students on their theses, and she has published over 20 papers in cooperation with students. Today, she teaches 8 courses at different level of studies. The Environmental Management course is an e-learning course, which is one of the new teaching methods. She works with Erasmus+ students, and she has reviewed more than 25 papers in journals. From 2014 to 2016, she was the head of the Department of Materials, Fibres and Textile Testing, and since 2014 the head of the Centre for Lifelong Learning at the Faculty. She is a member of the teachers' work group for the development of a new curriculum, and since 2017, she has been acting as the president of the commission for disciplinary responsibility of TTF students. She is a member of scientific and professional associations, and in 2017, the Ministry of Science and Education appointed her as a member of the Sectoral Council IV: Textile and Leather.



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CURRICULUM VITAE

Snježana Firšt Rogale was elected to the position of professor and senior scientific associate. She does research in the field of garment technology, which is related to the field of technological processes of garment production and the development of conventional and intelligent clothing, the application of modern high technology joining techniques using the method of thermal joining by conduction and convection, ultrasound and high frequency technique and the investigation of construction and thermal properties of conventional, protective and intelligent clothing. In the field of technological processes of garment manufacturing, she does research in the field of the development of methods of time determination of sewing suboperations, work zones and movements in the technological operations of clothing production, and research in the field of energy process parameters. The other field in which she does scientific research is intelligent clothing, on which she wrote her doctoral dissertation. Moreover, as part of the dissertation, she designed the first intelligent article of clothing with active thermal protection, in regard to which three patents have been registered and recognized in the Republic of Croatia, one in 13 European countries, and a patent application was submitted in the US.

She has been working on the thermal insulating properties of garment compositions and clothing for many years. She is a mentor to a PhD student whose topic is related to the research of the impact of embedding elements on the overall thermal properties of clothing. She was the Head of the Department for Clothing Technology for two terms. She is an assistant member of the Academy of Technical Sciences in Croatia, a member of the Association of Innovators Zagreb and the Association for International Commercialization of Innovations Zagreb. She was a member of the International Cooperation Office of the Faculty of Textile Technology as the ECTS Coordinator. She was a member of the International Programming Committee of the Scientific Conference DAAAM (2009-2017), and a member of the Organizing Committee of Textile Days Zagreb (2009-2017). She has won many awards for the development of intelligent clothing. She is the co-author of five books, a scientific monograph, three university handbooks, 11 scientific papers, 9 chapters in books, 21 scientific papers at international conferences, 5 professional papers, 2 plenary lectures and one invited lecture, and 30 other papers.



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CURRICULUM VITAE

Assoc. Prof. Sandra Flinčec Grgac, PhD, was born in Zagreb in 1976 and graduated in 2003, whereby she acquired the professional title of a bachelor of textile technology at the Faculty of Textile Technology, University of Zagreb. In 2005, she was hired at the Faculty of Textile Technology as a research assistant. She defended her dissertation on July 4th, 2012 at the same Faculty. She was awarded the academic title of an assistant professor in 2013, and in 2018, she was awarded the title of an associate professor at the same Faculty. She won an award of the Textile Science Research Centre (TSRC) for first place in the category of PhD students with her scientific paper entitled Application of Zeolite FAU for Flame-retardant Finishing of Cellulose. She received the Dean's Award in the category of scientific-teaching staff for two articles published in journals with high impact factor (2015, 2018). She has published one editorial book, one chapter in a book, 21 full papers in scientific journals, 40 scientific papers in proceedings with international review. She is the co-author of one scientific and one expert invited lecture, and has published 4 full papers in professional journals, attended a variety of workshops and courses related to textile technology and chemical ecology, writing project applications and working on scientific equipment held in the country and abroad. She is the head of an established research project funded by the Croatian Foundation for Science (UIP-2017-05-8780) and collaborates actively on domestic and European research projects. Her areas of special research interest are: the application of ultrasound and microwave energy in the pre-treatment and textile finishing, investigating ecological and economically favourable finishing processes in order to obtain multifunctional textile materials, the development of medical textiles with antimicrobial properties and reduced generation of textile dust, the preparation and application of β -cyclodextrin inclusion complexes with essential oil to achieve stable antimicrobial and wellness treatment of textiles, flame retardant finish for cellulose materials and their blends, and preparing organic-inorganic composite materials of different properties in order to obtain protective materials and filters. She collaborates with the industry and scientists in the country and abroad.



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CURRICULUM VITAE

Professor Jelka Geršak is a university professor of clothing science at the University of Maribor. She has extensive experience in clothing engineering in regard to clothing manufacturing processes design, fabrics mechanics and textile structure behaviour, objective evaluation of garment's appearance, clothing physiology and comfort. Her main focus of research is clothing science and human thermal physiology, based on studying complex aspects of clothing systems, textile materials performance and wearing comfort, and recently also functional and intelligent clothing.

She published more as 840 bibliographic units, which include 80 original scientific papers in international journals, 30 reviews and professional papers and more than 150 scientific papers at international conferences, 13 of them as invited lectures. She was in charge of more than 20 scientific projects, 4 scientific programmes, 14 international scientific projects, she was the coordinator of 20 CEEPUS (Central European Exchange Program for University Studies) networks, as well as the author of numerous studies for the industry's needs. Eight doctoral theses, 10 master theses and more than 200 diploma theses have been written under her mentorship.

Since 1985, she has been the head of the Laboratory of Clothing Engineering, Physiology and Construction of Garments, and since 2014, she has been the head of the Research and Innovation Centre for Design and Clothing Science. She has been the organizer and head of 5 international conferences, 4 symposiums in the field of clothing engineering and six international CEEPUS Winter School Design Weeks. She has established wide international scientific collaborations with universities from different countries (USA, France, Germany, Finland, Greece, Croatia, Poland, India, Russia, Hungary, BiH). Since 2002, she has been the visiting professor at the University of Zagreb Faculty of Textile Technology. She is an expert of the European Technology Platform for the Future of Textiles and Clothing, and a member of the International Consortium for the Development and Evaluation of PPE for Pesticide Operators and Re-enter Workers, and since 2018, a member of the IPC E-Textiles Standards Group in Europe. In addition, she is a member of numerous editorial boards of scientific journal and scientific councils of international conferences. Since 2012, she has been the editor of the Journal of Fibre Bioengineering and Informatics. Since 2009, she has been a member of the Croatian Academy of Engineering. She has received several awards for her research activities in Slovenia and abroad.



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CURRICULUM VITAE

Martinia Ira Glogar has over 20 years of teaching and research experience in the field of dyeing and printing of textiles, colour science, colour theory, spectrophotometric measurement and objective quantification of colour in the VIS and NIR area, as well as in the field of mathematical systems for objective evaluation of colour differences (CIE 94, CMC (1:c), CIEDE2000), in the field of the possibilities of using digital printing on textile surfaces, in the field of study of the influence of surface structures of coloured textile substrates on colour appearance and performance as a psycho-visual characteristic based on the application of objective spectrophotometric measurement methods; in the field of colour theory and science; in the field of colour psychology based on the study of energetic relations between colours; in the field of colour contrasts and harmony as well as the influence of specific relations between colours on the observer's reaction. From the beginning of her work at the Faculty of Textile Technology, Martinia Ira Glogar has been actively mentoring final student theses from the field of colour metrics, colour science, colour theory, dyeing and printing. She mentored 45 final theses at the undergraduate study programme, 13 final theses at the graduate study programme, and 1 PhD thesis. She worked on 9 scientific and professional projects (3 research projects, 2 projects funded from EU funds, 1 bilateral Slovenian-Croatian project, 1 bilateral Flemish-Croatian project, 2 professional projects). She published 4 editorial books, 2 book chapters, 11 scientific and professional papers, and participated at 52 international and national scientific and professional conferences. She was the head of the Department of Textile Chemistry and Ecology from 2016 to 2018. In 2013, as part of the ERASMUS + teacher mobility program, she was a lecturer at the Akademia Sztuk Pięknych, Lodz, Poland. She also contributed to the organization and assortment of the Colour Metrics Laboratory of the Department of Textile Chemistry and Ecology at the Faculty of Textile Technology, University of Zagreb.



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CURRICULUM VITAE

Ana Marija Grancarić, PhD. C. Col. F. SDC., is a professor emeritus at the University of Zagreb. She has published 5 books, 8 book chapters, 95 papers in refereed journals and 120 papers presented at scientific meetings. From 1989 to 1994, she was the head of the Chemical Department, and from 2002 to 2006, the vice-dean for science and international relations at the Faculty of Textile Technology, University of Zagreb. From 2006 to 2013, she was the head of International Relations Office at TTF, the first TTF out-going Erasmus teacher and teacher of incoming ERASMUS students.

Her main research topics are interface phenomena (electrokinetic charge and free surface energy of textiles), cotton mercerization and cationization, whiteness and quenching of FWA fluorescence, sun protection and antimicrobial finishing of textiles, flame retardancy, bioscouring of cotton and application of zeolite nanoparticles on textiles, alkaline and enzymes polyester hydrolysis, textile reinforced composites and textiles for the protection against invasive mosquitoes. She has collaborated and published papers with more than 40 researchers from abroad. Till now, she has been the head or Croatian coordinator of 12 European projects, ranging from bilateral to FP7 projects.

She is a member of the Croatian Academy of Engineering, the Croatian Science Foundation, the American Association of Textile Chemists and Colourists, AATCC (Raleigh, NC), the Society of Dyers and Colourists, SDC (Bradford, UK), the Croatian Association of Textile Engineering, the Croatian Chemical Society and the Society of Plastic and Rubber Engineering. From 1999 to 2002, she was a SDC Council member, and she became a chartered colourist and SDC fellow in 2001. She is a holder of many awards and medals, the most of important of them being the highest award for technical science entitled "Fran Bošnjaković", which she received from the University of Zagreb in 2012, and AUTEX Award, which she received in 2016. Professor Grancarić is the editorial board member of many research journals, a reviewer of many domestic and international journals, as well as research projects. From 2009 to 2013, she was a member of the Croatian Council for Science, and a member of the Technical Science Council at the University of Zagreb. She is the co-founder of AUTEX (2009), the founder (2003) and president of the Textile Alumni Society - AMCA TTF (Alma Matris Croaticae Alumni Textilie Technologiae Facultatis), the founder (2013) and president of the Croatian Colour Society (HUBO) and the co-founder of the Croatian society "Nikola Tesla - Genius for the Future."



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Goran Hudec is a full professor at the University of Zagreb Faculty of Textile Technology . He was born in Zagreb, and he received his graduate engineer degree in the field of computer sciences, his master of science degree in the field electronics and his doctor of science degree in the field of electrical engineering from the Faculty of Electrical Engineering, University of Zagreb. Non-formal education includes "Active Learning and Critical Thinking in Higher Education" (Forum for Freedom in Education) and "Management in E-learning" (E-learning Academy, Croatian Academic and Research Network (CARNet) and courses at the University of British Columbia). He is the author of university textbooks "Measurements and automatic process control" and "Biomechanics principles", and of university e-textbook "Electrotechnics and electronics".

He has published more than 80 scientific and professional papers, 15 of them related to e-Learning. He has managed many projects on e-Learning ("Textile factory on the Internet", "Virtual museum of ethno heritage" and "Reference centre for educational materials development"), and took part in the FP6 027607 project mGBL "Mobile game-based learning", the Tecrino 538710-LLP-1-2013-1-CY-LEONARDO-LMP project "Teaching creativity in engineering" and 2016-1-HU01-KA204-022911 Erasmus + project "Connecting to Nature and Self".

As a sportsman, he prefers long distance sport activities; recently he ran the Boston marathon, and a few years ago the Ironman distance triathlon. His award-winning short SF novel "Ring" was selected by Brian Aldiss and Sam J. Lundwall for the "World Omnibus of Science Fiction" collection.



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CURRICULUM VITAE

Dr. David Hui is a professor of mechanical engineering and director of Composites Materials Research Laboratory at the University of New Orleans. He received his PhD from the University of Toronto in aerospace engineering, and his master of science degree from the Massachusetts Institute of Technology. Dr. Hui has edited over 40 widely cited books, as evidenced in the Google Search showing on these books. Other books include: editor of the proceedings of the Army Research Office workshop "Dynamics of Structures", ICCE/1-24, SES, ASME books and numerous special issues of journals, and he served many times as a keynote lecturer. He is the founder and editor-in-chief of Composites Part B journal. Currently, he serves on the editorial board of 11 SCI journals, seven of them are nano journals, and the rest are mostly composite materials journals. Dr. Hui is an ASME Fellow, ICCE Life Member, AIAA Associate Fellow and CASI Associate Fellow. Dr. Hui is currently a Doctor Honoris Causa of five universities in Italy, Ukraine, Georgia, Vietnam and Bosnia and Herzegovina. He is an academician of engineering in three countries: Armenia, Georgia and Serbia. Dr. Hui is the chairman of ICCE, which has grown to be one of the world's pre-eminent annual conferences on composite materials or nano materials.

Dr. Hui has conducted research on composites materials and nano materials funded by over 3 million dollars, mostly for mechanical/aerospace engineering and ship structures applications. He is widely known for his research on (i) the modelling and prototyping of the mechanical properties of nano materials, (ii) the mechanical behaviour of materials under high or low temperatures, flammability and creep of composite materials, including smart material and structures, (iii) the impact of blast dynamics, micro-crack initiation and growth under thermal and mechanical loads, and (iv) infrastructure composites in harsh environments. Dr. Hui has co-authored over 396 SCI journal publications, and these papers have been cited over 9800 times from Scopus. Currently, Dr. Hui serves on over 40 technical committees or editorial boards, comprising over 2000 respected scientists on specific diverse fields on materials or nano science.

One of Dr. Hui's outstanding contributions to research lies in the modelling of the impact of composite materials using the energy partition model and functional graded approach to enhance the durability and safety of engineering structures in harsh environments. His pioneered research on the mechanisms of degradation of materials under low temperatures in composites has resulted in enormous improvement in the safety of engineering structures. Dr. Hui was the first to validate the dramatic effects of small curvature on the vibration of flat plates, leading to the re-design and re-analysis of many structures critical for engineering safety.

Dr. Hui was the recipient of research grants from NASA, ARO, ONR, AFOSR, NSF, LEQSF, US Army CRREL, GCRMTC, NOAA, Wright Patterson AFB, Universal Energy, Avondale Shipbuilding Inc., and Northrup Grumman Ship Systems, among others. In recent years, Dr. Hui has presented numerous keynote lectures: he successfully promoted federally funded multi-university partnerships on nano materials or composites of nano materials.



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She was born in Zabok, where she finished secondary textile school. She graduated in 1996, received her master's degree in 2000 and her PhD in 2008 from the University of Zagreb Faculty of Textile Technology (under the supervision of Prof. D. Rogale, PhD). She has been working at the Faculty of Textile Technology since February 1997, and has been teaching courses in the field of clothing technology and engineering, clothing construction and footwear technology. From 1997 to 2004, she worked as a research assistant, from 2004 to 2008 as an assistant, from 2008 to 2012 as a senior assistant, from 2012 to 2018 as an assistant professor, and since January 2018, she has been an associate professor.

Her scientific and research work is linked to the field of clothing technology and engineering, protective clothing and footwear production technology. She has published 13 scientific papers in journals, and more than 50 scientific papers in the proceedings of scientific and professional conferences. She is the co-author of one university textbook, and as an associate, she has participated in the implementation of about 10 development projects for the Croatian Ministry of Defence (led by Prof. Z. Dragčević, PhD). She was the head of the bilateral project implemented in cooperation with Slovenia (from 2010 to 2011), she was an associate on the FP7 project (coordinated by Prof. S. Bischof, PhD), and a member of the Management Committee of the COST Action TU1101 project - Towards safer bicycling through optimization of bicycle helmets and usage (2011-2015).

In the framework of the international CEEPUS program, she received scientific and professional training at the Faculty of Mechanical Engineering, University of Maribor, Slovenia (three months in 1998), and she has spent a month (in 2000) at the Technical College for Light Industry in Budapest, Hungary. As guest lecturer, she spent one week at the Istanbul Aydin University, Turkey, as part of the Erasmus+ mobility for teaching staff (2015).

She is a member of the ITC&DC Team and was actively involved in the organization of all ITC&DC conferences (from 2002 to 2018). She was the head of the Department of Clothing Technology (from December 2013 to May 2017), the president of the Committee for Quality Management at the University of Zagreb Faculty of Textile Technology (from 2012 to 2015), and the vice-dean for education at the University of Zagreb Faculty of Textile Technology (from April 2017 to September 2018).



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CURRICULUM VITAE

Prof. Emerit. D. Katović, PhD was born in Zagreb in 1941, where he completed his primary and secondary education. He graduated in 1977 from the Faculty of Technology, University of Zagreb. He defended his master's thesis in 1982. He defended his dissertation on November 15th, 1985 at the same Faculty. In 1982, he started working as a research assistant, in 1986 as a research associate and assistant professor, in 1990 as a senior research associate and associate professor, and in 1996 as a full professor. He received his tenure in 2002. He was the vice-dean for science at TTF twice; in the period from 1995 to 1998 and from 2006 to 2009. He was the dean of the Faculty of Textile Technology of the University of Zagreb during two mandates (from 1998 to 2002). In 1998, dr. sc. Katović was appointed as a member of the world organization The Textile Institute - Manchester GB, and he is now a lifelong „Member of Council." He is a member of CORDIS's list of experts for research and development in the EU in the field of textiles and clothing. Until now, he has published over 80 scientific papers in the field of textile and wood industries in the most significant international and national journals. His works have been translated and published in Russian and Japanese. In 2007, he received the „Fran Bošnjaković" award from the University of Zagreb for the promotion and development of engineering, especially in the scientific field of textile engineering, and for research in the field of textile materials finishing. In 2009, he won third place at the IMB Innovation Award in Cologne, which was organized under the auspice of the European Commission, Directorate-General for Research and Development.



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CURRICULUM VITAE

She was born in 1978 in Pula, Republic of Croatia. She finished elementary and high school in Zagreb. In 2004, she graduated from the University of Zagreb Faculty of Textile Technology, specifically the textile-mechanical department, the textile technology process study programme. She received her PhD in February of 2011 by defending the doctoral thesis entitled "Study of needlepunched geotextiles structures and properties". Since September of 2004, she has been employed at the University of Zagreb Faculty of Textile Technology as an assistant professor at the Department of Textile Design and Management. As a researcher, she has actively participated in scientific projects "Achieving product quality by designing yarns and knitted fabrics" (no. 0117007), and since 2007, she has been working on the scientific project "Multifunctional technical nonwoven and knitted textiles, composites and yarns" led by Prof. Zenun Skenderi, PhD. Since 2016, she has been a member of the "Comfort and antimicrobial properties of textiles and footwear" project, led by Prof. Zenun Skenderi, PhD. Her research and scientific interests are directed towards the technical sciences, i.e. the field of textile technology related to textile materials, production, structure and properties of technical nonwoven structures.

She is the author of 7 scientific papers published in journals, and 16 papers published in conference proceedings. She is a member of the editorial board of Leather & Footwear magazine and president of the TO-219 floor coverings board at the Croatian Standards Institute. She has participated in the work of the organizational committees of international and domestic scientific conferences. She teaches at the undergraduate and graduate study levels at the Faculty of Textile Technology, and teaches courses in the English language for foreign students (within the Erasmus + programme).



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CURRICULUM VITAE

She has worked as a professor emeritus at the Faculty of Chemical Engineering and Technology, University of Zagreb, since 2014. In 2000, she was promoted to the tenured professor position at the same Faculty. She received her PhD in 1980, and her master's degree in 1974 at the Faculty of Natural Science, University of Zagreb. She has published more than 100 scientific papers, mostly in international journals, one book (publisher Nova Science, USA), several book chapters, as well as about 40 scientific and other papers published in different relevant international journals. She has worked as the supervisor on 7 international scientific projects and 12 national ones. Also, she has worked as the supervisor or co-author on about 30 projects for industrial application. Main fields of scientific interest: chemical and environmental engineering and environmental management, particularly industrial wastewater treatment. For more than 20 years, she has been engaged in intensive research work in the field of advanced oxidation processes for the decolourisation and mineralisation of wastewater.



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Prof. dr. sc. Stana Kovačević is a full professor at the Department of Textile Design and Management. Her professional career began in company Tekstilni kombinat Zagreb, where she worked from 1977 to 1993 (as a production manager for 10 years). During her work in the industry, she spent two weeks in the German company Henkel, Switzerland (September 14th to 28th of 1990) and in the Textile Workshop Maribor, Slovenia (June 18th to July 2nd of 1988), where she worked on the research and application of new sizing products with emphasis to starch recycling. In 1993, she was hired as an assistant at the Faculty of Textile Technology, University of Zagreb. In 2016, she was elected to the position of a full professor.

From 2011 to 2019, she was the head of the Doctoral Study Council of the Textile Science and Technology Department at the Faculty of Textile Technology. She is the author of one book (Hand weaving) and 3 university textbooks (Weaving Processes, Yarn Preparation and Fire Protection in Textile Industry), and a number of scientific papers published as journal articles, professional papers, scientific and review papers, conference proceedings papers, abstracts, books and book chapters, and others. She has published over half of her papers in co-authorship with young scientists and PhD students with whom she continually co-operates.

So far, she has been the mentor on two doctoral theses, 49 graduate theses, a committee member of 9 doctoral theses, of which 3 were outside Croatia, and one master's thesis.

Her scientific research is based in the areas of development and improvement of sizing process, the design of woven fabrics for protective clothing, transport, medical and military purposes. Her work includes the research of complex woven fabric structures, work study in textile-mechanical technology, the analysis of historical fabrics and the development of innovative testing devices (five registered patents).

She has been leading and successfully implementing scientific projects "Advanced technical textiles and processes", "Investigation of the parameters that impact fabric design in CAD-CAM weaving" (2002-2007), code: 0117008, "Optimizing the starch coat on yarn" (2001-2004); code: TP-01/01205. Currently she is the head of the "Multifunctional woven composites for thermal protection clothing" project (2018 - 2022); code: lp-2018-01-3.



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CURRICULUM VITAE

Kristina Krulić Himmelreich, PhD, associate professor, enrolled in the Faculty of Science - Department of Mathematics in Zagreb in 2001, from where she graduated on September 30th, 2005 and received the master's degree in mathematics and physics education from University of Zagreb. In May of 2010, she defended her dissertation. She teaches undergraduate courses Mathematics 1 and Statistics, and the postgraduate course Selected Topics in Mathematics. She has reviewed 18 scientific articles. Since 2011, she has been the associate editor of the Journal of Classical Analysis. Also, she has participated in the work of 3 research projects. The aim of her research is a systematic research of general inequalities in view of mathematical analysis. Special topics of the research in which she has participated include Hardy's inequality, fractional derivatives and fractional integrals. So far, she has published 1 scientific book, 14 papers in CC journals, 5 papers in SCIE journals, 14 papers in journals indexed by Mathematical Reviews, and 1 professional paper. She has participated in 11 international conferences. So far, she has held three invited lectures. She was the advisor on one doctoral thesis.



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Karlo Lelas received his master's degree in physics from the University of Zagreb in 2007, and defended his PhD thesis at the same university in 2012 (supervisor Hrvoje Buljan). In the period from 2007-2015, he was a junior research assistant and teaching assistant at the Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB) of the University of Split. During this period, he worked in two fields: (i) theoretical physics of strongly interacting one-dimensional quantum systems, and (ii) experimental elementary particle physics (as a member of the CMS collaboration at CERN). He started his work as a junior research assistant in field (ii), but with time he focused on field (i), in which he defended his PhD thesis. His current interest are synthetic gauge/magnetic fields in ultracold atomic gases.

KL was promoted to the position of an assistant professor of physics at the University of Zagreb in 2015. He teaches General Physics and Classical Mechanics.

Five selected publications:

K. Lelas, N. Drpić, T. Dubček, D. Jukić, R. Pezer, and H. Buljan, Laser assisted tunneling in a Tonks-Girardeau gas, *New J. Phys.* **18**, 095002 (2016).

T. Dubček, K. Lelas, D. Jukić, R. Pezer, M. Soljačić, and H. Buljan, The Harper-Hofstadter Hamiltonian and conical diffraction in photonic lattices with grating assisted tunneling, *New J. Phys.* **17**, 125002 (2015).

K. Lelas, T. Ševa, H. Buljan, and J. Gould, The pinning quantum phase transition in a Tonks-Girardeau gas: diagnostics by ground state fidelity and Loschmidt echo, *Phys. Rev. A* **86**, 033620 (2012).

K. Lelas, D. Jukić, and H. Buljan, Ground state properties of a one-dimensional strongly-interacting Bose-Fermi mixture in a double well potential, *Phys. Rev A* **80**, 053617 (2009).

Chatrchyan et al (CMS Collaboration), Transverse-Momentum and Pseudorapidity Distributions of Charged Hadrons in pp Collisions at $\sqrt{s}=7\text{TeV}$, *Phys. Rev. Lett.* **105**, 022002 (2010)



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Igor Majnarić, B.Sc.Eng., PhD, was born on July 21st, 1971. He has been a permanent employee of the Faculty of Graphic Arts since 1998. During his work life, he held the following positions: assistant at the Department of Printing (from 1998 to 2007), senior assistant at the Department of Printing (from 2007 to 2013) and now associate professor at the Department of Printing. He currently teaches Fundamental printing techniques 2 (6th semester of the undergraduate study programme), Digital printing techniques (1st semester of the graduate study programme), and Measurement in printing and Peripheral printing unit (3rd semester of the graduate study programme). As a lecturer, Igor Majnarić holds 36 practical exercises in the field of printing and preparing data for publication. The main area of his scientific activity is the analysis of printing substrates and printing inks, and their interaction during the printing process, as well as their influence on the final quality of print media products. The narrow specialization of his work includes NIP printing techniques (Electrophotography and Inkjet printing techniques). As part of his scientific activities, he has participated in four national research projects and two bilateral Croatian-Slovenian projects. He also participated in two Erasmus scientific research exchanges, one CEPPUS scientific research exchange and one external lecturer exchange within university exchange with the University of Ljubljana. So far, Igor Majnarić published over 71 scientific and professional papers in the field of graphic technology and graphic design. He is a permanent reviewer of four scientific journals, a member of the organizing committee of the international conferences MATRIB and GRID, and the Apple Distinguished Educator for the Faculty of Graphic Arts. He currently holds the position of the head of the Department of Printing at the Faculty of Graphic Arts, and the position of the president of committees for education and teaching literature. He is the author of university textbook "Fundamentals of Digital Printing". Igor Majnarić has also been a member of the panel for evaluating the project proposals submitted to the Croatian Science Foundation for the academic years 2015/2016; 2016/2017; 2017/2018 (Panel TZ-P3), and is the evaluator of the Croatian Accreditation Agency for ISO/IEC 19752:2017 and ISO/IEC 19798:2017 (printer toner capacity) methods.



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Professor Alka Mihelić-Bogdanić was born in Zagreb on June 27th, 1949. Professor Alka Mihelić-Bogdanić, PhD, works as a full professor at the University of Zagreb Faculty of Textile Technology. She received her bachelor's degree in 1972, her master's degree in 1975, and her doctor's degree in 1977 from the Zagreb University, Faculty of Technology. Her research activities are in the field of chemical engineering, textile technology and energetics. Her areas of special research interest are: energetics, technical thermodynamics, energy management in industry and new and renewable energy sources.

In co-operation with professor Rajka Budin, PhD, she has published two university textbooks: The basis of technical thermodynamics and The sources and energy management in industry.

From 1984 to 2000, she has collaborated with the Institute for Thermodynamic at the Technical University Graz and with the Institute for Physics at the Karl Franz University Graz, in the field of alternative energy sources as well as the Stirling engine. She has published over 140 scientific papers with international reviews and 13 professional papers.

Her research activities are in the field of chemical engineering, textile technology and energetics. Her areas of special research interest are: energetics, technical thermodynamics, energy management in industry and new and renewable energy sources.

She has received a special award in form of a diploma for her PhD thesis from the Organization committee of Sixth Yugoslavian Exhibition of Inventions, Technical Improvements and Innovations, RAST-YU 78, Rijeka 1978, and the J. J. Strossmayer award for the best scientific work in the field of technical sciences in 2002 for her book The basis of technical thermodynamics, Školska knjiga, Zagreb.

She has collaborated on 11 scientific projects and led the scientific project titled: Reducing specific energy consumption in industrial processes, which was funded by the Ministry of Science, Education and Sports.

She is a member of and works at the following scientific associations: International Solar Energy Society, Croatian Energy Association (HED), Croatian Solar Energy Association, Croatian Society KoREMA, Croatian Nuclear Society. She is also a member of the publishing council and editorial board of Solar Energy, a scientific journal for solar energy and other non-renewable energy sources, Journal of textile and clothing technology – Tekstil, and Textile Science and Engineering.



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CURRICULUM VITAE

Professor Budimir Mijović is employed as a full-time professor and researcher at the University of Zagreb Faculty of Textile Technology, Department of Basic Natural and Technical Sciences, Zagreb, Croatia. He received his PhD degree in 1987 in the field of biomaterials and bioengineering at the University of Zagreb, Faculty of Mechanical Engineering and Naval Engineering. After his PhD, his research was focused on the mechanics of blood vessels and biorheology. From 2008 to 2009, he held the position of the head of the Department of Basic Natural and Technical Sciences, and from 2009 to 2012, the position of the vice-dean for science at the University of Zagreb Faculty of Textile Technology. As a research fellow and visiting academician, he has worked at numerous institutions, including: Technical Faculty, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, Department of Mechanical Engineering, Georgia Institute of Technology, USA, Boise State University, USA, Technical University of Eindhoven, Nederland, Technical University of Munich, Germany, etc. In 2001, he received the International scientist of the year award from the International Biographical Centre from Cambridge, England. His scientific area of interest is nanofibers production via electrospinning and their application in the field of soft tissue cells culture for potential tissue regeneration, thermally insulating materials, UV-protective materials, etc. He is currently focused on the realization of the project proposal funded by the Croatian Science Foundation concerning the development of a custom-tailored scaffold prototype for skin and ocular tissue growth.



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Slobodan Milošević, born on March 26, 1958 in Rijeka, is a married father of two children. He attended elementary school in Rijeka and Zagreb. He graduated from the Mathematical Gymnasium in Zagreb in 1976. In 1981, he graduated from the experimental physics study programme at the Faculty of Science in Zagreb. He received his master's degree from the same faculty in 1984, and his PhD in the field of atomic and molecular physics from the Ruđer Bošković Institute, University of Zagreb. He has been employed at the Institute of Physics since November of 1981, where he progressed from a young research assistant to a tenured scientific advisor in February 2004. From 2013 to 2017, he served as the director of the Institute of Physics. He is currently working as a tenured senior advisor. He has spent over five years at postgraduate study programmes in Goettingen, Pisa and Copenhagen, specifically in the period from 1987 to 1995. Since 2001, he has been teaching the elective course "Methods of atomic and molecular beams" at the postgraduate study programme at the Faculty of Science in Zagreb. He has been the leader of and associate on more than ten domestic and international projects. He was the mentor on 12 diploma theses and 6 doctoral theses. So far, he has published 157 original scientific papers, of which 96 are listed as "journal papers" in the CC base, 2 CC conference proceedings, 14 in other international journals, and 45 papers in conference proceedings. He is the co-author of over 150 conference contributions, he has held 8 invited lectures, over 20 speeches, 17 seminars, 6 lectures at summer schools (physics and astronomy), and wrote numerous popular articles and a dozen notices on the internet. He has held dozens of popular lectures and workshops in schools and at science fairs, and participated in several TV and radio shows. In 2005, he led the EU project World Year of Physics in Croatia (# 516938 WYP2005-EUROPE). His scientific papers were quoted 1259 times (in WoS, February 18, 2019), h index = 19, Google scholar (1859 citation, h = 22, 18 February 2019). In 2007, he was the co-author of one patent in Slovenia. He is a member of the Croatian Physical Society, the Croatian Astronomical Society and the Croatian Vacuum Society, where he served as the president from 2011 to 2017. For the last twenty years, his research interest has been related to the diagnostics and application of laser-induced plasma and low pressure to high pressure cold plasmas.



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CURRICULUM VITAE

Gojko Nikolić, PhD, was born in 1939 in Šibenik. He is a full professor in retirement. In 1962, he graduated from the Faculty of Mechanical Engineering and Naval Architecture in Zagreb; he received his master's degree in 1972 and PhD in 1985 from the same faculty. He has worked in various industries for thirty-three years: from the position of an automatic line constructor, production director, technical director to a member of a company's management. In addition to working in the industry, he has been teaching at the Faculty of Mechanical Engineering and Naval Architecture for thirty years, and during the last eleven years, at the Faculty of Textile Technology in Zagreb. He has been awarded the honorary title of a distinguished professor. He is a regular member of the International Academy of Engineering - Central European Branch (IAE-CEB, Vienna). He has won a number of honours and awards, among which are the annual award Rikard Podghorsky of the Academy of Technical Sciences in 2004 for significant contribution to connecting science and economy, the State award for technical culture Faust Vrančić for lifetime achievement in 2015 and Medals of the Croatian Academy of Technical Sciences for scientists in recognition of special contribution to science and profession, Zagreb 2018.

He is the initiator of the automation production in Croatia and has introduced new areas of automation to courses at the Faculty of Mechanical Engineering and Naval Architecture and the Faculty of Textile Technology in Zagreb. He has published more than 150 scientific and professional papers, thirty books of which twelve are university textbooks, and one scientific book. He is the inventor of twenty domestic and international patents for which he has received numerous gold and silver medals worldwide: from Europe, to America and Asia. During the last few years, he has initiated and worked on the development and application of robots in neurosurgery.



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CURRICULUM VITAE

Prof. Emeritus Đurđica Parac-Osterman, PhD, was born in 1946. Academic education; 1970: Bachelor of Science, Chemical Technology Engineer, 1978: Master of Science, Technical Sciences, 1985: PhD in the field of Technical Sciences. Employment and titles: 1970-1972: textile company in Senj, 1972: assistant at the Faculty of Textile Technology, 1987-1993: docent at the Faculty of Textile Technology, 1993-2000: professor at the Faculty of Textile Technology, 2000-2005: full professor at the Faculty of Textile Technology, 2005: full professor (tenure) at the Faculty of Textile Technology, 1988-1991: guest professor at the Faculty of Technology Banja Luka, 1998-2004: guest professor at the University of Maribor. 2000 to date: professor at the doctoral study programme at the Faculty of Graphic Arts Zagreb, 2009 to date: professor at the University of Dubrovnik, head of Department of Textile Chemistry and Ecology (2006-2011), head of the administrative council of Karlovac University of Applied Sciences (2011-2015). Scientific specialisation at BAYER, Leverkusen, Germany, in 1974. Projects (chief researcher): "Application of Fuzzy Logic in Dyeing Processes and Colour Management", "Colours and Dyes in Processes of Ecologically Acceptable Sustainable Development", EUREKA E!2983 TEXTILWET, and bilateral Slovenia/Croatia project "UV protection of Textiles". Prof. Emeritus Đurđica Parac-Osterman, PhD, has developed a close collaboration with the industry; A. Schnied, Linz/Austria; Frotirka, Investment Project for the Justification of the Production of Azo Organic Dyes, Cinkarna Celje, Slovenia; Collaboration on the quality control of camouflage paints and elaboration of standards for MORH and Croatian MUP. She wrote two university textbooks and a textbook with her colleagues from Univerza v Mariboru. She is the author of 7 chapters in international books. She has mentored many diploma papers, 6 master's theses and 6 doctoral dissertations in Croatia and 1 in Slovenia. Membership in associations: Croatian HATZ, Matrix Croatica, Slovenian Colourists Association, Croatian Society of Textile Engineers, Croatian Society of Chemistry, Society of Dyers and Colourists- Bradford UK, SITTH and Journal "Tekstil". In 2013, she became the vice-president of HUBO. Her recognition in social circles was confirmed by her public appearances on the Croatian National Television. During these broadcasts, emphasis was placed on textile dye toxicity and customer protection. A special show has been dedicated to the phenomenon of colours, in which she participated along with other scientists.



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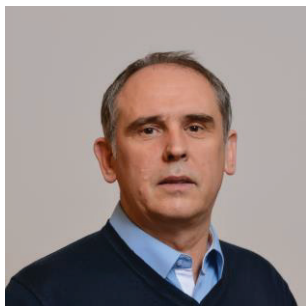
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Gordana Pavlović was born in 1965 in Zagreb, where she attended primary and secondary school. In the period from 1984 to 1989, she studied physics and chemistry at the Faculty of Science, University of Zagreb. She graduated in 1989. In the period from 1990 to 2000, she worked as an assistant in the Laboratory of General and Inorganic Chemistry, Faculty of Science, University of Zagreb. She received her Master of Science degree in 1993, and her PhD in 1998, both in the area of Inorganic Structural Chemistry. The title of her PhD thesis was: "Stereochemistry of polydentate Schiff bases and their cobalt, vanadium, nickel and copper complexes". She was awarded the titles of assistant professor, associate professor, full professor and tenured professor in 2002, 2007, 2012 and 2017, respectively, all at University of Zagreb Faculty of Textile Technology. Her scientific interests are mainly directed at the area of chemical crystallography of small molecules. She was a researcher on several national scientific projects such as: Compounds of specific properties - synthesis and structure, Chemistry of the 12th group metals in molecular systems of biological importance, Protein-ligand interactions at atomic level, Metallosupramolecular architectures and inorganic-organic polyoxometalate based hybrids. She has published 100 original scientific papers cited in CC journals as a co-author or chief author in the field of chemical crystallography, 11 high school textbooks and task collections, 1 book chapter, 6 professional papers, 69 conference abstracts (22 domestic and 47 international congress posters and oral presentations) and given 2 plenary lectures at international conferences. Her articles have so far been cited for more than 1900 times (h-index: 18). She is a judge on several CC chemical scientific journals (for more than 70 articles). She was a co-mentor of ten bachelor theses in the area of structural inorganic chemistry and co-mentor of two PhD theses, while the third one is in the process of completion. She is a member of the Scientific Research Committee at the Faculty, a member of the Accreditation Committee at the Faculty, head of the Centre for Long-Life Learning at TTF, ECTS Faculty Coordinator, the head of the Applied Chemistry Department, and since October of 2018, the dean of the Faculty. She is a member of the Croatian Chemical Society and Croatian Crystallographic Association. She is the creator and manager of several university study courses at the bachelor (4), master (1) and PhD (1) level.



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CURRICULUM VITAE

Željko Penava, PhD, was born in Imotski in 1964. He completed primary and secondary school in Posušje, BiH. He enrolled in the study programme of textile technology (textile-mechanical technology major) at the University of Zagreb, Faculty of Technology (TF), from where he graduated in 1989 and started working at the Department of Textile-Mechanical Technology of the Institute of Textiles and Clothing. In 1989, he enrolled into the postgraduate study programme at TF, textile engineering major. He received his master's degree in 1993, and acquired the title of master of science in technical fields of study; the field of chemical engineering. Since 2000, he moved to the economy and works as a director of a company. In 2001, he was appointed to the position of a lecturer in the field of engineering, mechanical technology branch, for the group of courses on weaving. He continued teaching in 2002 as a lecturer for the group of courses on weaving at the University of Zagreb Faculty of Textile Technology (TTF). He received his PhD in 2004 and gained the title of doctor of technical sciences in the field of textile technology. He was appointed to the position of an assistant professor in 2006 at the TTF. In 2011, he received the scientific title of senior research associate and the academic title of associate professor for a group of courses on textile-mechanical technology at TTF. Since 1991, he has been participating in the realization of various scientific projects. Since 2009, he has been the editor of the conference collection titled Textile Science and Economy. He is a member of the review and organization committee of that conference. He is a member of the editorial board of the scientific journals Tekstil and Tekstilec. He has published more than 70 scientific and 20 professional papers. In the period from 2012 to 2014, he was the head of the Department of Textile Design and Management. In May 2014, he was elected to the Croatian Academy of Engineering as an associate member in the Department of Textile Technology. He became a scientific advisor and full professor in 2016.



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CURRICULUM VITAE

Slavenka Petrak was born in 1970 in Karlovac. She graduated from the University of Zagreb Faculty of Textile Technology in 1995, got her master of science degree in 1999, and her PhD in 2007. She wrote her master's thesis and PhD dissertation in the field of computer clothing construction, under the supervision of Prof. D. Rogale, PhD. She has been employed at the Faculty since 1995, in the Department of Clothing Technology (Textile technology, Clothing technology). She has held the following positions: from 1995 to 2004 - junior researcher; 2004 - assistant; 2007 - senior assistant; 2008 - scientific associate; 2009 - assistant professor; 2014 - senior scientific associate; 2015 - associate professor. Since 1995, she has participated in 4 scientific-research projects, in 1 project financed by the Croatian Institute of Technology, in 2 bilateral projects with Austria and Hungary, 2 Croatian Science Foundation projects and 6 university grants. She is the holder of 10 courses from the field of computer clothing construction and 3D clothing and footwear design, at professional, undergraduate, graduate and doctoral study programmes of the Faculty. She is the head of 3 laboratories: Studio for 3D body scanning, Laboratory for computer-based garment design and Laboratory for CAD/CAM-systems of clothing engineering. She has published the following works from the specified field: 1 chapter in a scientific-professional book, 1 chapter in a monograph, 13 original scientific papers, 2 scientific review papers, 2 review papers, 1 invited scientific lecture at an international conference and 2 at domestic conferences, 35 original scientific papers published in the proceedings of international scientific conferences, 2 science popularization articles, 5 professional papers, 10 participations in domestic scientific-professional conferences, 7 public lectures, and was a member of the editorial board on one scientific proceeding. From 2009 to 2012, she held the position of the vice-dean for education at TTF, and she was a member of the Doctoral Study Council. She was a member of the scientific committee of the 3rd, 8th and 11th scientific-professional symposium TZG in 2010, 2015 and 2018, a member of the organisational committee of the 4th, 5th and 10th symposium TZG in 2011, 2012 and 2017, and the vice-president of the World Scientific Conference AUTEX 2012. She was a member of the University of Zagreb Commission for e-learning from 2010 to 2014. At TTF, she is a member of the CTD council, a member of the Centre for life-long learning and a member of the Library Board. She is the supervisor of one PhD student at the doctoral study programme of textile science and technology.



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CURRICULUM VITAE

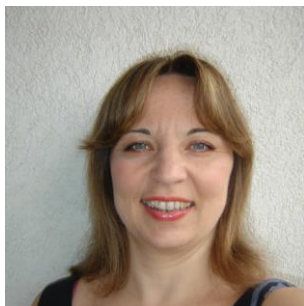
Vesna Marija Potočić Matković was born on July 17th, 1971 in Zagreb. In July 1996, she graduated from the Faculty of Textile Technology, University of Zagreb. In 1998 she took a job as a junior researcher at the Department of Textile Design and Management (then named the Department of Textile-Mechanical Technology) at the same Faculty. She earned her master's degree in February of 2002. On January 29th, 2008, she defended her doctoral thesis entitled "Study of the mutual influence of technology and design in knitting." She has worked on eight projects or research projects funded by the Ministry of Science, Education and Sport, two CARNET projects, and one Leonardo da Vinci EU project on life-long learning. From September of 2015 to December of 2016, she was leading the project titled Development of standards of qualifications and undergraduate study programmes at the Faculty of Textile Technology, funded by the European Social Fund and the Ministry of Science and Education. Today, she is leading the project titled Internationalization of the doctoral study programme Textile Science and Technology, funded by the European Social Fund and the Ministry of Science and Education. The above-mentioned researches resulted in the publishing of a series of scientific papers: 19 original scientific papers of which 5 were published in the CC database and 9 in WoS, 33 scientific papers presented at international and national scientific meetings and 8 professional papers. Her professional training abroad included Politehnika Lodzka, Poland, within the CEEPUS exchange program, and training at company Stoll, Germany, under the scholarship of the Ministry of Science, Education and Sport. She became assistant professor on October 1st, 2010, and associate professor on February 1st, 2016. She teaches a group of courses related to technology and construction of knitted fabric: Knitting techniques, Techniques of textile making III, Construction of textile fabrics, Construction of knitted fabrics, Textile-mechanical processes. Her scientific research is mostly related to the impact of the structure of fabrics on the properties of knitted and technical textiles, and mutual influence of design and technology in knitting.



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CURRICULUM VITAE

Prof. Tanja Pušić, PhD, graduated from the Faculty of Technology, University of Zagreb, in 1986. She earned her master's degree in 1990, and her PhD in 1997, also from the University of Zagreb. She is employed at the University of Zagreb Faculty of Textile Technology as a full professor and senior researcher. She has held the position of the vice-dean for science from 2012 to 2017. She was the head of Textile Science Research Centre from 2012 to 2018. The topics of her teaching and research career are related to the textiles finishing and textile care. Her teaching competences have been confirmed at the undergraduate, graduate and doctoral study levels. Her special interests include the following topics: microcapsules, cosmetotextiles, electrokinetic phenomena, mercerization, adsorption and desorption of surfactants, detergency, detergents, fluorescent whitening agents, UV absorbers, special polymers in detergents, modification of textiles in textile care process, dry and wet cleaning. The results of her work are numerous scientific and professional publications and conference papers presented nationally and internationally. As co-author, she has published two university textbooks. In addition to her academic work, prof. Pušić developed a close collaboration with the industry through consultancy and projects, as well as through her leadership of international and national projects. She has coordinated one FP7 project, two Eureka projects and four bilateral projects. She is active in the popularization of science and professional work in the textile care field. She is a member of numerous professional and scientific organizations, and has also holding a leading position in the International Technical Committee for Textile Care (ICTC) since 2005.



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CURRICULUM VITAE

Assoc. prof. Iva Rezić, PhD, is the vice-dean for scientific research at the University of Zagreb Faculty of Textile Technology, where she leads several scientific projects and courses: "Analytical Chemistry", "Instrumental Methods of Analysis", "Physical Chemistry" and "Textile Chemistry". She is the holder of the course "Methodology of Design of Experiment" at the postgraduate study programme. She has a double PhD degree - in the field of natural sciences (analytical chemistry) and technical sciences (textile engineering). Her knowledge and expertise in project management is focused on the research of antimicrobial and toxic nanoparticles, heavy metals and other pollutants determination, trace elements analysis and the development and optimization of complex systems and chemical methods. As a part of the ADRIS Foundation project, her team develops materials that are active against antibiotic-resistant microorganisms, and within the Croatian Science Foundation project, they synthesize nanoparticles through enzymes, provide characterization and apply this knowledge in various products (such as geotextiles and food packaging).

From 2016 to 2018, she was the head of the Department of Applied Chemistry, and since 2018, she has been the vice-dean for scientific research. Moreover, she is a member of the Sectoral Council III: Mining, Geology and Chemical Technology (Ministry of Science and Education) (2017-2020), and of the Thematic Innovation Council for Energy and Sustainable Environment, (Ministry of Economy, Entrepreneurship and Crafts).

The results of her scientific work are presented in 54 scientific papers, 1 university handbook and 4 chapters in scientific books. She has given 24 oral and 46 poster presentations at international conferences, and has received many awards for her achievements: the Austrian Government Award Grant in 2004, the Dean's Award in 2007, the Croatian Academy of Engineering Award in 2008, the Award of the University Teachers' Association in 2008, and the Recognition of the Faculty of Textile Technology in 2011. So far, she has been a collaborator on 14 projects and has led 5 scientific projects and 3 grants. She has been the editor-in-chief of TEDI journal since 2009, and an editor of 4 international scientific journals. Moreover, she has served as a reviewer on 31 journals and various international projects. In addition, she actively cooperates with partners from the industry, public and state bodies, and is engaged in the popularization of science through many TV and radio shows.



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CURRICULUM VITAE

Mirna Rodić, PhD, associate professor, was born in 1975 in Split. She has graduated from the Faculty of Science – Department of Mathematics in Zagreb: in 2001, she received her bachelor's degree in mathematics and computer science education, and in 2003, the bachelor's degree in computer science. At the same faculty, she received her master's degree in mathematics in 2006, and her PhD in mathematics in 2008 (natural sciences; mathematics; mathematical analysis). Since 2001, she has been working at the Faculty of Textile Technology, University of Zagreb (as an associate professor since 2016). She teaches courses in mathematics and descriptive geometry at the undergraduate and graduate level, as well as at the postgraduate study level. Up to now, she was the advisor for 20 undergraduate theses, which connect mathematics (especially geometry) with textile technology and fashion design. In 2016, she was the advisor for the thesis that won the Rector's award. Her scientific work covers mathematics, mathematical analysis, especially inequations and means. She regularly attends international scientific conferences, and she has held 12 lectures. Until now, she has published 15 scientific papers in highly ranked mathematical journals with international reviews. As a researcher, she has participated on four research projects. She was the reviewer for seven international scientific mathematical journals. She is a member of the "Mathematical inequations and applications" seminar, a member of the Croatian Mathematical Society, a member of the Croatian Society for Geometry and Graphics, and a member of the Association croate des boursiers du gouvernement français.



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CURRICULUM VITAE

Dubravko Rogale was elected to the position of professor and senior scientific associate. He works at the Faculty of Textile Technology, University of Zagreb. His scientific and research activities are related to the development of intelligent clothing, garment manufacturing processes, process parameters, new procedures of computer construction and garment modelling, the improvement of methodological methods in garment engineering, modern joining techniques etc. This forms the basis for the curriculum of the courses of which he is in charge at the undergraduate, graduate and post-graduate study level. He is the author of 14 innovations and 25 patents and patent applications, three of which are international. For his innovations, he has won as many as 50 awards, e.g. E. S. PENKALA Award for Best Zagreb's Innovation (INOVA, Zagreb, 2015), Gold medal (EUROINVENT, Iassi, 2015), the Grand Prix for the best Industrial Design, Gold medal (Archimedes, Moscow, 2014), Gold medal and Humanitarian Award (INPEX, Pittsburgh, 2014), WIIPA Special Award (IPITEX, Bangkok, 2019), Special gold medal and Macri Special Award (MTE, Kuala Lumpur, 2019), Special award (KIDE, Taiwan, 2018). He is the vice-president of the Association of Innovators Zagreb and a member of the Association for International Commercialization of Zagreb Innovations. He was the project manager of several domestic and international scientific projects. Under his mentorship, more than a hundred diploma theses were written, and he was also the mentor of seven master's theses and six doctoral dissertations. He is the co-author of 11 books, 13 textbooks, 137 scientific and research papers, 99 research project studies, projects, papers and computer programs for the purposes of economy, institutions and manufacturers of clothing industry equipment. He is a regular member of the Croatian Engineers Association, of which he is the vice-president, and a member of the Scientific Council for Technological Development of the Croatian Academy of Sciences and Arts. He is also a member of the Croatian Systems Society, Croatian Ergonomics Society, Association of University Teachers and Other Scientific Workers in Zagreb, and the president of the Quality Improvement Committee of the Croatian Chamber of Commerce. He was the head of the Department of Clothing Technology during three mandates, the vice-dean for teaching at the Faculty of Textile Technology during two mandates, and the dean of the Faculty of Textile Technology during two mandates.



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CURRICULUM VITAE

Tomislav Rolich was born in 1971 in Zagreb. He received his bachelor's, master's and PhD degrees in computing from the University of Zagreb, Faculty of Electrical Engineering and Computing (FER) in Zagreb, Croatia, in 1995, 2001, and 2005, respectively.

Since 1998, he has been working at the University of Zagreb Faculty of Textile Technology. In 2017, he was promoted to the position of a full professor. He participated in 5 scientific projects of the Ministry of Science, Education and Sport of the Republic of Croatia. He was the head of the scientific research project "Application of mathematical modelling and intelligent algorithms in clothing construction" funded by the Croatian Science Foundation. He published 3 book chapters, 4 university textbooks, 10 original scientific research papers in CC journals, 6 scientific papers in other journals and 33 scientific papers in conference proceedings with international peer review in the areas of optimization, evolutionary algorithms, fuzzy logic, neural networks and machine learning.

Prof. Rolich was a member of the organizing committee of the International Scientific Conference ITC&DC 2002 and ITC&DC 2004, as well as a member of the technical editorial board of the proceedings of the International Scientific Conference ITC&DC 2002 and ITC&DC 2004, and he has served as a paper reviewer in journals and in proceedings of international scientific conferences.



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CURRICULUM VITAE

Ivana Salopek Čubrić was born in 1978 in Zagreb, Croatia, where she completed elementary and high school. In 2001, she graduated from the Faculty of Textile Technology, and in 2002, from the Faculty of Political Science. Since 2002, she has been employed at TTF, where she received her master's degree in 2006, and PhD in 2009. She received the academic title of associate professor in 2018, and the scientific title of scientific advisor in 2019. She is actively involved in research in the fields of yarn and textile materials design, thermophysiological comfort of textiles, as well as the development and evaluation of generic skills. Since 2003, she has been intensively working on different research projects. She has worked on European projects related to the research and development of generic skills entitled "Grading Soft Skills" (head of the project at the TTF, lead researcher) and "Teaching creativity in engineering" (researcher). Furthermore, she was a head of WP on two projects funded by the European Social Fund. She was the lead researcher for the research grants "Design of functional materials with optimal thermal comfort", "Design of functional textile materials with the aim to increase wellbeing", "Design of innovative materials for heat retention comfort" and "Thermography in testing comfort parameters of innovative textile materials". She is the editor of 4 scientific books, the author of one textbook, 30 scientific papers in journals, 4 book chapters, and 54 full papers in conference proceedings. Also, she has served as the vice-president of the Croatian Ergonomics Society, a member of the editorial board of 6 international scientific journals, a consultant of the Central Bureau for Standards and a member-founder of the Association of Young Scientists. She participated in the organizational committees of 10 international and national scientific conferences. She has won awards for the best student (in 2000 and 2001), the award of the Prof. dr. sc. Mladen Žerdik foundation (2002), the Young Scientist Award for Scientific Research (2008), the Award for the best e-course (2015), the Europe's Best Practices in Education Award (2015) and the Award for the best teacher at TTF (2016). She is a frequent visiting professor at foreign institutions. At TTF, she teaches at the bachelor, master and doctoral levels, as well as courses in English for foreign students (within Erasmus+ programme). At the moment, she is the head of the Department for Textile Design and Management.



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CURRICULUM VITAE

She was born in 1980 in Zagreb, where she completed elementary and high school. She graduated from the University of Zagreb Faculty of Textile Technology (Design of Textiles and Clothing) in 2003. Since 2005, she has been an employee of TTF, in the Department of Textile Design and Management, where she received her PhD in 2012, according to the Scandinavian model, with the dissertation entitled "Technological Justification and Optimization of Sizing with Prewetting Sizing Process". She received the academic title of assistant professor in 2016, and the scientific title of senior research associate in 2017. Her scientific and research interests are directed towards a wide area of weaving, all aspects of the preparation processes, design, development, manufacture and application in various fields of use. Since 2005, she has worked intensively on different scientific research projects as a researcher, coordinator and head of research: „Research of influential parameters by designing fabric in CAD-CAM weaving“ (researcher), „Advanced technical fabrics and processes“ (researcher), „Flemish - Croatian Textile Training Network: T2Net“ (researcher); „BISTEC - Building innovation support through efficient cooperation network“ (coordinator for TTF), „Innovation in the quality function of advanced textile materials“ (researcher), „Lateral shrinkage - Poisson effect“ (researcher), „Structural fabric selection“ (researcher), „Natural fibres agrotexile“ (coordinator), „Designing new agrotexile structures“ (coordinator). She is the editor of 1 scientific book, the technical editor of 2 scientific books, the author of 4 book chapters, 14 scientific papers in journals cited in tertiary publications (CC, SCI), 3 scientific papers in journals cited in secondary publications, and 27 full scientific papers in conference proceedings. She participated in the organizational committees of international and national scientific conferences. At the Faculty of Textile Technology, she teaches at the bachelor, master and postgraduate doctoral study levels.



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CURRICULUM VITAE

Katarina Nina Simončić is an Associate Professor of Fashion History at the University of Zagreb Faculty of Textile Technology, Croatia. Her teaching areas are fashion and design history. She received her PhD from the Art History Department of the Faculty of Humanities and Social Sciences, University of Zagreb, with thesis: Fashion culture in Zagreb at the turn of the 19th to the 20th century. Her research fields are the relationships between genres including portrait painting, printmaking, photography and the fashion artefacts of the 16th to 20th centuries. She is the author of several publications related to the cultural history of fashion and the connection between fashion and tradition.



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Professor Zenun Skenderi, PhD, was born in Jablanica, Prizren, the Republic of Kosovo. He is a professor of textile science at the University of Zagreb. He graduated from the Faculty of Technology of University of Zagreb, and has received his master's degree in 1986 at the same Faculty, and his PhD at the Faculty of Textile Technology, University of Zagreb, in 1998. In 2009, he obtained the title of a full professor, and in 2015, a full professor tenure.

He has worked in the industry from 1980 to 1987 in a spinning mill (short staple fibres). He stayed twice at Zellweger Uster (Uster Technologies) in Switzerland, as part of the programme titled "The quality of semi-finished products and yarn". He attended the Texas International Cotton School as part of the Cochran Fellowship Program of the U.S. Department of Agriculture. He closely cooperates with the industry.

He has published a large number of scientific and professional papers in the field of spinning, non-woven textiles and the comfort of textiles and footwear (<https://bib.irb.hr/lista-radova?autor=141653>).

Currently he teaches different courses in the field of spinning, nonwoven and technical textile. His main research fields include spinning, nonwoven and technical textile, as well as the comfort of textile and footwear.



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CURRICULUM VITAE

Prof. emeritus Ivo Soljačić was born in Zagreb. He received his university education at the University of Zagreb: bachelor's degree in chemical technology from the Faculty of Technology; master's degree in chemical engineering from the Faculty of Pharmacy and Biochemistry; PhD in chemical engineering from the Faculty of Technology. His special research and professional interests are the finishing of textiles as well as textile care. He published over 200 scientific and professional papers, five books and three notes. His special scientific and education contribution in the field of textile technology was rewarded by the University of Zagreb and the Croatian Academy of Engineering.



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CURRICULUM VITAE

Assist. Prof. Maja Somogyi Škoc, PhD, graduated from the University of Zagreb Faculty of Textile Technology, Textile-Chemistry Technology major, in 2002. From 2003 to 2004, she worked on a technological-research project, and she also worked on a scientific-research project that started in 2004 and lasted until 2012. Since 2007, she has been actively participating on a project that includes the research of the possibility of achieving multifunctional protective properties of textiles by the application of the sol-gel process, on which she wrote her doctoral thesis in 2010. Her scientific-research and expert work has from the very beginning covered the area of testing and quality assurance of textiles with the emphasis on technical textiles, with intense work in the field of geotextiles and medical textiles and research on their objective characterization and evaluation. She has worked as an associate researcher on scientific-research projects, a technological project, HORIZON 2020, a HRZZ project, bilateral projects, etc. Her scientific-research work has expanded on the modification of textiles by the sol-gel process with nanoparticles and natural active compounds (i.e. medical wound dressings). She published a number of original research papers, and participated in international scientific and national scientific and professional meetings. She is a lecturer on courses Technical textiles, Medical textiles (graduate study programme), Physical-mechanical testing of textiles and Textile eco-products (undergraduate study programme), as well as Technical textiles in separation processes (doctoral study programme). She was the mentor on 28 undergraduate and graduate final papers and 1 undergraduate ERASMUS final paper. She was the head of Interlaboratory Test ILT-T-01, Argentina, 2012. She participated in the analysis of and the final report on the personal protective equipment of the big fire on Kornati in 2007. From 2016 to 2018, she was the head of the Department of Materials, Fibres and Textile Testing. She attended many workshops and seminars, such as: REACH in Practice, methodical and didactic seminar for the educational training, and she attended Gent University (Belgium), the Sächsisches Textilforschungsinstitut eV (Germany) and Instrumentalia d.o.o. (Slovenia) for scientific and professional training. She served as a reviewer for scientific journals, different international symposia and congresses. She is a member of the editorial board of the international interdisciplinary journal TEDI. She is an active member of the HDKI, HIST, DIT, AMCA TTF and Technical Committee 221.



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CURRICULUM VITAE

In 1986, associate professor Ana Sutlović received her bachelor's degree from the Faculty of Textile Technology, University of Zagreb, with the thesis entitled Environmentally hazardous chemical decolouration of waste waters. After graduation, she was employed at the Faculty of Textile Technology as a junior assistant on courses from the field of textile dyeing and printing. In 2002, she obtained her master's degree with the thesis entitled Study of cotton reactive dyeing from recycled dyebath. She received her PhD in 2008 from the Faculty of Textile Technology, University of Zagreb, with the thesis titled Study of natural dyestuff – contribution to human ecology.

Assoc. prof. Ana Sutlović works in the scientific research and education field of textile dyeing and textile printing. She has researched plant extracts as potential natural dyes; she has also worked on the analysis of natural dyes (TLC, HPLC, FTIR etc.) and on the optimization of the dyeing process. Her research is applied in the field of heritage conservation and the ability to apply natural dyes in the modern industry. In addition, she has researched dyehouse wastewater treatment with the aim of reducing water pollution and optimization of wastewater purification process with ecological emphasis. She has also been participating in science popularization programmes of the University of Zagreb and the Faculty of Textile Technology.

Membership: Croatian Association of Textile Engineers; Alma Matris Croaticae Alumni Textilie Technologiae Facultatis; Croatian Colour Society.

Bibliography: <https://bib.irb.hr/lista-radova?autor=232770&lang=EN>



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CURRICULUM VITAE

He was born in Zagreb, Croatia, in 1954. In 1977, he graduated from the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb. He received the Rector's prize and Faculty medal for outstanding achievements during study.

He was briefly employed as a mechanical engineer in a metal factory in Novska, Croatia. From late 1977, he was employed at the former military academy of engineering and as a teaching assistant and lecturer at the Department of Mechanics. He received his master's degree in 1982 with the thesis entitled Elastic-plastic analysis of circular cylindrical shells.

A three-month study stay in 1992 at the College, Swansea University, Wales, Department of Civil Engineering.

Since 1993, he has been employed at the Faculty of Textile Technology, University of Zagreb. He was awarded the title of an assistant professor in 2002, an associate professor in 2007, and a professor in early 2013. He is the author of two university textbooks on problems in mechanisms and automation in clothing technology and engineering mechanics. He currently teaches engineering mechanics, the fundamentals of mechanical engineering, textile mechanics, composite materials, mechanisms in textile and clothing machinery and mechanical material models at the Department of Fundamental Natural and Engineering Sciences.

He received his PhD in 1998 with the thesis titled Contribution to the numerical elastoplastic analysis of structural elements. His scientific interest had formerly been directed at structural elastoplasticity, but since his arrival at the Faculty of Textile Technology, it has turned to the application of numerical methods in problems of textile mechanics and clothing production. He has worked as a researcher on a number of research projects, and since 2007, he has been the head of the project entitled Computational modelling in engineering analyses of textile and garments (funded by the Croatian Ministry of Science). He is the author or co-author of two university textbooks and over 50 papers, of which 9 were published in journals, 3 chapters in scientific books, and 31 papers in proceeding of international conferences.

He is the member of the management board of the Croatian Society of Mechanics.



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CURRICULUM VITAE

Anita Tarbuk received her bachelor's degree in textile technology in 2001, her master's degree in 2005 and PhD in 2009 in technical science, textile engineering, all at the University of Zagreb Faculty of Textile Technology (UniZg TTF). In 2013, she completed pedagogic-psychological-didactic-methodical education for teachers at the University of Zagreb, Faculty of Education. She has published 7 scientific book chapters; 40 scientific papers in journals (25 of which are CC and SCI); more than 100 papers in international conference proceedings, 6 professional papers and 2 reviews in journals. She has given 1 plenary lecture, 2 invited lectures and 30 lectures at international scientific and professional conferences, and 13 at workshops. She was a researcher on 20 projects: 1 of the Ministry of Science, 2 of the HRZZ, 5 bilateral scientific projects; 1 bilateral, 1 trilateral and 2 multilateral LLP projects, 3 EUREKA, 2 FP7 and 1 COST Action project. She was the head of research for company "Novozymes" and on 3 research projects funded by the University of Zagreb. Her total citation in WoS is 371, h-index 10. She was a member of the scientific/organization committee of conferences/symposia, and a reviewer for highly ranked journals and one monograph. She won a few awards for her work, including the Annual award "Vera Johanides" for the best young scientist, from the Croatian Academy of Engineering in 2008. Her field of expertise are interface phenomena (electrokinetics, adsorption, surface free energy, hydrophilicity) and textile modification (cellulose mercerization and cationization, enzymatic pre-treatment, modification and finishing), and multifunctional finishing of textiles for protection and design. She teaches undergraduate, graduate, postgraduate and professional courses in Croatian and English. She has been serving as a guest professor at the Lodz Technical University, Lodz, Poland, since 2015 (2 weeks per year). Since 2017, she has been teaching a course in English titled "Finishing of Textiles" at ITECH, Lyon, France (56 h – 3 weeks per year). She has spent more than 8 months as a researcher and 3 months as a teacher abroad. She has been the mentor on 18 bachelors/master theses. She was the head of International Relations Office at TTF, as well as the ERASMUS+ and ECTS coordinator (2013-2017). She is a member of the Technical Committee TC 120 for Leather and Footwear at the Croatian Standards Institute. At the alumni society (AMCA TTF), she was a journal team member and editor (2004-2016) and a secretary (2012-2016). She has been a member of the Ethics Committee at alumni central and a graphic designer of their journal.



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CURRICULUM VITAE

She was born in 1968. She finished her PhD in 2006 at the University of Zagreb Faculty of Textile Technology ; she received the scientific title of scientific adviser in the area of technical sciences and textile technology in 2016, and the title of professor in 2018. She is working at the Department of Materials, Fibres and Textile Testing and was the head of the Department for two years, from 2012 to 2014. As a lecturer in charge of seven courses, she is actively involved in teaching at the undergraduate, graduate, doctoral and professional level in the field of quality and textile testing, quality management and textile materials. Her scientific research is linked to the areas of testing and quality control of different textile materials, evaluation methodology for quality assessment of textiles, textile materials properties modification, nanotechnology, UV protective textiles, monofunctional and multifunctional textile materials, as well as the testing of their functionality and durability. Her recent scientific interest has been focused on the studies related to the usage and functional durability of different textiles, leather, fishing nets, and bio-composites. Her scientific work with students has resulted in the publication of 40 papers on which she is a co-author, 28 undergraduate and graduate theses, as well as the publication and presentation of 11 student papers under her mentorship, of which two have won the Rector's Award. Her scientific and research work, currently associated with two scientific research projects of the Croatian Science Foundation (HRZZ), has resulted in the publication of more than 70 different publications. For the purpose of scientific and professional training and teaching mobility, she has spent some time abroad (Spain, Slovenia). She has been participating in scientific, organisation and review committees of international conferences, and in the reviewing of scientific papers for 9 journals cited in the WOScc database. She is the member of international editorial board of Tekstilec journal and editor of Leather & Footwear journal. In 2012, the Croatian Accreditation Agency granted her the status of an expert for the accreditation scheme titled: Testing laboratory in accordance with ISO/IEC 17025. Since 2015, she has been the head of the Quality Management Committee, and since 2018, the vice-dean for education at the University of Zagreb Faculty of Textile Technology .



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CURRICULUM VITAE

Prof. Darko Ujević, PhD, was born in Imotski on June 28th, 1955. He received his PhD on March 9th, 1998, at the Faculty of Textile Technology of the University of Zagreb. He is registered in the registry of scientific researchers under number 139605. He received his specialist training in Tübingen, Dekendorf, Lodz and Knoxville. He has worked as the main researcher and manager of 1 technology research and development project, 1 compound technological project and 2 scientific and research projects. He has also worked as the manager of 2 bilateral projects and as one of the coordinators of the 1 FP7 project and 1 LLP project titled TIED SHOE. He has developed a professional and scientific collaboration with the Institute of Textile Technology and Process Engineering Denkendorf, Technical University of Lodz, University of Tennessee, Knoxville, Technical Faculty of the University of Bihać, Bosnia-Herzegovina, University of Vienna, Faculty of Life Sciences - Department of Anthropology, and Budapest University of Technology and Economics, Faculty of Mechanical Engineering - Department of Polymer Engineering. He has published 20 scientific papers in CC journals, 25 scientific papers in other journals, 28 papers in other journals, 129 papers in books of conference proceedings with international review, 68 other papers in books of conference proceedings, 16 other papers and 3 patents. He has also published 12 university textbooks, 25 book chapters, 4 historical sports books, 2 anthropometric measurements manuals, 9 books of proceedings, 2 scientific expert books and 7 technical books. He has completed more than 100 studies for the needs of the textile and clothing industry. He is a collaborating member of the Croatian Academy of Engineering and a member of the Scientific Council for Technological Development of the Croatian Academy of Sciences and Arts. He is an international instructor and referee for contact and budokai sports. He received an annual award 'Rikard Podhorsky'. He can speak, read and write English.



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CURRICULUM VITAE

Branka Vojnović was born in Zagreb in 1970. After finishing primary and secondary school, she enrolled in the Faculty of Chemical Engineering and Technology, University of Zagreb, in 1989. In 1994, she received the Rector's Award, and she graduated in 1995. In the same year, she was hired as a research assistant at the Faculty of Textile Technology, University of Zagreb, Department of Textile Chemistry and Material Testing. She graduated in 1999, thereby completing her postgraduate studies and defending her master's thesis. In 2004, Branka Vojnović defended her doctoral dissertation "The Characterization of Heavy Metal in Textile Finishing Processes" at the Faculty of Textile Technology, University of Zagreb. In 2006, she was appointed to the position of an assistant professor, and in 2012, to the position of an associate professor. In 2017, she was elected to the position of a professor at the University of Zagreb Faculty of Textile Technology.

Her scientific and research work is based on the development of analytical methods for the determination of metal ions in textile and leather, their validation and the preparation of textile material or leather samples for analysis. She also deals with the environmental problems of textile wastewaters, the promotion of the removal of different pollutants (metal ions, dyes etc.) from the textile wastewaters by using natural zeolites and other natural materials. She has published more than 25 scientific papers in domestic and international journals, and has participated in over 40 scientific and professional conferences. She has worked as an associate researcher on four scientific-research and six bilateral projects, two European projects, two Eureka! Projects, one ecological and one Croatian Science Foundation project. As a teacher, she holds courses at the undergraduate, professional, graduate and doctoral studies, and has been a mentor on 17 graduate student papers. She is also a qualified assessor of the Croatian Accreditation Agency for the accreditation scheme for testing laboratories according to HRN EN ISO/IEC 17025 for the field of chemical, analytical and environmental samples. She was the head of the Department of Applied Chemistry from 2008 to 2012, and the vice-dean for education from 2012 to 2017.



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CURRICULUM VITAE

Zlatko Vrljičak was born in 1955, and graduated from the University of Zagreb Faculty of Textile Technology in 1977. He completed his master's degree in 1982, and received his PhD at the Faculty of Textile Technology in 1997. He is a renowned teacher and a full professor at the University of Zagreb Faculty of Textile Technology. His areas of research interest include technological processes of design, the manufacturing, analysis and control of knitted fabrics and the CAD/CAM system in the production of knitwear. He has published more than 50 scientific papers, 50 professional papers, he has actively participated in international congresses across Europe for 50 times, and he is the author of two papers published in the Croatian Technical Encyclopaedia. He is a member of the Croatian Association of Textile Engineers, the president of the Croatian Association of Knitting Technologist and a member of the International Federation of Knitting Technologist (IFKT), and its long-time financial controller.



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CURRICULUM VITAE

Prof. Edita Vujasinović received the highest scientific position of adviser in 2013. Her research and teaching are focused on textile fibres and materials, including fibre-reinforced composites, extreme textiles, objective measurement and evaluation, the restoration and conservation of textiles, textile forensic as well as eco-design and recycling as a part of the life-cycle thinking approach to the 21st century textile production. As a result of this work, she has published a number of original research papers, and participated in international/national scientific projects. Since 2002, she has been a member of the editorial board of Croatian scientific and professional journal Tekstil, a member of the American Fibre Society and numerous Croatian professional associations (DIT, HIST, CSCE, DSN, HDKI, AMCA TTF). In 2012, she was elected as a member of the Croatian Academy of Engineering. Since 2005, she has been acting as an independent reviewer of the European Commission for projects in the FP7 and Horizon 2020 programme.

Useful information



1. *Website of the Doctoral Study Programme TST at the University of Zagreb Faculty of Textile Technology*



2. *The Protocol states the obligations and rights of the students of the doctoral study programme of Textile Science and Technology*



3. *The Regulations on doctoral studies at the University of Zagreb*



4. *HR Excellence in Research*



5. *Local transportation / other useful information / free time*

