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| **Study program** Applied chemistry with the management basics |
| **Course title** Forensic chemistry (H268C) |
| **Name of lecturer/lecturers** Niko S. Radulović |
| **Type of course** Elective |
| **Number of ECTS allocated** 6 |
| **Course objectives**Acquisition of knowledge about the basics of forensic science and acquaintance of the student with its goal and possibilities. Developing the ability to solve theoretical and experimental problems in forensic laboratory work. |
| **Course outcomes**The student should be able to:* describe and explain the chemical and physical-chemical processes related to the analysis of forensic samples; propose the most appropriate method for analyzing a certain type of sample;
* know the possibilities and limitations of forensic analysis;
* perform sampling of physical evidence, prepares samples for analysis, independently plans an experiment and determines parameters with instrumentation used in practical classes;
* interpret the results of forensic analysis,
* make conclusions based on the obtained results and
* prepare them for the trial - evidentiary material;
* achieve oral and written communication, independent work - expertise, self-organization and planning of professional work.
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| **SYLLABUS***Lectures*Objective of Forensic Chemistry: Capabilities of the Forensic Laboratory. Type and type of forensic analysis. Legalbasis. Accreditation of forensic laboratory. Treatment of physical evidence: Sample collection and preparation. Five stages of forensic sample processing. Contamination. Microchemical analysis. Fiber identification and comparison: microscopy, infrared spectroscopy, pyrolysis, fiber staining and color comparison, microspectrophotometry, chemical composition, documentation and sources. Types of fibers. Fingerprint chemistry: Chemical composition of latent fingerprint residue. Factors Affecting the Latent Residual. Visualization methods. Reagents. Forensic compatibility of reagent formulation. Fire Cause Investigation: Fire Chemistry. Conditions for flaming. Types of fire. Explosions. Collecting samples from the fire scene. Test, control and reference sample. The place where the fire started. Flammable liquids: Headspace adsorption, Solid-phase microextraction (SPME), distillation and solvent extraction. Analysis: GC, GCMS, IR/FT-IR, Microscopy/scanning electron microscopy. Characterization of hydrocarbon mixture. Firearms: Types of ammunition. Residues from firing. Determination of shooting distance. Analysis of alcohol in breath, blood and other body fluids. Postmortem analysis. Examination of the authenticity of suspicious documents and artificial aging of documents. Ink analysis. Analysis of controlled substances: qualitative and quantitative analysis of amphetamines, LSD, Cannabis sativa and products, diamorphine and heroin, cocaine, Catha edulis and Lophophora williamsii products, psilocybin and psilocin from mushrooms, barbiturates and benzodiazepines. Paints, coatings and plastics: Paint and plastics as a forensic sample. Pigments, fillers and additives. Forensics in environmental chemistry. Geochemical forensics. Determining the place and time of pollution with oil or oil derivatives.*Laboratory work*Work in a forensic laboratory. Visit and get to know the forensic laboratory and the rules of work in it. Sample collection and preparation. Five stages of forensic sample processing. Contamination. Microscopy and fiber infrared spectroscopy. Chemistry of fingerprints. GC-MS analysis of samples from the fire scene. Determination of shooting distance. Analysis of alcohol in breath, blood and other body fluids. Analysis of controlled substances (GC-MS, IR/FT-IR, HPLC, NMR): amphetamine, LSD, Cannabis sativa and products, diamorphine and heroin, cocaine, barbiturates and benzodiazepines. Differentiation of fuel type, source and time of contamination. |
| **References**1. R. Maksimović, M. Bošković, U. Todorović, Metode fizike, hemije i fizičke hemije u kriminalistici, Policijska akademija, Beograd, 1998.
2. J. I. Khan, T. J. Kennedy, D. R. Christian, Jr., Basic Principles of Forensic Chemistry, Springer, Heidelberg, 2012.
3. Cole, M.D., The Analysis of Controlled Substances, John Wiley & Sons Ltd, 2003.
4. Saferstein, R., Criminalistics: An Introduction to Forensic Science, 8th Edition, Prentice Hall, 2003.
5. The Encyclopedia of Forensic Sciences, Three-Volume Set, 1-3, Jay Siegel, Geoffrey Knupfer, Pekka Saukko (Eds.), Academic Press, 2000.
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| **Active teaching classes** | **Lectures** 60 | **Laboratory work** 15 |
| **Teaching mode**Interactive lectures, theoretical and experimental exercises, laboratory-research work, homework assignments, seminar work, panel discussions |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** |
| **Pre exam duties** | **Points** | **Final exam**  | **Points** |
| Activity during lectures | 5 | Written examination | 20 |
| Practical teaching | 15 | Oral examination | 20 |
| Teaching colloquia | 30 |  |  |
| Homework assignments | 5 |  |  |
| Seminar | 5 |  |  |