

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

Ime predmeta: **Klinična biokemija**
 Course title: **Clinical Biochemistry**

Študijski program in stopnja Study programme and cycle	Študijska smer Study option	Letnik Year of study	Semester Semester
Splošna medicina, enovit magistrski študijski program		Tretji	5.
General medicine, Uniform master's degree study program		Third	5th

Vrsta predmeta (obvezni ali izbirni) /
 Course type (compulsory or elective)

obvezni
 compulsory

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
15	15	AV LV RV	30		30	3

Nosilec predmeta / Course coordinator: **doc. dr. Evgenija Homšak**

Jeziki /Languages:

Predavanja / Lectures:

slovenski/slovene

Vaje / Tutorial:

slovenski/slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites for enrolling in the course or for performing study obligations:

Vsebina (kratek pregled učnega načrta):

PREDAVANJA in SEMINARJI: Uvod v klinično biokemijo, organizacija klinične biokemije in laboratorijev, zagotavljanje kakovosti, evaluacija metod v klinični biokemiji in referenčne vrednosti, testiranje ob pacientu (POCT), biološki vzorci – vrste analiznega materiala, seč in urinske preiskave, beljakovine v krvni plazmi, neproteinske dušikove spojine v krvnem serumu, lipidi in lipoproteini, motnje v presnovi ogljikovih hidratov, sladkorna bolezen: diagnostika in kontrola terapije, acidobazno ravnovesje in plinska analiza krvi, voda in elektroliti, laboratorijska endokrinologija, klinična encimologija, tumorski označevalci.

VAJE: Hematološke preiskave, urinske preiskave, določanje acidobaznega ravnovesja in elektrolitov, analitika beljakovin v serumu, določanje neproteinskih dušikovih spojin, bilirubina in drugih pomembnih

Content (syllabus outline):

LECTURES and SEMINARS: Introduction into Clinical Biochemistry, organisation of clinical biochemistry and laboratories, quality assurance, evaluation of methods in clinical biochemistry and reference values, point of care testing (POCT), biological material – variety of analytical samples, urine and urinalysis, plasma proteins, nonprotein nitrogenous compounds in serum, lipids and lipoproteins, disturbances in carbohydrate metabolism, Diabetes mellitus: diagnostics and laboratory monitoring of treatment, acid – base balance and blood gas analysis, water and electrolytes, laboratory endocrinology, clinical enzymology, tumour markers.

Laboratory work: Laboratory Hematology, urine examination, acid – base balance and electrolytes analysis, analytical techniques for protein determination, nonprotein nitrogenous compounds, bilirubin and other

metabolitov v serumu, imunološke preiskave, določanje koncentracij zdravilnih učinkovin v biološkem materialu, ogled klinično-biokemičnih laboratorijev.

important metabolites in serum, immunodiagnostic procedures, therapeutic drug monitoring, visit to clinical-biochemical laboratories.

Temeljna literatura in viri / Reading materials:

Temeljna literatura: ▪ Nessar Ahmed, Clinical Biochemistry. Oxford University Press 2011. ▪ CA Burtis,, Bruns DE. Fundamentals of Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 7th ed.Elsevier Saunders, 2015. ▪ Dodatna literatura: ▪ L Thomas. Labor und Diagnose, 6.aufgabe, TH – Books Verlagsgesellschaft GmbH, Frankfurt/Main. 2005. ▪ LA Kaplan, AJ Pesce, Clinical Chemistry Theory, Analysis, Correlations 5th ed. Mosby Elsevier, 2010. ▪ LM Devlin, Textbook of biochemistry with clinical correlations. 7th edition. Wiley, 2010. ▪ William J Marshall, Stephen K Bangert, Clinical Chemistry, 6th edition,. Mosby Elsevier 2008. ▪ Michael L. Bishop, Edward P. Fody, Larry E. Schoeff, Clinical Chemistry: Techniques, principles, correlations, 6th edition, Wolters Kluwer, Lippincott Williams Wilkins 2010. ▪ Robert L. Sunheimer, Linda Graves, Clinical Laboratory Chemistry, Pearson 2011. ▪ Osredkar Joško, Marc Janja, Laboratorijska medicina 1, Učbenik za študente medicine, farmacije in lab. biomedicine. UL, FF, Lj 2012. ▪ Martin A Crook, Clinical Biochemistry and Metabolic Medicine, 8th edition. CRC Press, 2012.	
---	--

Cilji in kompetence:

Predmet študenta teoretično in praktično seznani s področjem klinične biokemije. Na predavanjih in seminarjih posluša in aktivno pripravlja in predstavlja različne teme o pomembnosti klinično-biokemičnih preiskav v sodobni diagnostiki, seznani se tudi z analitiko teh preiskav.

Na vajah vrši sam, ali v skupini, nekatere analize postopke pregleda bioloških vzorcev.

Objectives and competences:

The subject introduces the student theoretically and practically to the area of Clinical Biochemistry. The student listens to lectures and coursework and actively prepares and presents various themes on the importance of clinical-biochemical examinations in modern diagnostics as well as analytical procedures.

In laboratory practice the student performs some analytical procedures for examinations of biological samples, either alone or in group.

Predvideni študijski rezultati:

Znanje in pridobljene kompetence
Študent mora zahtevano znanje in pridobljene osnovne kompetence iz področja predmeta potrditi s kolokvijem iz vaj, opravljenim seminarjem in izpitom.

Prenosljive/ključne spretnosti in drugi atributi:
Pridobljeno znanje in kompetence študent koristi in uporabi za namen diagnostike in spremljanja bolezni v interni medicini, pediatriji, ginekologiji in onkologiji.

Intended learning outcomes:

Knowledge and acquired competences
Student must confirm the demented knowledge and acquired basic competences in the field of the subject with examination of laboratory practice, completed seminar and final examination.

Transferable/Key Skills and other attributes:
The student benefits and uses the acquired knowledge and competences for the purpose of diagnosis and disease monitoring in internal medicine, pediatrics, gynecology and oncology.

Metode poučevanja in učenja:

Predavanja in seminarji
Laboratorijske vaje

Learning and teaching methods:

Lectures and seminars
Laboratory practice

Reference nosilca / Course coordinator's references:

1. **HOMŠAK, Evgenija.** Implementing a new cardiac biomarker : keys for successes. *Indian journal of clinical biochemistry*. Nov. 2019, vol. 34, suppl. 1, str. s34. ISSN 0974-0422. <https://link.springer.com/article/10.1007/s12291-019-00859-4>. [COBISS.SI-ID [6867775](#)]

2. **HOMŠAK, Evgenija.** Laboratorijska diagnostika pred in med nosečnostjo. *Laboratorijska medicina : znanstveno-strokovno glasilo Slovenskega združenja za klinično kemijo in laboratorijsko medicino*. [Tiskana izd.]. mar. 2019, [št.] 1, str. 62-64. ISSN 2670-4463. [COBISS.SI-ID [6630207](#)]
3. SIMUNDIC, Ana-Maria, FILIPI, Petra, VRTARIC, Alen, MILER, Marijana, NIKOLAC GABAJ, Nora, KOCIS, Andrea, AVRAM, Sanja, GLIGOROVIC BARHANOVIC, Najdana, BULO, Anyla, CADAMURO, Janne, **HOMŠAK, Evgenija**, et al. Patient's knowledge and awareness about the effect of the over-the-counter (OTC) drugs and dietary supplements on laboratory test results : a survey in 18 European countries. *Clinical chemistry and laboratory medicine*. [Online ed.]. 2019, vol. 57, iss. 2, str. 183-194. ISSN 1437-4331. <https://www.degruyter.com/downloadpdf/j/cclm.2019.57.issue-2/cclm-2018-0579/cclm-2018-0579.pdf>, DOI: [10.1515/cclm-2018-0579](#). [COBISS.SI-ID [6598463](#)]
4. **HOMŠAK, Evgenija**, MOŽINA, Barbara. Biokemične lastnosti ginekoloških rakov in tumorski označevalci. V: TAKAČ, Iztok (ur.), ARKO, Darja. *Ginekološka onkologija*. 1. izd. Maribor: Univerzitetna založba Univerze, 2020. Str. 57-69. ISBN 978-961-286-330-2. [COBISS.SI-ID [512970552](#)]
5. **HOMŠAK, Evgenija**, GRUSON, Damien. Soluble ST2 : a complex and diverse role in several diseases. *Clinica Chimica Acta*. [Online ed.]. 2020, vol. 507, str. 75-87, ilustr. ISSN 1873-3492. <https://www.sciencedirect.com/science/article/pii/S0009898120301662?via%3Dihub>, <https://doi.org/10.1016/j.cca.2020.04.011>, DOI: [10.1016/j.cca.2020.04.011](#). [COBISS.SI-ID [6989631](#)]
6. **HOMŠAK, Evgenija.** Vpliv biološke variabilnosti na laboratorijsko diagnostiko avtoimunskih bolezni. *Laboratorijska medicina : znanstveno-strokovno glasilo Slovenskega združenja za klinično kemijo in laboratorijsko medicino*. [Tiskana izd.]. maj 2020, [št.] 2, str. 44-49, ilustr. ISSN 2670-4463. https://www.szklm.si/assets/images/upload/LM_2_2020.pdf. [COBISS.SI-ID [19826179](#)]
7. WIERINGA, Gijsbert, QUERALTO, Jose, **HOMŠAK, Evgenija**, JASSAM, Nuthar, CAVALIER, Etienne, SVINAROV, Dobrin, LENIČEK KRLEŽA, Jasna, CHRISTOU, Spyroula, PIKNER, Richard, RENNEBOD LARSEN, Trine, KRHIN, Blaž, et al. A proposed common training framework for specialists in laboratory medicine under EU directive 2013/55/EC : (the recognition of professional qualifications). *Clinical chemistry and laboratory medicine*. [Online ed.]. 2021, vol. 59, issue 3, str. 505-512. ISSN 1437-4331. <https://doi.org/10.1515/cclm-2020-1504>, <https://www.degruyter.com/view/journals/cclm/ahead-of-print/article-10.1515-cclm-2020-1504/article-10.1515-cclm-2020-1504.xml>, DOI: [10.1515/cclm-2020-1504](#). [COBISS.SI-ID [43928579](#)]
8. WIERINGA, Gijsbert, JASSAM, Nuthar, **HOMŠAK, Evgenija**, RAKO, Ivana, RACEK, Jaroslav. The Academy of the European Federation of Clinical Chemistry and Laboratory Medicine and the European Register of Specialists in Laboratory Medicine : guide to the Academy and the Register : version 4 - 2020. *Clinical chemistry and laboratory medicine*. [Online ed.]. 2021, vol. 59, issue 3, str. 499-503. ISSN 1437-4331. <https://doi.org/10.1515/cclm-2020-1507>, <https://www.degruyter.com/view/journals/cclm/ahead-of-print/article-10.1515-cclm-2020-1507/article-10.1515-cclm-2020-1507.xml>, DOI: [10.1515/cclm-2020-1507](#). [COBISS.SI-ID [43902467](#)]
9. GRUSON, Damien, KUMAR DABLA, Pradeep, STANKOVIC, Sanja, **HOMŠAK, Evgenija**, GOUGET, Bernard, BERNARDINI, Sergio, MACQ, Benoit. Artificial intelligence and thyroid disease management: considerations for thyroid function tests. *Biochimica medica*. [Online ed.]. 2022, vol. 32, issue 2, str. 1-7, ilustr. ISSN 1846-7482. <https://doi.org/10.11613/BM.2022.020601>, <https://www.biochimica-medica.com/en/journal/32/2/10.11613/BM.2022.020601>, DOI: [10.11613/BM.2022.020601](#). [COBISS.SI-ID [111920899](#)]
10. JAGRIČ, Tomaž, GORENJAK, Maksimiljan, **HOMŠAK, Evgenija**, KREBS, Bojan. Citokinski odgovor pri bolnikih, zdravljenih z metodo odprtega trebuha zaradi hude sepse, povzročene z dogajanjem v trebušni votlini = Interleukin response in patients treated with abbreviated laparotomy for severe intraabdominal sepsis. *Acta medico-biotechnica : AMB*. [Tiskana izd.]. 2022, vol. 15, [no.] 2, str. 17-25. ISSN 1855-5640. <https://journals.um.si/index.php/amb/article/view/2561>, [Digitalna knjižnica Univerze v Mariboru – DKUM](#), [Digitalna knjižnica Slovenije - dLib.si](#), DOI: [10.18690/actabiomed.238](#). [COBISS.SI-ID [139450883](#)]
11. KUMAR DABLA, Pradeep, UPRETI, Kamal, SINGH, Divakar, SINGH, Anju, SHARMA, Jitender, DABAS, Aashima, GRUSON, Damien, GOUGET, Bernard, BERNARDINI, Sergio, **HOMŠAK, Evgenija**, STANKOVIC, Sanja. Target association rule mining to explore novel paediatric illness patterns in emergency settings. *Scandinavian journal of clinical and laboratory investigation*. 2022, vol. 82, issue 7/8, str. 595-600, ilustr. ISSN 1502-7686. <https://www.tandfonline.com/doi/full/10.1080/00365513.2022.2148121>, <https://doi.org/10.1080/00365513.2022.2148121>, DOI: [10.1080/00365513.2022.2148121](#). [COBISS.SI-ID [135490563](#)]
12. JAGRIČ, Tomaž, HLADNIK, Gaja, KOLARIČ, Rok, DUGONIK, Marjeta, **HOMŠAK, Evgenija**. Does leptin cause proximal gastric cancer in the obese? The role of serum leptin in the etiology of proximal gastric cancer. *Hormone molecular biology and clinical investigation*. 2023, [v tisku][str. 1-8], ilustr. ISSN 1868-1891. <https://www.degruyter.com/document/doi/10.1515/hmbci-2022->

- [0101/html](#), <https://doi.org/10.1515/hmbci-2022-0101>, DOI: [10.1515/hmbci-2022-0101](https://doi.org/10.1515/hmbci-2022-0101). [COBISS.SI-ID [178840067](#)]
13. ROŠKAR, Zlatko, DREISINGER, Mojca, TIČ, Primož, **HOMŠAK, Evgenija**, BEVC, Sebastjan, GOROPEVŠEK, Aleš. New flow cytometric methods for monitoring STAT5 signaling reveal responses to SARS-CoV-2 antigen-specific stimulation in FOXP3+ regulatory T cells also in patients with advanced chronic lymphocytic leukemia. *Biosensors*. 2023, vol. 13, issue 5, [article no.] 539, str. [1]-22, ilustr. ISSN 2079-6374. <https://www.mdpi.com/2079-6374/13/5/539/html>, <https://doi.org/10.3390/bios13050539>, DOI: [10.3390/bios13050539](https://doi.org/10.3390/bios13050539). [COBISS.SI-ID [151737859](#)]
 14. GÖRSKA, Ewelina, TYLICKA, Marzena, HERMANOWICZ, Adam, MATUSZCZAK, Ewa, SANKIEWICZ, Anna, GORODKIEWICZ, Ewa, HERMANOWICZ, Justyna, KARPIŃSKA, Elżbieta, SOCHA, Katarzyna, KOCHANOWICZ, Jan, **HOMŠAK, Evgenija**, et al. UCHL1, besides leptin and fibronectin, also could be a sensitive marker of the relapsing–remitting type of multiple sclerosis. *Scientific reports*. 2023, [vol.] 13, [article no.] 3423, str. [1-10], ilustr. ISSN 2045-2322. <https://www.nature.com/articles/s41598-023-30237-3>, <https://doi.org/10.1038/s41598-023-30237-3>, Digitalna knjižnica Univerze v Mariboru – DKUM, DOI: [10.1038/s41598-023-30237-3](https://doi.org/10.1038/s41598-023-30237-3). [COBISS.SI-ID [143814659](#)]
 15. QUERALTÓ, Josep, BRADY, Jennifer, CAROBENE, Anna, **HOMŠAK, Evgenija** and WIERINGA Gijsbert. The European Register of Specialists in Clinical Chemistry and Laboratory Medicine: code of conduct, version 3 – 2023. *Clin Chem Lab Med* 2023 Feb 1;61(6):981-988.doi: 10.1515/cclm-2023-0031.
 16. BELE, Uroš, SERDINŠEK, Tamara, **HOMŠAK, Evgenija**, BUT, Igor. The impact of extracorporeal magnetic stimulation as addition to mirabegron in overactive bladder treatment in women: a single-centre randomized sham-controlled study. *Journal of clinical medicine*. 2024, vol. 13, issue 3, [article no.] 916, str. [1]-10, ilustr. ISSN 2077-0383. <https://www.mdpi.com/2077-0383/13/3/916>, <https://doi.org/10.3390/jcm13030916>, DOI: [10.3390/jcm13030916](https://doi.org/10.3390/jcm13030916). [COBISS.SI-ID [183860227](#)]