UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Napredna okoljska športna fiziologija
Course title:	Advanced environmental exercise physiology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
3. stopnja	**Kineziologija**	**2.**	**3.**
3rd Cycle	**Kineziology**	**2.**	**3.**

Vrsta predmeta / Course type Splošni izbirni predmet/elective subject

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	**30**				**65**	**5**

Nosilec predmeta / Lecturer: Izr. prof. dr. Tadej Debevec

Jeziki / Languages:	
Predavanja / Lectures:	**Slovensko/Angleško; Slovene/English**
Vaje / Tutorial:	**Slovensko/Angleško; Slovene/English**

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

Študent/ka mora biti vpisan na doktorski študij

Prerequisits:

Student has to be enrolled as a PhD student

Vsebina:

Osnovi koncepti
Ključni fiziološki mehanizmi
Terminologija
Pogled v zgodovino
Interdisciplinarnost

Metode raziskovanja v okoljski fiziologiji
Preučevanje višinske adaptatcije
Preučevanje adaptacije na vročino/mraz
Preučevanje ostalih okoljskih dejavnikov
Strategije raziskovanja na podorčjih kjer je težje pridobivanje ustreznega števila preiskovancev

Višinska fiziologija
Fiziološki vplivi povečane nadmorske višine
Višinska patofiziologija

Content (Syllabus outline):

Basics concepts
Key physiological mechanisms
Terminology
Historical overview
Interdisciplinary approach

Research methods in environmental physiology
Methods for investigating altitude adaptation
Methods for investigating heat/cold adaptation
Methods for other environmental factors
Research methods on topic with few participants

Altitude physiology
Physiological effects of high altitude
Altitude pathophysiology
Clinical populations at moderate / high altitudes

Klinične populacije na povečani nadmorski višini **Višinska vadba na povečani višini** *Modeli višinskega treninga* *Implementacija v trenažni proces* *Strategije ob tekmovanjih na višini* **Vpliv okoljske temperature na športno sposobnost** *Ključni termoregulacijski procesi v mrazu in vročini* *Interakcije temperaturnih sprememb z ostalimi okoljskimi dejavniki* *Metode ogrevanja/ohlajanja v mrazu/vročini v ekstremnih okoljih* **Pomen hidracije** *Fiziologija ustrezne hidriranosti v različnih okoljih / okoljskih vplivih.* **Vadba v onesnaženih okoljih** *Onesnaženost zraka in športna sposobnost/zdravje* *Ocenjevanje kakovosti zraka* *Metode zmanjševanja vpliva onesnaženosti* **Vadba v hiperbaričnem in vodnem okolju** *Vplivi povečanega tlaka na športno sposobnost in telesno homeostazo* *Vpliv temperature vode ob potapljanju* **Breztežnost / neaktivnost** *Fiziološki vplivi breztežnosti / neaktivnosti* *Sredstva za zmanjševanje vplivov breztežnosti* *Vzporednice s sedentarnim načinom življenja* **Biološki ritmi in športna sposobnost** *Vpliv fizioloških ritmov na športno sposobnost* *Motnje ritmov kot posledica ekstremnih okolij* *Pomen počitka in spanja*	**Altitude training and competition** *Altitude training models* *Implementation in training programmes* *Strategies for altitude competition* **Effects of ambient temperature on sports performance** *Key thermoregulatory factors in the cold / the heat* *Interactions between ambient temperature changes and other environmental factors* *Contemporary warming/cooling methods in extreme environments* **Importance of hydration** *Physiology of proper hydration under various environmental stressors* **Exercise in polluted environments** *Air pollution and sports performance/health* *Air quality assessment* *Methods to reduce the pollutant effects* **Hyperbaric physiology** *Effects of hyperbaria on exercise capacity and physiological homeostasis* *Effects of water temperature during immersion* **Gravitational physiology** *Physiological effects of microgravity* *Exercise and other countermeasures* *Similarities between microgravity and sedentarism* **Biological rhythms and sports performance** *Circadian rhythms and performance* *Rhythms disturbances in extreme environments* *Importance of sleep and recovery*

Temeljni literatura in viri / Readings:

- Advanced Environmental Exercise Physiology; Cheung S.S. Human Kinetics, 2010.
- High Altitude Medicine and Physiology; West J.B., Schoene R.B., Luks A.M., Milledge J.S. CRC Press, 2013
- Maximising Performance in Hot Environments: A problem-based learning approach; Tyler C. Routledge, 2019
- Physiological Bases of Human Performance During Work and Exercise; Editors: Nigel A.S. Taylor N.A.S and Groeller H. Elsevier, 2008.

Cilji in kompetence:

Glavni cilj predmeta je študentom predstaviti strategije in metode ki jih uporabljamo na podorčju okoljske športne fiziologije. Predmet v tem pogledu nadgrajuje dodiplomske in podiplomske predmete s področja fiziologije športa, anatomije in medicine športa z namenom izboljšanja razumevanja adaptacije človeškega telesa na vadbo oziroma napor v različnih okoljih. Človeška oz. športna zmogljivost je namreč v veliki meri determinirana prav z različnimi okoljskimi dejavniki. Ob tem je pomembno te dejavnike prepoznati ter razumeti njihov vpliv in potencialno uporabo v športu. Poleg navedenega je namen predmeta tudi usposobiti študente za uporabo različnih okoljskih vabenih metod (višinski trening, vročinska adaptacija), ki preko različnih fizioloških mehanizmov lahko izboljšajo športno sposobnost in imajo tudi terapevtsko/klinično uporabnost. Ključni cilji in pridobljene kompetence so navedene v nadaljevanju.

Cilji

- Natančno razumeti fiziološke mehanizme preko katerih različni okoljski dejavniki vplivajo na človeško telo, športno sposobnost in športni rezultat.
- Razumeti vpliv bioloških ritmov na fiziološke procese in športno sposobnost.
- Razumeti integrativne in povezane fiziološke odzive človeka na kombinirane okoljske dejavnike.
- Razumeti pomen ustrezne prehranjenosti in hidracije pri aktivnosti v ekstremnih okoljih.
- Razumeti in znati uporabljati različne metode športne vadbe, ki zmanjšajo negativni vpliv različnih okoljskih dejavnikov.
- Znati implementirati metode okoljske vadbe (višinski trening itd.) v trenažni proces za izboljšanje športnega rezultata.
- Razumeti možnosti in omejitve uporabe okoljskih dejavnikov v terapevtske namene.
- Pridobivati in kritično ovrednotiti strokovno literaturo na področju okoljske športne fiziologije.
- Izluščiti zanimiv raziskovalni problem na področju okoljske fiziologije ter zastaviti in izvesti ustrezen znanstveno-raziskovalnih ali aplikativni projekt.

Objectives and competences:

Key objective of this course it to provide prospective students with the opportunity to learn the most common methodological and research approaches that are employed within environmental exercise physiology. This will be achieved by upgrading their understanding of sports physiology, anatomy and sports medicine and thus enable them to efficiently handle the athlete management in various “extreme” environments. This is especially important since environmental factors are known to importantly modulate exercise capacity. In addition, the course aims to equip the students with the knowledge necessary to utilize different environmental training methods for performance enhancement (i.e. altitude training, heat acclimation protocols) on the one hand and therapeutic purposes in clinical populations on the other. Key objectives and competences are outlined below:

Objectives

- To fully understand the key physiological mechanism related to environmental factors that influence human body, exercise capacity and subsequent performance.
- To recognise the importance of biological/circadian rhythms on physiological modulations.
- To understand the integrative physiological responses related to combined environmental stressors.
- To recognise the importance of proper nutrition and hydration in extreme environments.
- To understand and know how to utilize different exercise training approaches to reduce the potential negative effects of extreme environments.
- To be able to implement environmental training methods (e.g. altitude training) in the athletes' preparation with the aim of further performance improvement.
- To understand the potential benefits and limitations of various environmental stressors in therapeutic settings.
- To be able to obtain and critically assess scientific literature in the environmental exercise physiology field.
- To be able to elucidate interesting research problems related to environmental physiology

- Pisno in ustno poročati o rezultatih raziskovalnega dela.

Splošne kompetence

- Razumevanje integrativnega prepletanja fizioloških sistemov v različnih okoljih.
- Sposobnost iskanja novih in povezanih dejstev ter znanj.
- Sposobnost kritičnega preverjanja ter pridobivanja informacij.
- Zmožnost samostojnega strokovno/raziskovalnega dela na enostavnejših fizioloških problemih.
- Usposobljenost za uporabo empiričnih in teoretičnih raziskovalnih strategij v kineziologiji.

Specifične kompetence

- Poznavanje interaktivnih vplivov različnih okoljskih dejavnikov in človeka.
- Zmožnost analize vplivov okolja na vadbeni proces in tekmovalno sposobnost.
- Sposobnost implementacije okoljskih faktorjev v vadbeni proces z namenom izboljševanja športne sposobnosti.
- Sposobnost priprave in implementacije različnih terapevtskih metod okoljske vadbe za v kliničnih populacijah.
- Sposobnost sinteze smiselnih znanstvenih vprašanj in izvedbe raziskovalnega dela na področju okoljske in športne fiziologije.
- Zmožnost interdisciplinarnega povezovanja znanj in raziskovalnih metod s področji vezanih na kineziologijo in okoljsko fiziologijo (kineziologija, medicina športa, fiziologija napora).

and subsequently perform an appropriate research project to address these problems.

- To be able to report the obtained results in the form of public presentations and written scientific papers.

General competences

- Understanding the integrative nature of physiological responses in different environments.
- Ability to utilize experimental and theoretical strategies in exercise physiology.
- Ability to identify and obtain important facts and new knowledge.
- Ability to obtain and critically assess crucial information.
- Ability for independent research work in kinesiology.

Topic-specific competences

- Understanding the interactive effects of individual or combined environmental factors
- Ability to analyse the effects of environmental factors.
- Ability to implement the environmental stressors in the athletes' training in order to further enhance sport performance.
- Ability to recognize and implement various therapeutic environmental strategies in clinical populations.
- Ability to synthesize scientific questions and perform research projects in the field of environmental exercise physiology.
- Ability to employ interdisciplinary experimental approaches (related to kinesiology, sports medicine and physiology) to answer contemporary kinesiology and environmental exercise physiology issues.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Študentje bodo poznali osnovne principe in fiziološke mehanizme, ki vplivajo na adaptacijo posameznika na različne okoljske dejavnike.
- Sposobni bodo kritično oceniti potencialne negativne in pozitivne učinke različnih okoljskih dejavnikov na športnika.

Intended learning outcomes:

Knowledge and understanding:

- Students will understand the basic physiological principles and mechanism governing adaptation of humans to various extreme environments.
- Students will be able to critically distinguish potential positive and negative effects of environmental factors on athletes.

• Poznali bodo različne metode višinske in vročinske aklimatizacije ter bodo sposobni njihove implementacije v trenažni process. • Razumeli bodo prednosti in omejitve uporabe različnih okoljskih dejavnikov za terapevtske namene. • Sposobni bodo pridobivati in kritično ovrednotiti literaturo na področju okoljske športne fiziologije. • Sposobni bodo načrtovati in izvajati znanstveno/raziskovalne projekte na področju okoljske fiziologije.	• Students will understand and know how to utilize different methods of altitude and heat acclimation. • Students will understand the potential and limitations of therapeutic environmental strategies in clinical populations. • Students will be able to critically evaluate the scientific literature covering the field of environmental exercise physiology. • Students will be able to plan and execute environmental physiology research projects.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, seminarska naloga, vaje.	Lectures, seminars, coursework, tutorial.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminar z zagovorom	50%	Seminar presentation
Ustni izpit	50%	Oral exam

Reference nosilca / Lecturer's references:

Izr. frof. dr. Tadej Debevec je na Fakulteti za šport diplomiral leta 2006. Doktorat je leta 2011 pridobil na Mednarodni podiplomski šoli Jožefa Stefana za raziskovalno delo na področju učinkov višinske/hipoksične in hiperoksične vadbe na fiziološke adaptacije in športno sposobnost. V letih 2013/2014 je bil podoktorski raziskovalec na Univerzi v Cape Town, Faculty of Health Sciences Department of Human Biology, UCT/MRC Research Unit for Exercise Science and Sports Medicine. Njegovo raziskovalno delo obsega preučevanje adaptacijskih fizioloških mehanizmov na različne okoljske dejavnike tako pri pri zdravih posameznikih kot tudi v kliničnih populacijah. Leta 2019 je bil izvoljen v naziv izredni profesor za področje kineziloških znanosti na Univerzi v Ljubljani in v naziv višji znanstveni sodelavec na Institutu “Jožef Stefan”.

Dr. Debevec graduated from the Faculty of Sport, University of Ljubljana in 2006. He obtained his Ph.D. in 2011 for the work on different altitude/hypoxic & hyperoxic training modalities and their effects on athletic performance. During 2013/2014 he was a post-doctoral fellow at University of Cape Town, Faculty of Health Sciences Department of Human Biology, UCT/MRC Research Unit for Exercise Science and Sports Medicine. His research is primarily focused on investigating physiological adaptations of humans to different environmental stressors in health and disease. In 2019, he was elected as an Associate Professor of Sport Science at the University of Ljubljana and to the position of Senior Research Associate at the Jozef Stefan Institute (Ljubljana, Slovenia).

Izbrane publikacije / Selected publications

Debevec, T. (2017). Hypoxia-Related Hormonal Appetite Modulation in Humans during Rest and Exercise: Mini Review. Front Physiol, 8, 366.

Debevec, T., Ganse, B., Mittag, U., Eiken, O., Mekjavic, I. B., & Rittweger, J. (2018). Hypoxia Aggravates Inactivity-Related Muscle Wasting. Front Physiol, 9, 494.

Debevec, T., Millet, G. P., & Pialoux, V. (2017). Hypoxia-Induced Oxidative Stress Modulation with Physical Activity. Front Physiol, 8, 84.

Debevec, T., Pialoux, V., Ehrstrom, S., Ribon, A., Eiken, O., Mekjavic, I. B., & Millet, G. P. (2016). FemHab: The effects of bed rest and hypoxia on oxidative stress in healthy women. J Appl Physiol (1985), 120(8), 930-938.

Debevec, T., Pialoux, V., Mekjavic, I. B., Eiken, O., Mury, P., & Millet, G. P. (2014). Moderate Exercise Blunts Oxidative Stress induced by Normobaric Hypoxic Confinement. Medicine & Science in Sports & Exercise, 46(1), 33-41.

Debevec, T., Pialoux, V., Poussel, M., Willis, S. J., Martin, A., Osredkar, D., & Millet, G. P. (2020). Cardio-respiratory, oxidative stress and acute mountain sickness responses to normobaric and hypobaric hypoxia in prematurely born adults. Eur J Appl Physiol, 120(6), 1341-1355.

Debevec, T., Simpson, E. J., Mekjavic, I. B., Eiken, O., & Macdonald, I. A. (2016). Effects of prolonged hypoxia and bed rest on appetite and appetite-related hormones. Appetite, 107, 28-37.

Millet, G. P., & Debevec, T. (2020). CrossTalk proposal: Barometric pressure, independent of P O 2 , is the forgotten parameter in altitude physiology and mountain medicine. J Physiol, 598(5), 893-896.

Millet, G. P., Debevec, T., Brocherie, F., Malatesta, D., & Girard, O. (2016). Therapeutic Use of Exercising in Hypoxia: Promises and Limitations. Frontiers in Physiology, 7(224).

Sotiridis, A., Ciuha, U., Debevec, T., & Mekjavic, I. B. (2020). Heat acclimation does not modify autonomic responses to core cooling and the skin thermal comfort zone. J Therm Biol, 91, 102602.

Sotiridis, A., Debevec, T., Ciuha, U., Eiken, O., & Mekjavic, I. B. (2019). Heat acclimation does not affect maximal aerobic power in thermoneutral normoxic or hypoxic conditions. Exp Physiol, 104(3), 345-358.