

	UČNI NAČRT PREDMETA/COURSE SYLLABUS
Predmet	Biokemija, biologija celice, biofizika
Course title	Biochemistry, Cell Biology and Biophysics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Fitoterapija/I. stopnja	Ni smeri študija	2.	3.
Phytotherapy/Ist level	No specific field	2 nd	3 rd

Vrsta predmeta/Course type	obvezni/obligatory
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Univerzitetna koda predmeta/University course code	FIT_2_UN5
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Predavanja Lectures	Sem. vaje Tutorial	Kab. vaje Cabinet tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			10		95	6

Nosilec predmeta/Lecturer:	doc. dr. Nevenka Kregar Velikonja izr. prof. dr. Franci Merzel
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Jeziki/ Languages:	Predavanja/Lectures:	slovenski/Slovenian
	Vaje/Tutorial:	slovenski/Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
<ul style="list-style-type: none"> Vpis v drugi letnik študijskega programa. Študent mora pred izpitom opraviti kolokvij iz laboratorijskih vaj. 	<ul style="list-style-type: none"> The prerequisite for inclusion is enrolment in the second year of study. Students have to pass preliminary exam – laboratory work.

Vsebina:	Content (Syllabus outline):
<i>Biokemija in biologija celice:</i> <ul style="list-style-type: none"> <i>Osnove celične zgradbe.</i> Rastlinska in živalska celica. Organeli. <i>Osnove molekularne zgradbe organizma:</i> ionska sestava in uvod v biomolekule, zgradba beljakovin, lipidov, ogljikovih hidratov in nukleinskih kislin. Transport plinov in vzdrževanje pH. Encimi in koencimi, encimske reakcije. Lastnosti nukleinskih kislin, biosinteza beljakovin, izražanje genov; uvod v 	<i>Biochemistry and cell biology:</i> <ul style="list-style-type: none"> <i>Basics of the cell structure.</i> Plant and animal cell. Organelles. <i>Basics of the molecular structure of a living organism:</i> ionic structure and introduction to the biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids. Transfer of gasses and balancing the pH. Enzymes and coenzymes, enzyme reactions.

genetske bolezni, molekularne osnove raka.

- *Biokemične osnove celične zgradbe* (holesterol in funkcije, beljakovine citoskeleta, transport po celici, prehod skozi biološke membrane itn).
- *Biokemija prebave in presnove*: prebavni encimi in hormoni, transport makro- in mikronutrientov, presnova beljakovin, presnova ogljikovih hidratov, presnova maščob, sinteza energetske bogatih molekul (ATP), presnova nukleinskih kislin, presnova vitaminov in mineralov.
- *Biokemične osnove vzdrževanja notranjega okolja*: prenašanje sporočil znotraj celic (kalcij, ciklični AMP), prenašanje sporočil med celicami (osnove hormonskega uravnavanja celičnih procesov), beljakovine v plazmi (albumin, imunoglobulini, faktorji strjevanja krvi).
- *Osnove laboratorijskih preiskav*, lastnosti in posebnosti bioloških diagnostičnih vzorcev, vplivi na sestavo bioloških vzorcev.

Biofizika:

- *Biomehanika*: opis biomehanskih količin, gibanje, nihanje, sile, dinamika, elastičnost, delo in energija, moč, statično ravnovesje, navor, težišče, tekočine, hidrostatični tlak, vzgon, gibanje tekočin, viskoznost, toplota, toplotno raztezanje snovi, energijski zakon, prevajanje toplote.
- *Valovni pojavi, zvok in svetloba*: opis valovanja, interferenca, uklon, spekter valovanja, ultrazvok v medicini, uho, Dopplerjev pojav, svetloba, geometrijska optika, odboj, zrcala, lom, leče, oko, kratkovidnost, dolgoovidnost, očala, mikroskop.
- *Elektrika in magnetizem*: sile med statičnimi naboji, električno polje, potencial, električni dipol, kapaciteta, delovanje defibrilatorja, EKG, električni tok, upor, Ohmov zakon, magnetno polje, indukcija, tuljava, elektromagnetno valovanje.

- Characteristics of nucleic acids, biosynthesis of protein, basics of heredity, introduction to genetic diseases, molecular basics of cancer.
- *Biochemical bases of the cell structure* (cholesterol and functions, cytoskeleton protein, transfers within cells, transition through the cell membrane, etc.)
- *Biochemistry of metabolism and digestion*: digestive enzymes and hormones, transfer of macro- and micronutrients, metabolism of protein, carbohydrates, fats; synthesis of energy-source ATP molecules, metabolism of nucleic acids, vitamins and minerals.
- *Biochemistry of maintaining the internal environment*: transporting signals within cells (calcium, cyclic AMP), transferring signals between cells (hormonal balancing of the cell processes), protein in plasma (albumin, immunoglobulins, factors of the blood coagulation).
- *Basic laboratory examinations*, characteristics and exceptions in biological diagnostic samples, influences on the biological sample structures.

Biophysics:

- *Biomechanics*: describing biomechanical quantities, mechanics, oscillation, forces, dynamics, elasticity, work and energy, power, static balance, torque, gravity, fluid, hydrostatic pressure, buoyancy, the movement of fluids, viscosity, heat, thermal stretching of substances, energy law, heat transfer.
- *Wave phenomena, sound and light*: describing wave interference, diffraction, the spectrum of the wave, ultrasound in medicine, the ear, the Doppler effect, light, geometric optics, reflection, mirrors, refraction, lenses, eye, myopia (short-sightedness), hyperopia (long-sightedness), glasses, microscope.
- *Electricity and magnetism*: Forces between the static charges, electric field, electric potential, dipole, capacity, operation of the defibrillator, ECG, electrical current, resistance, Ohm's law, the magnetic field,

<ul style="list-style-type: none"> • <i>Atomska zgradba snovi in molekularni pojavi: zgradba atoma in atomskega jedra, kvantna slika snovi, Rentgenska svetloba, slikanje z magnetno resonanco, stabilnost izotopov in pojav radioaktivnosti, jedrski razpadi, molekule, molekularna zgradba plinov in tekočin, površinska napetost, kapilarni pojavi, zračna embolija.</i> <p><i>Laboratorijske vaje:</i></p> <ul style="list-style-type: none"> • Mikroskopiranje rastlinskih in živalskih celic. • Kri, biokemija transportnih molekul v krvi, krvne skupine. • Biokemične osnove laboratorijskih preiskav; osnovne hematološke in biokemične preiskave. 	<p>the induction coil, electromagnetic waves.</p> <ul style="list-style-type: none"> • <i>The atomic structure of different matters and molecular phenomena: structure of the atom and atomic nucleus, quantum image of materials, X-ray image, Roentgen light, magnetic resonance imaging, the stability of isotopes and the phenomenon of radioactivity, nuclear decays, molecules, molecular structure of gases and liquids, surface tension, capillary phenomena, air embolism.</i> <p><i>Laboratory work:</i></p> <ul style="list-style-type: none"> • Microscopy of plant and animal cells. • Blood, biochemistry of the transport molecules in blood, blood types. • Biochemical bases of laboratory diagnostics, basic haematological and biochemical diagnostics.
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<p>Temeljna literatura in viri/Readings:</p> <p>Biokemija/Biochemistry</p> <p>Temeljna literatura/Basic literature</p> <ul style="list-style-type: none"> • Boyer, R. (2005). <i>Temelji biokemije</i>. Ljubljana: Študentska založba. • Milislav, I. (2010). <i>Izbrane teme iz biokemije za zdravstvene fakultete</i>. Ljubljana: Zdravstvena fakulteta • Kregar Velikonja, N. (2016). <i>Biokemija : navodila za vaje : (interno gradivo za študente zdravstvene nege)</i>. Novo mesto: Fakulteta za zdravstvene vede Novo mesto. <p>Priporočljiva literatura/Recommended literature</p> <ul style="list-style-type: none"> • Alberts, B. (2010). <i>Essential cell biology</i>. New York, London: Garland Science. • Lehninger, A. L. (2008). <i>Principles of biochemistry</i>. New York: W.H. Freeman and Company. • Sertić, J. (2008). <i>Klinička kemija i molekularna dijagnostika</i>. Zagreb, Medicinska naklada. <p>Biofizika/Biophysics:</p> <p>Temeljna literatura/Basic literature</p> <ul style="list-style-type: none"> • Bohinc, K. (2016) <i>Fizika človeškega telesa</i>, Ljubljana: Zdravstvena fakulteta, Univerza v Ljubljani. • Sevšek, F. (2004). <i>Biomehanika</i>. Ljubljana: VŠZ, Univerza v Ljubljani. <p>Priporočljiva literatura/Recommended literature</p> <ul style="list-style-type: none"> • Halliday, D., Resnick, R. in Walker, J. (2013). <i>Fundamentals of physics</i>. 6. ed. New York: Wiley and sons. – izbrana poglavja • Elektronsko gradivo s predavanj.
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Cilji in kompetence:	Objectives and competences:
<p><i>Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc:</i></p> <ul style="list-style-type: none"> • Usvojiti znanja potrebna za razumevanje osnovnih pojavov, procesov in tehnik v zdravstvu, medicini in v človeškem telesu, ki temeljijo na principih biokemije in biofizike. • Na različnih primerih iz zdravstva, medicine in narave spoznati aplikacijo biofizikalnega in biokemijskega znanja in dobiti celosten pregled nad bazičnimi biokemijskimi in biofizikalnimi vsebinami. • Spoznati možnosti radioloških diagnostičnih metod, ki so vse pomembnejši dejavnik sodobne medicine. • Razumevanje splošne strukture temeljne discipline (stroke) ter povezanosti z drugimi disciplinami. • Zmožnost profesionalne komunikacije s strokovnjaki drugih znanstvenih področij in usposobljenost za uspešno delovanje v medpoklicnih timih. 	<p><i>The learning unit mainly contributes to the development of the following general and specific competences:</i></p> <ul style="list-style-type: none"> • The acquisition of knowledge, obligatory for understanding the basic phenomena, processes and techniques in medicine, health care and human body, founded on the principles of biochemistry and biophysics. • Getting familiar with how to apply the biophysics and biochemistry knowledge to gain an integrative view over basic contents using specific cases in medicine, health care and nature. • Getting to know the possibilities of the radiology diagnostic methods, as the more and more important factor of the contemporary medicine. • Understanding the basic structure of the fundamental discipline (expertise) and connection with other disciplines. • The ability to communicate professionally with experts in other scientific fields and to work successfully in interprofessional teams.

Predvideni študijski rezultati:	Intended learning outcomes:
<p>Znanje in razumevanje: <i>Študent/-ka:</i></p> <ul style="list-style-type: none"> • pozna glavne biomolekule in njihovo delovanje ter pozna glavne biokemične procese, ki se odvijajo v človeškem organizmu; • študent se seznanja z delom v diagnostičnem laboratoriju in s vplivi predanalitskih dejavnikov na rezultate laboratorijskih preiskav; • študent se seznanja z osnovami biofizike in pridobi znanja o biofizikalnih procesih človeškega organizma; • znanje in razumevanje osnov radioloških diagnostičnih metod omogoča razumevanje njihove pravilne uporabe v klinični radiologiji. 	<p>Knowledge and understanding: <i>Students:</i></p> <ul style="list-style-type: none"> • know major biomolecules and their activity, and main biochemical processes taking place in the human body; • become familiar with the work in the diagnostic laboratory and the influences of pre-analysis factors on the results of the laboratory tests; • become familiar with the basics of biophysics and obtain knowledge of bio-processes in the human organism; • knowledge and understanding of the basics of radiological diagnostic methods, which enable comprehension of their use in clinical radiology.

Metode poučevanja in učenja:	Learning and teaching methods:
<ul style="list-style-type: none"> • predavanja z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov), • laboratorijske vaje. 	<ul style="list-style-type: none"> • lectures with active student participation (explanation, discussion, questions, examples, problem solving); • laboratory work.

Načini ocenjevanja:	Delež (v %) Weight (in %)	Assessment:
Načini: <ul style="list-style-type: none"> • izpit • kolokvij iz vaj Ocenjevalna lestvica: ECTS.	80 % 20 %	Types: <ul style="list-style-type: none"> • n exam • preliminary exam based on laboratory work Grading scheme: ECTS.