




University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: General Toxicology			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: mandatory			
Semester: I		Year of studies: I	
ECTS points: 10		Course code: 63ΠΡΟ10Τ	
Requirements: /			
Course aims: Introduction, comprehension and acquirement of knowledge in general toxicology.			
Course outcomes: Evaluation and general toxicology knowledge application.			
Course contents: <i>Lectures</i> Basic terms and definitions. Dose-response. Fate of poisons in the organism: ADME processes. Toxicokinetics. Systemic toxicity: hepatotoxicity, nephrotoxicity, neurotoxicity, pulmototoxicity, dermatotoxicity, hematotoxicity, endocrine toxicity, reproductive toxicity, genotoxicity, carcinogenicity. Toxic responses. Mechanisms of toxicity: enzymes inhibition, covalent binding for cellular molecules, adverse effect of xenobiotics on ionic transporters, oxidative stress, interactions with bioelements. Biomarkers and biomonitoring. Therapy and antidotes. <i>Practical classes</i> Study cases on different toxicokinetic models. Risk assessment of critical effects.			
Recommended literature: 1. Timbrell JA. Introduction to Toxicology, CRC Press, 2002. 2. Casaret and Doull's Toxicology: The Basic Science of Poisons. Ed.: Curtis D. Klaassen, McGraw-Hill Companies, Inc., USA, 1996. 3. Boelsterli UA. Mechanistic toxicology. The molecular basis of how chemicals Disrupt biological targets. Ed.: Boelsterli UA. Informa healthcare, 2009.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 30		Other forms of teaching: 30	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Principles of Ecotoxicology			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: mandatory			
Semester: I		Year of studies: I	
ECTS points: 10		Course code: 63ΠΡΟ1ΠΕ	
Requirements: /			
Course aims: Introduction, comprehension and acquirement of knowledge in ecotoxicology.			
Course outcomes: Evaluation and application of acquired knowledge in the field of ecotoxicology.			
Course contents: <i>Lectures</i> Basic terms and definitions. Sources of pollution. Fate and behaviour in the environment: air, water, soil, biota; exposure, transport, distribution, metabolism, bioaccumulation and biomagnification. Entrance into the food chain. Bioindicators of exposure and contamination. Ecological factors of toxicity. Ecotoxicological modeling. Global pollution. Basic principles of sustainable development in the environment. <i>Practical classes</i> Models of chemicals distribution in the environment, Examples of ecotoxicological risk assessment.			
Recommended literature: 1. Connell DW, Lam P, Richardson B, Wu R. Introduction to Ecotoxicology, Wiley-Blackwell, 1999. 2. Hoffman DJ, Rattner BA, Burton GA, Cairns J. Handbook of Ecotoxicology, 2nd edition, CRC Press LLC, USA, 2003. 3. Walker CH, Hopkin SP, Sibly RM, Peakal DB. Principles of ecotoxicology. Eds. Walker CH et al. Taylor and Francis 2003.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 30		Other forms of teaching: 30	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Environmental Contaminants			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: mandatory			
Semester: I		Year of studies: I	
ECTS points: 10		Course code: 63ΠΡΟ1ЖС	
Requirements: /			
Course aims: Analyses of the most relevant environmental chemicals.			
Course outcomes: Evaluation and application of acquired knowledge.			
Course contents: <i>Lectures</i> Toxic gasses: carbon monoxide, hydrogen sulfide, sulphur dioxide, chlorine, ammonia, nitrogen oxides. Organic solvents: benzen and derivates, halogenated hydrocarbons, carbon disulfide, alcohols. Metals: lead, cadmium, mercury and arsenic. Persistent organic pollutants (POPs): polycyclic aromatic hydrocarbons, polychlorinated and polybrominated bifenils, polychlorinated dibenzodioxines, polichlorinated dibenzofuranes and polybrominated difenileters. Pesticides. Food contaminants. <i>Practical classes</i> Analyses of the parameters of toxicity of environmental contaminants concerning human and environmental exposure, particularly in Serbia.			
Recommended literature: 1. Marquardt H, Schafer SG, McClellan R, Welsch F: Toxicology. Academic Press, USA, 1999. 2. Derelanko MJ, Hollinger MA. Handbook of toxicology, second edition. Ed.: Derelanko MJ, Hollinger MA. CRC Press LLC, Boca Raton, USA, 2000. 3. Handbook of Human Toxicology. Ed.: Massaro EJ, CRC Press LLC, USA, 1997.			
The total of active learning classes			
Lectures: 30		Practical classes: 15	
Research work: 30		Other forms of teaching: 30	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Toxicity Tests			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: mandatory			
Semester: II		Year of studies: I	
ECTS points: 10		Course code: 63ΠΡΟ2ΤΕ	
Requirements: /			
Course aims: Acquiring knowledge and skills regarding criteria and methods used for chemicals toxicity testing.			
Course outcomes: Critical assessment of the quality and the results of toxicity testing.			
Course contents: <i>Lectures</i> Acute oral, dermal and inhalation toxicity tests, acute eye/skin irritation/corrosion, skin sensitisation. Subacute, subchronic and chronic toxicity tests. Carcinogenicity tests. Genotoxicity/mutagenicity tests. Reproductive toxicity tests. Developmental toxicity tests. Other tests-neurotoxicity. Ecotoxicity tests: birds, aquatic organisms, bees, soil organisms. <i>Practical classes</i> Quality analysis of toxicity tests. Critical evaluation of toxicity tests results.			
Recommended literature: 1. EU Test Method Regulation, Council Regulation (EC) No 440/2008. 2. Hayes AW. Principles and methods in toxicology. Ed. Hayes AW. Taylor and Francis 2001. 3. Jacobson-Kram D and Keller K. Toxicological testing handbook Principles, applications and Data Interpretation. Eds.: Jacobson-Kram D and Keller K. Informa healthcare, 2006.			
The total of active learning classes			
Lectures: 30		Practical classes: 30	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			


University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Chemicals Risk Assessment			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: mandatory			
Semester: II		Year of studies: I	
ECTS points: 10		Course code: 63ΠΡΟ2ΠΡ	
Requirements: /			
Course aims: Acquiring knowledge and skills regarding: risk assessment and classification and labeling.			
Course outcomes: Competent work in: dossier development, quality assessment and evaluation of dossier, human health risk assessment and ecotoxicological risk assessment.			
Course contents: <i>Lectures</i> Human health and ecotoxicological risk assessment - introduction. Hazard identification. Dose-response assessment. Exposure assessment. Risk characterization. Risk assessment methodologies: deterministic and probabilistic approach. Risk assessment of non-carcinogenic substances. Risk assessment of carcinogenic and genotoxic substances. Aggregative risk assessment. Cumulative risk assessment. Integrative risk assessment. Risk assessment in legislative toxicology. Classification and labeling of chemicals. <i>Practical classes</i> Critical evaluation of data and dossier development. Basic calculations in risk assessment. Risk calculation for carcinogenic/genotoxic substances using slope factor. Determination of toxicity equivalent factor. Total risk calculation and risk interpretation. Reference values. Classification and labeling of chemicals.			
Recommended literature: 1. Paustenbach DJ. Human and ecological risk assessment. Ed.: Paustenbach DJ. John Wiley and Sons, Inc., New York, USA, 2002. 2. Toxicology and Risk Assessment of Chemicals, Nielsen E, Ostergaard G, Laarsen JC. Informa Helthcare 2008. 3. Toxicology and Risk Assessment: A comprehensive introduction. Graim H, Snider R. John Wiley and Sons, 2008. 4. Toxicological profiles. Public Health Service, Agency for Toxic Substances and Disease Registry. 5. Health Safety Guides, WHO 6. Environmental Health Criteria, WHO/IPCS 7. Toxicological Risk Assessment of Chemicals : a practical guide. Nielsen E, Ostergaard G, Laarsen JC. Informa Helthcare 2008.			
The total of active learning classes			
Lectures: 30		Practical classes: 45	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			


Other activities		
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University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Pharmaceutical Waste			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: elective			
Semester: II		Year of studies: I	
ECTS points: 5		Course code: 63ПРИ2ΦO	
Requirements: /			
Course aims: Acquiring knowledge and skills on waste management, particularly concerning pharmaceutical waste. The emphasis is put on the safe waste management in relation to human health and environment.			
Course outcomes: Qualified work in pharmaceutical waste management.			
Course contents: <i>Lectures</i> Types and categories of hazardous waste. Medical waste. Methods and procedures of pharmaceutical waste management. Treatment of pharmaceutical waste. The role of pharmacies in pharmaceutical waste management. Classification and labelling of medical waste. <i>Practical classes</i> Characterization and classification of medical waste. Safe handling and disposal of pharmaceutical waste. Current issues related to pharmaceutical waste.			
Recommended literature: 1. Jaqueline Vaughn. Waste management. A reference handbook. ABC Clio INC. 2009. 2. Mulder JG and Dencker L. Pharmaceutical Toxicology Ed.: Mulder JG and Dencker L. Pharmaceutical Press, 2006. 3. Zakon o upravljanju otpadom "Službeni glasnik RS ", br. 36/09 i 88/10.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Toxicovigilance			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: elective			
Semester: II		Year of studies: I	
ECTS points: 5		Course code: 63ПРИ2ТВ	
Requirements: /			
Course aims: Acquiring knowledge about toxicovigilance.			
Course outcomes: Evaluation and knowledge application in the field of toxicovigilance.			
Course contents: <i>Lectures</i> Concept of toxicovigilance. Role of pharmacist and Poison Control Centre. Information, education and prevention. Global monitoring of hazardous effects: household products, occupational and environmental pollutants. <i>Practical classes</i> Collection and analysis of data on hazardous human health effects: monitoring of occupational exposure and consumers exposed by food, water and general use products in Serbia.			
Recommended literature: 1. Gupta SK, Singh U, Velpandian T. Analytical Toxicology for Poisoning Management and Toxicovigilance. Alpha Science International. 2002.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Regulatory Toxicology			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: elective			
Semester: II		Year of studies: I	
ECTS points: 5		Course code: 63ПРИ2ЛЕ	
Requirements: /			
Course aims: Application of acquired knowledge and skills in the frame of legislative toxicology.			
Course outcomes: Qualified work in accordance with legislation and safe chemicals management.			
Course contents: <i>Lectures</i> Law on chemicals. Law on biocides. Law on plant protection products. Law on waste management. Dossier on chemicals. Safety data sheet. Dangerous Substances Directive (67/548/EEC), Dangerous Preparations Directive (1999/45/EC), Regulation (EC) 1272/2008. <i>Practical classes</i> Legislative in practice. Building the dossier and safety data sheet. Qualitative and quantitative evaluation of a dossier.			
Recommended literature: 1. Zakon o hemikalijama "Službeni glasnik RS", br. 36/09 i 88/10. 2. Zakon o biocidnim proizvodima. "Službeni glasnik RS", br. 36/09 i 88/10. 3. Zakon o sredstvima za zaštitu bilja. "Službeni glasnik RS", br. 52/10. 4. Zakon o upravljanju otpadom "Službeni glasnik RS", br. 36/09 i 88/10. 5. Zakon o zdravstvenoj zaštiti. "Službeni glasnik RS", br. 107/05 i 72/09. 6. Dangerous Substances Directive (67/548/EEC), 7. Dangerous Preparations Directive (1999/45/EC), 8. Regulation (EC) 1272/2008.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Seminars			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Toxicological laboratory and good laboratory practice			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: elective			
Semester: II		Year of studies: I	
ECTS points: 5		Course code: 63ПРИ2УЛ	
Requirements: /			
Course aims: Acquiring knowledge about various aspects of organization and management of toxicological laboratory: equipment, budget, staff, implementation of good laboratory practice.			
Course outcomes: Individual and team work in planning, organization and management of activities in toxicological laboratory.			
Course contents: <i>Lectures</i> Types of toxicological laboratories. Management of data, staff, documents, records, samples, equipment and laboratory supplies, budget. Validation and calibration of instruments. Methods validation. Laboratory safety. ISO standards and principles of accreditation. Good laboratory practice. <i>Practical classes</i> Implementation of a model for laboratory organization. Building the documents for quality system - guidance, procedure, record.			
Recommended literature: 1. Moffat Ac. Osselton MD, Widop B. Clark's analysis of drugs and poisons in pharmaceutical, body fluids and post-mortem materials. Moffat Ac. Osselton MD, Widop B. Third edition Pharmaceutical Press London 2012. 2. ISO 17025 standard			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Seminars			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			

University of Belgrade Faculty of Pharmacy	Specialized Academic Studies TOXICOLOGICAL RISK ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS		
Study programme: Toxicological Risk Assessment of Environmental Contaminants			
Course title: Management of Chemical Accidents			
Teachers: Biljana M. Antonijević, Vesna J. Matović, Dragana L. Vujanović, Mirjana M. Đukić, Zorica L. Bulat, Danijela D. Đukić-Ćosić			
Course status: elective			
Semester: II		Year of studies: I	
ECTS points: 5		Course code: 63ПРИ2ХА	
Requirements: /			
Course aims: Acquiring knowledge about different aspects of chemical accidents.			
Course outcomes: Understanding the principles of management in chemical accidents.			
Course contents: <i>Lectures</i> The most common chemicals involved in accidents. Management of chemical accidents - various aspects. Mobile teams and mobile laboratories. Methods of decontamination used for water and soil. Personal protective measures and equipment. <i>Practical classes</i> Review and analysis of ecological disasters. The use of simulations in management of chemical accidents.			
Recommended literature: 1. International Programme of Chemical Safety. Public health and chemical incidents. 1999. 2. Principles and Methods of Toxicology. Ed.: Hayes WA, Raven Press, New York, 2006.			
The total of active learning classes			
Lectures: 15		Practical classes: 15	
Research work: 15		Other forms of teaching: 15	
Teaching methods: Lectures, Practical work; Workshop, Homework, Individual research			
Grading system:			
Exam prerequisites	Points	Final exam	Points
Active participation in lectures	20	Practical	
Practical classes	40	Written	40
Colloquia		Oral	
Seminars			
Other activities			