Univerza v Mariboru

MEDICINSKA FAKULTETA

| OPIS PREDMETA / SUBJECT SPECIFICATION | |
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| **Predmet:** | BIOKEMIJA |
| **Subject Title:** | BIOCHEMISTRY |

| Študijski program<br>Study programme | Študijska smer<br>Study field | Letnik<br>Year | Semester<br>Semester |
|---|---|---|---|
| BIOMEDICINSKA TEHNOLOGIJA<br>BIOMEDICAL TECHNOLOGY | | 1 | **1/2** |

**Univerzitetna koda predmeta / University subject code:** 1003

| Predavanja<br>Lectures | Seminar<br>Seminar | Sem. vaje<br>Tutorial | Lab. vaje<br>Lab. work | Teren. vaje<br>Field work | Samost. delo<br>Individ. work | ECTS |
|---|---|---|---|---|---|---|
| 20 | 40 | | 15 | | 225 | **10** |

**Nosilec predmeta / Lecturer:** Prof. dr. Uroš Potočnik

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| **Jeziki / Languages:** | **Predavanja / Lecture:** | slovenščina, angleščina / slovenian, english |
| | **Vaje / Tutorial:** | slovenščina, angleščina, francoščina/ slovenian, english, french |

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

Kandidat mora imeti pred vpisom ustrezno znanje iz naravoslovnih ved z ustreznega področja na nivoju univerzitetnega študija.

**Prerequisites:**

Prior to entering, the candidate for postgraduate program must have an appropriate knowledge and understanding of bioscience (biology, chemistry, physics, mathematics) on the university level.

**Vsebina:**

- Biomolekule.
- Metode izolacije in kvantitativnega ter kvalitatitvnega določanja strukture in funkcije beljakovin: elektroforeza, kromatografske metode, pI, spektrofotometrija, FTIR, MALDI-MS, proteomika in metabolomika, biološki modeli.
- Imunocito(histo)kemiske metode: temeljni principi in aplikacije.
- Napake v strukturi beljakovin in z njimi povezane bolezni.
- Encimi: Regulacija in klinična aplikacija: plazemski intracelularni encimi, merjenje encimske aktivnosti, serumski markerji pri poškodbah tkiva, encimi kot analitični in terapevtski reagenti.
- Heteropolisaharidi: glikoproteini in glikolipidi, proteoglikani in peptidoglikani, oligosaharidi in občutljivost gostitelja.
- Metode določanja ogljikovih hidratov.
- Lektini.
- Transdukcija.

**Contents (Syllabus outline):**

- Biomolecules.
- Methods of isolation and determination of proteins: electrophoresis, chromatography, pI, spectrophotometry, FTIR, MALDI-MS, proteomics and metabolomics, biological models.
- Imunocyto(histo)chemistry: principles and applications.
- Protein folding and associated diseases.
- Enzymes: Regulation and clinical applications: intracellular enzymes from plasma, measurements of enzyme activity, serum markers in the diagnosis of tissue damage, enzymes as analytical reagents and therapeutic agents.
- Heteropolysaccharides: glycoproteins and glycolipids, proteglycans and peptidoglycans.
- Analytical methods in glycobiochemistry.
- Lectins.
- Transduction.
- Gastrointestinal digestion and absorption, gastrointestinal hormones, thermic effect

- Gastrointestinalna digestija in absorbcija, gastrointestinalni hormoni, termični učinek hrane.
- Izbrane vsebine iz metabolizma ogljkovih hidratov.
- Lipidi: fosfolipidi in glikosfingolipidi v klinični medicini, holesterol in žolčne kisline, plazemski lipoproteini in z njimi povezane napake v organizmu.
- Metabolna homeostaza: metabolična vloga organov, homeostaza ogljkovih hidratov, homeostaza lipidov.
- Homeostaza beljakovin.
- Nepravilnosti v metabolni homeostazi.
- Endokrini metabolizem- primeri organskih sistemov.
- Molekularna imunologija: molekule in kemijski procesi v imunskem sistemu, protitelesa, interferoni in citokini.
- Biokemija raka.
- Metode pridobivanja protiteles in njihova analitska vrednost.
- Cepiva.
- Biokemija hemostaze: interakcije med metabolizmom lipidov in hemostazo.
- Izbrane vsebine iz metabolizma vitaminov in njihovih nadomestkov.
- Keto-nukleozidi.
- Toksini in droge, doping. Principi in aplikacije.

of food.
- Selected topics in crbohydrate metabolism.
- Lipids: phospholipids and glycolipids in clinical medicine, cholesterol and bile acids, plasma lipoprotein associated disorders.
- Metabolic homeostatis: organs, carbohydrate and lipid homeostasis.
- Protein homeostasis.
- Abnormalities in homeostasis.
- Endocrine metabolism – organic systems.
- Molecular immunology: molecules and chemical processes in immune system, antibodies, interferons and cytokines.
- Biochemistry of cancer.
- Production of antibodies and their applications.
- Vaccines.
- Biochemistry of hemostasis: interactions between lipid metabolism and hemostasis.
- Selected topics from vitamin metabolism.
- Keto-nucleosides.
- Toxins, drugs, doping. Principles and applications

**Temeljni študijski viri / Textbooks:**


- Modern experimental biochemistry/edited by Rodyner Boyer, 2002, ISBN: 0-8053-3111-5
- Medical Biochemistry, Bhagavan, N.V. 2002, ISBN: 0-12-095440-0
- Textbook of Biochemistry with clinical correlations, Devlin, T.M. (Ed.) 1993, ISBN: 0-471-51348-2
- The essentials of glycobiology / edited by Ajit Varki ... et al.]., 1999, ISBN 0-87969-560-9
- Reviews of Physiology Biochemistry and Pharmacology, 1994, ISBN: 3540575367 Reviews of Physiology, Biochemistry and Pharmacology/Special Issue on Signal Transduction III, 1994, ISBN: 3540575871
- Molecualr and genetic interactions involving phytochemicals, Kreft, I. and Škrabanja, V. (Ed.) 2001, ISBN: 961-6379-02-X
- Molecular interactions between microorganisms and cells, Hacker, J. and Heesemann, J. (Ed.)2002, ISBN: 0-471-17846-2
- Mad Cow Disease and Related Spongiform EncephalopathiesSeries : Current Topics in Microbiology and Immunology , Vol. 284 Harris, D.A. (Ed.)2004, ISBN: 3-540-20107-6
- Drug Discovery and Evaluation,Pharmacological Assays,Vogel, Hans G. (Ed.)2nd, completely revised, updated, and enlarged ed., 2002, ISBN: 3-540-42396-6


**Cilji:**

- Spoznati poglobljene vsebine iz strukture in funkcije biomolekul,
- Povezati strukturo in funkcijo biomolekul v biokemičnih procesih človeškega telesa ter povezati napake v strukturi in funkciji s pojavom bolezenskih stanj.
- Spoznati moderne metode eksperimentalne biokemije in njihovo uporabo.

**Objectives:**

- To get familiar in depth with interactions between structure and function of biomolecules.
- To achieve a synthesis of structure and function of biochemical processes in a human body, as well as correlate disorders in structure and function with the clinical medicine.
- To get familiar with modern principles of

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| | experimental biochemistry and its applications. |

| **Predvideni študijski rezultati:** | **Intended learning outcomes:** |
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| Znanje in razumevanje:<br>Poglobljeno temeljno teoretično in praktično znanje na področju moderne eksperimentalne biokemije.<br><br>Prenesljive/ključne spretnosti in drugi atributi:<br>teoretično in praktično znanje kot osnova za specializirane predmete (predmete izbirnih vsebin) ter za doktorsko disertacijo. | Knowledge and Understanding:<br>In-depth knowledge of fundamental theoretical and practical principles of modern experimental biochemistry.<br><br>Transferable/Key Skills and other attributes:<br>Theoretical and practical knowledge as well as skills in the use and interpretation of modern experimental methods as a basis of specialized subjects (chosen subjects) and for a doctoral thesis. |

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
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| • predavanja,<br>• seminarji,<br>• tutorials,<br>• individualno delo z mentorjem<br>• PBL<br>• laboratorijske vaje | • lectures<br>• seminars<br>• tutorials,<br>• individual work with tutor<br>• PBL<br>• laboratory practical's. |

| **Načini ocenjevanja:** | Delež (v %) / Weight (in %) | **Assessment:** |
|---|---|---|
| Način (pisni izpit, ustno izpraševanje, naloge, projekt)<br>Pisni izpit:<br>Ustni izpit:<br>Seminarska naloga in opravljene laboratorijske vaje:<br>. | | Type (examination, oral, coursework, project):<br>Written exam:<br>Oral exam:<br>Project work and accomplished laboratory practical's:<br>. |

| ***Materialni pogoji za izvedbo predmeta :*** | ***Material conditions for subject realization*** |
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| Dobro opremljen biokemijski laboratorij.<br>Knjižnica in računalniška učilnica z dostopom od internetnih baz. | Modern, equipped biochemical lab.<br>Library and computer class-room with internet access. |

| ***Obveznosti študentov:*** | ***Students' commitments:*** |
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| *(pisni, ustni izpit, naloge, projekti)* | *(written, oral examination, coursework, projects):* |
| Pisni in ustni izpit, seminarska naloga ter opravljene laboratorijske vaje | Written and oral exam, project work and accomplished laboratory practical's. |