<table>
<tr><td>Course Title</td><td colspan="5">Advanced concepts in Exercise physiology</td></tr>
<tr><td>Course Code</td><td colspan="5">DLSEH512</td></tr>
<tr><td>Course type</td><td colspan="5">Compulsory</td></tr>
<tr><td>Level</td><td colspan="5">Master</td></tr>
<tr><td>Year / Semester of study</td><td colspan="5">1st /1st</td></tr>
<tr><td>Teacher’s Name</td><td colspan="5"></td></tr>
<tr><td>ECTS</td><td>10</td><td>Lectures / week</td><td></td><td>Laboratories/week</td><td></td></tr>
<tr><td>Course Purpose</td><td colspan="5">The purpose of the course is to provide students with a comprehensive and holistic understanding of the physiological principles governing athletic performance. The course covers a wide range of topics, from the fundamentals of exercise physiology to advanced concepts and applications in health. Students learn about the different types of exercise, the goals of sports training and the health benefits of exercise. The course then examines the basic principles of exercise physiology, where students learn about the functioning of human body systems during exercise, including the cardiovascular, respiratory, musculoskeletal, endocrine and nervous systems. The course then examines the adaptations of human body systems to exercise and athletic training. Students learn about how exercise causes changes in the structure and function of body systems that improve athletic performance. The course concludes with an examination of advanced concepts and applications in the field of applied ergophysiology. Students learn about topics such as hypoxic training, altitude exercise, exercise recovery from exercise, and the use of exercise to treat medical conditions.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">Upon successful completion of the course, students will be able to:
● Recognize the structure, function and adaptation of the musculoskeletal system to exercise.
● They explain the fundamental principles of neuromuscular function and its role in controlling movement and regulating exercise performance.
● They describe the complex processes of macronutrient metabolism and energy production during exercise, highlighting the role of lactic acid in exercise.
● They analyze the concepts of mitochondrial biogenesis and its implications for exercise performance and ascetic adaptations.
● They decipher the complex functions of the cardiovascular and respiratory systems during exercise, including their role in oxygen transport and carbon dioxide exchange.
● They examine the interaction between the endocrine and immune systems in response to exercise, emphasizing their effect on athletic performance and recovery.</td></tr>
</table>

	● They define the principles of exercise environmental physiology, particularly the effects of extreme environmental conditions on the body's physiological responses and athletic performance.		
Prerequisites		Corequisites	
Course Content	Module 1 (Week 1 - 2)	Students will gain knowledge about muscle architecture, power-speed relationships, and adaptations that occur in the myotendon complex during training. In addition, they will examine the relationship between force and speed production, highlighting the mechanisms that regulate this relationship.	
	Module 2 (Week 3 - 5)	Students will gain knowledge about the function and adaptations of the neuromuscular system. Reference will be made to the composition of muscles at the level of motor units and their behavior during fatigue, but also to the immediate and chronic adaptations of the central and peripheral movement control systems.	
	Module 3 (Week 6)	Students will explore the complex functions of the body's energy systems during exercise, including the mechanisms of ATP production, the use of carbohydrates and fats for energy production, the creation and role of lactic acid in exercise, the crossover effect and its adaptations to athletic training, and mitochondrial biogenesis processes in response to different exercise volumes.	
	Module 4 (Week 7 - 9)	Students will explore the functions of the cardiovascular and respiratory systems, examining their dynamic adaptations to exercise and the factors that affect their performance, with basic references to cardiac output, and blood pressure, interpretation of the electrocardiogram, cardiovascular dynamics at different exercise intensities, autonomic nervous system function with exercise and sports training, respiratory gas exchange, pulmonary ventilation, oxygen deficit and debt, respiratory threshold, cardiopulmonary tests to assess aerobic capacity, aerobic performance and anaerobic threshold.	
	Module 5 (Week 10 - 11)	Students will examine the complex interactions between the endocrine and immune systems during and after exercise, exploring how exercise triggers a cascade of hormonal responses that affect metabolism, muscle growth and recovery, as well as how these responses affect immune system function. The module also discusses the j-shaped relationship between exercise and immune function, the role of exercise in reducing delayed muscle pain (DOMS), and the balance between pro- and anti-inflammatory responses during exercise.	
	Module 6 (Week 12)	Students will understand how the body adapts and responds to extreme environmental conditions, such as microgravity, hypo- and overweight, heat and cold. They will also learn about the physiological changes that occur in these extreme environments, the effects these changes have on athletic performance, and the strategies that can be used to mitigate these effects.	

<table>
<tr><td>Teaching Methodology</td><td colspan="2">The course is structured and developed based on the principles of distance learning, good practices as well as the guidelines of the Evaluation Body and finally the Pedagogical Framework developed and implemented by our University. Also, through the design and development of distance learning courses, synchronous and asynchronous interaction, communication and collaboration are taken into account at 3 levels: 1) between instructor and student, 2) between students, and 3) between students and content.
The course is taught entirely online through the electronic platform Moodle LMS. Mandatory, optional and additional bibliography (e.g. books, articles, links, open educational resources, case studies) in combination with notes, course presentations and suggestions for reading study (bibliography) are available to students through an electronic platform. Also, a variety of appropriate educational material is given through the online platform in the form of presentations with notes, presentations with narration, interactive presentations and videos, interactive learning scenarios, gamification activities, avatars, digital twins, audio files, online quizzes). Various online tools, new and emerging technologies are being exploited: communication tools (e.g. video conferencing, chat rooms), collaboration tools (e.g. discussion forums, blogs, wikis), as well as content development tools. Students are encouraged through the platform and various technological tools to interact with their fellow students and the instructor, in order to become active members of the online learning community created within the framework of the course. Finally, with the use of various technological tools, each student is expected to create his own online learning community. More information about distance learning at Frederick University, the Pedagogical Background developed and implemented, as well as the toolkit used, can be found at the following link.

About Distance Learning - Frederick University</td></tr>
<tr><td>Bibliography</td><td>Module 1 (Week 1 - 2)</td><td>Mandatory Bibliography

Digital Multimedia Material

• Presentations on the topics of module 1
Articles/Conference Proceedings:

Lieber, R. L., & Fridén, J. (2000). Functional and clinical significance of skeletal muscle architecture. Muscle & Nerve, 23(11), 1647–1666.
Pinniger, G. J., Steele, J. R., & Cresswell, A. G. (2003). The force-velocity relationship of the human soleus muscle during submaximal voluntary lengthening actions. European Journal of Applied Physiology, 90, 191–198.
Sugi, H., & Ohno, T. (2019). Physiological Significance of the Force-Velocity Relation in Skeletal Muscle and Muscle Fibers. International Journal of Molecular Sciences, 20(12), 3075. [doi]</td></tr>
</table>

		Brunello, E., & Fusi, L. (2023). Regulating Striated Muscle Contraction: Through Thick and Thin. Annual Review of Physiology. [doi] Herzog, W. (2014). The role of titin in eccentric muscle contraction. Journal of Experimental Biology, 217(16), 2825–2833. [doi] Herzog, W. (2018). The multiple roles of titin in muscle contraction and force production. Biophysical Reviews, 10(4), 1187–1199. [doi] Andersen, J. L., & Aagaard, P. (2010). Effects of strength training on muscle fiber types and size; consequences for athletes training for high-intensity sport. Scandinavian Journal of Medicine & Science in Sports, 20 Suppl 2, 32–38. [doi] Crotty, E. D., Furlong, L.-A. M., & Harrison, A. J. (2023). Ankle and Plantar Flexor Muscle-Tendon Unit Function in Sprinters: A Narrative Review. Sports Medicine (Auckland, N.Z.). [doi] Lai, A., Schache, A. G., Lin, Y.-C., & Pandy, M. G. (2014). Tendon elastic strain energy in the human ankle plantar-flexors and its role with increased running speed. Journal of Experimental Biology, jeb.100826. [doi] D'Antona, G., Lanfranconi, F., Pellegrino, M. A., Brocca, L., Adami, R., Rossi, R., Moro, G., Miotti, D., Canepari, M., & Bottinelli, R. (2006). Skeletal muscle hypertrophy and structure and function of skeletal muscle fibres in male body builders. Journal of Physiology, 570(Pt 3), 611–627. [doi] Fitts, R. H., & Widrick, J. J. (1996). Muscle mechanics: Adaptations with exercise-training. Exercise and Sport Sciences Reviews, 24, 427–473. Malisoux, L., Francaux, M., Nielens, H., & Theisen, D. (2006). Stretch-shortening cycle exercises: An effective training paradigm to enhance power output of human single muscle fibers. Journal of Applied Physiology (Bethesda, Md.: 1985), 100(3), 771–779. [doi]
	Module 2 (Week 3 -5)	**Mandatory Bibliography** **Digital Multimedia Material** • Presentations on the topics of module 2 **Articles/Conference Proceedings:**

1. Heckman, C. J., & Enoka, R. M. (2012). Motor unit. Comprehensive Physiology, 2(4), 2629–2682. [doi]
2. Hug, F., Avrillon, S., Ibáñez, J., & Farina, D. (2023). Common synaptic input, synergies, and size principle: Control of spinal motor neurons for movement generation. The Journal of Physiology, 601(1), 11–20. [doi]
3. Forbes, P. A., Chen, A., & Blouin, J.-S. (2018). Chapter 4—Sensorimotor control of standing balance. In B. L. Day & S. R. Lord (Eds.), Handbook of Clinical Neurology (Vol. 159, pp. 61–83). Elsevier. [doi]
4. Disselhorst-Klug, C., Schmitz-Rode, T., & Rau, G. (2009). Surface electromyography and muscle force: Limits in sEMG-force relationship and new approaches for applications. Clinical Biomechanics (Bristol, Avon), 24(3), 225–235. [doi]
5. Taube, W., Leukel, C., & Gollhofer, A. (2012). How neurons make us jump: The neural control of stretch-shortening cycle movements. Exercise and Sport Sciences Reviews, 40(2), 106–115. [doi]
6. Lazaridis, S. N., Bassa, E. I., Patikas, D. A., Giakas, G., Gollhofer, A., & Kotzamanidis, C. M. (2010). Neuromuscular differences between prepubescents boys and adult men during drop jump. European Journal of Applied Physiology, 110(1), 67–74. [doi]
7. Gandevia, S. C. (2001). Spinal and supraspinal factors in human muscle fatigue. Physiological Reviews, 81(4), 1725–1789.
8. Froyd, C., Beltrami, F. G., Millet, G. Y., & Noakes, T. D. (2016). Central regulation and neuromuscular fatigue during exercise of different durations. Medicine and Science in Sports and Exercise, 48(6), 1024–1032. [doi]
9. McCrary, J. M., Ackermann, B. J., & Halaki, M. (2018). EMG amplitude, fatigue threshold, and time to task failure: A meta-analysis. Journal of Science and Medicine in Sport, 21(7), 736–741. [doi]
10. Zero, A. M., & Rice, C. L. (2021). State-of-the-art review: Spinal and supraspinal responses to muscle potentiation in humans. European Journal of Applied Physiology, 121(5), 1271–1282. [doi]
11. Blazevich, A. J., & Babault, N. (2019). Post-activation potentiation versus post-activation performance

enhancement in humans: Historical perspective, underlying mechanisms, and current issues. Frontiers in Physiology, 10, 1359. [doi]

12. Xenofondos, A., Bassa, E. I., Vrabas, I. S., Kotzamanidis, C. M., & Patikas, D. A. (2018). Muscle twitch torque during two different in volume isometric training protocols: Fatigue effects on post-activation potentiation. Journal of Strength and Conditioning Research, 32(2), 578–586. [doi]
13. Blazevich, A. J., Gill, N. D., Kvorning, T., Kay, A. D., Goh, A. G., Hilton, B., Drinkwater, E. J., & Behm, D. G. (2018). No Effect of Muscle Stretching within a Full, Dynamic Warm-up on Athletic Performance. Medicine and Science in Sports and Exercise, 50(6), 1258–1266. [doi]
14. Timmins, R. G., Shield, A. J., Williams, M. D., Lorenzen, C., & Opar, D. A. (2016). Architectural adaptations of muscle to training and injury: A narrative review outlining the contributions by fascicle length, pennation angle and muscle thickness. British Journal of Sports Medicine, 50(23), 1467–1472. [doi]
15. Aagaard, P., Suetta, C., Caserotti, P., Magnusson, S. P., & Kjaer, M. (2010). Role of the nervous system in sarcopenia and muscle atrophy with aging: Strength training as a countermeasure. Scandinavian Journal of Medicine & Science in Sports, 20(1), 49–64. [doi]
16. Blazevich, A. J. (2006). Effects of Physical Training and Detraining, Immobilisation, Growth and Aging on Human Fascicle Geometry. Sports Medicine, 36(12), 1003–1017. [doi]
17. Lazarczuk, S. L., Maniar, N., Opar, D. A., Duhig, S. J., Shield, A., Barrett, R. S., & Bourne, M. N. (2022). Mechanical, Material and Morphological Adaptations of Healthy Lower Limb Tendons to Mechanical Loading: A Systematic Review and Meta-Analysis. Sports Medicine (Auckland, N.z.), 52(10), 2405–2429. [doi]
18. Nuzzo, J. L. (2023). Narrative Review of Sex Differences in Muscle Strength, Endurance, Activation, Size, Fiber Type, and Strength Training Participation Rates, Preferences, Motivations, Injuries, and Neuromuscular Adaptations. Journal of Strength and Conditioning Research, 37(2), 494–536. [doi]
19. Arampatzis, A., Karamanidis, K., Morey-Klapsing, G., De Monte, G., & Stafilidis, S. (2007). Mechanical properties of

		the triceps surae tendon and aponeurosis in relation to intensity of sport activity. Journal of Biomechanics, 40(9), 1946–1952. [doi]
	Module 3 (Week 6) Elena	**Mandatory Bibliography** **Digital Multimedia Material** • Presentations on the topics in module 3 **Articles/Conference Proceedings:** 1. Spaulding HR, Yan Z. AMPK and the Adaptation to Exercise. Annu Rev Physiol. 2022 Feb 10;84:209-227. doi: 10.1146/annurev-physiol-060721-095517. PMID: 35143330; PMCID: PMC8919726. 2. Evans PL, McMillin SL, Weyrauch LA, Witczak CA. Regulation of Skeletal Muscle Glucose Transport and Glucose Metabolism by Exercise Training. Nutrients. 2019 Oct 12; 11(10):2432. doi: 10.3390/nu11102432. PMID: 31614762; PMCID: PMC6835691. 3. Flores-Opazo M, McGee SL, Hargreaves M. Exercise and GLUT4. Exerc Sport Sci Rev. 2020 Jul; 48(3):110-118. doi: 10.1249/JES.0000000000000224. PMID: 32568924. 4. Mul JD, Stanford KI, Hirshman MF, Goodyear LJ. Exercise and Regulation of Carbohydrate Metabolism. Prog Mol Biol Transl Sci. 2015;135:17-37. doi: 10.1016/bs.pmbts.2015.07.020. Epub 2015 Aug 20. PMID: 26477909; PMCID: PMC4727532. 5. Muscella A, Stefàno E, Lunetti P, Capobianco L, Marsigliante S. The Regulation of Fat Metabolism During Aerobic Exercise. Biomolecules. 2020 Dec 21; 10(12):1699. doi: 10.3390/biom10121699. PMID: 33371437; PMCID: PMC7767423. 6. Horowitz JF, Klein S. Lipid metabolism during endurance exercise. Am J Clin Nutr. 2000 Aug; 72(2 Suppl):558S-63S. doi: 10.1093/ajcn/72.2.558S. PMID: 10919960. 7. Purdom T, Kravitz L, Dokladny K, Mermier C. Understanding the factors that effect maximal fat oxidation. J Int Soc Sports Nutr. 2018 Jan 12;15:3. doi: 10.1186/s12970-018-0207-1. PMID: 29344008; PMCID: PMC5766985. 8. Brooks GA, Osmond AD, Arevalo JA, Duong JJ, Curl CC, Moreno-Santillan DD, Leija RG. Lactate as a myokine and exerkine: drivers and signals of physiology and metabolism. J Appl Physiol (1985). 2023 Mar 1; 134(3):529-548. doi: 10.1152/japplphysiol.00497.2022. Epub 2023 Jan 12. PMID: 36633863; PMCID: PMC9970662. 9. Cairns SP. Lactic acid and exercise performance : culprit or friend? Sports Med. 2006; 36(4):279-91. doi: 10.2165/00007256-200636040-00001. PMID: 16573355.

		10. Lee S, Choi Y, Jeong E, Park J, Kim J, Tanaka M, Choi J. Physiological significance of elevated levels of lactate by exercise training in the brain and body. J Biosci Bioeng. 2023 Mar; 135(3):167-175. doi: 10.1016/j.jbiosc.2022.12.001. Epub 2023 Jan 19. PMID: 36681523. 11. Popov LD. Mitochondrial biogenesis: An update. J Cell Mol Med. 2020 May; 24(9):4892-4899. doi: 10.1111/jcmm.15194. Epub 2020 Apr 12. PMID: 32279443; PMCID: PMC7205802. 12. Bishop DJ, Botella J, Genders AJ, Lee MJ, Saner NJ, Kuang J, Yan X, Granata C. High-Intensity Exercise and Mitochondrial Biogenesis: Current Controversies and Future Research Directions. Physiology (Bethesda). 2019 Jan 1; 34(1):56-70. doi: 10.1152/physiol.00038.2018. PMID: 30540234.
	Module 4 (Week 7-9)	**Mandatory Bibliography** **Digital Multimedia Material** • Presentations on the topics in module 4 **Articles/Conference Proceedings:** 1. Zorzi A, Vio R, Bettella N, Corrado D. Criteria for interpretation of the athlete's ECG: A critical appraisal. Pacing Clin Electrophysiol. 2020 Aug; 43(8):882-890. doi: 10.1111/pace.14001. Epub 2020 Jul 30. PMID: 32602144. 2. Lavie CJ, Arena R, Swift DL, Johannsen NM, Sui X, Lee DC, Earnest CP, Church TS, O'Keefe JH, Milani RV, Blair SN. Exercise and the cardiovascular system: clinical science and cardiovascular outcomes. Circ Res. 2015 Jul 3; 117(2):207-19. doi: 10.1161/CIRCRESAHA.117.305205. PMID: 26139859; PMCID: PMC4493772. 3. Fu Q, Levine BD. Exercise and the autonomic nervous system. Handb Clin Neurol. 2013;117:147-60. doi: 10.1016/B978-0-444-53491-0.00013-4. PMID: 24095123. 4. Rowland T. Endurance athletes' stroke volume response to progressive exercise: a critical review. Sports Med. 2009; 39(8):687-95. doi: 10.2165/00007256-200939080-00005. PMID: 19769416. 5. Aubert AE, Seps B, Beckers F. Heart rate variability in athletes. Sports Med. 2003; 33(12):889-919. doi: 10.2165/00007256-200333120-00003. PMID: 12974657. 6. Buchheit M, Laursen PB. High-intensity interval training, solutions to the programming puzzle: Part I: cardiopulmonary emphasis. Sports Med. 2013 May;

43(5):313-38. doi: 10.1007/s40279-013-0029-x. PMID: 23539308.

7. Souissi A, Haddad M, Dergaa I, Ben Saad H, Chamari K. A new perspective on cardiovascular drift during prolonged exercise. Life Sci. 2021 Dec 15;287:120109. doi: 10.1016/j.lfs.2021.120109. Epub 2021 Oct 27. PMID: 34717912.
8. Poole DC, Jones AM. Oxygen uptake kinetics. Compr Physiol. 2012 Apr; 2(2):933-96. doi: 10.1002/cphy.c100072. PMID: 23798293.
9. Xu F, Rhodes EC. Oxygen uptake kinetics during exercise. Sports Med. 1999 May; 27(5):313-27. doi: 10.2165/00007256-199927050-00003. PMID: 10368878.
10. Herdy AH, Ritt LE, Stein R, Araújo CG, Milani M, Meneghelo RS, Ferraz AS, Hossri C, Almeida AE, Fernandes-Silva MM, Serra SM. Cardiopulmonary Exercise Test: Background, Applicability and Interpretation. Arq Bras Cardiol. 2016 Nov; 107(5):467-481. doi: 10.5935/abc.20160171. PMID: 27982272; PMCID: PMC5137392.
11. Bangsbo J. Oxygen deficit: a measure of the anaerobic energy production during intense exercise? Can J Appl Physiol. 1996 Oct; 21(5):350-63; discussion 364-9. doi: 10.1139/h96-031. PMID: 8905187.
12. Sales MM, Sousa CV, da Silva Aguiar S, Knechtle B, Nikolaidis PT, Alves PM, Simões HG. An integrative perspective of the anaerobic threshold. Physiol Behav. 2019 Jun 1;205:29-32. doi: 10.1016/j.physbeh.2017.12.015. Epub 2017 Dec 14. PMID: 29248631.
13. Noakes TD. Maximal oxygen uptake: "classical" versus "contemporary" viewpoints: a rebuttal. Med Sci Sports Exerc. 1998 Sep; 30(9):1381-98. doi: 10.1097/00005768-199809000-00007. PMID: 9741607.
14. Bassett DR Jr, Howley ET. Limiting factors for maximum oxygen uptake and determinants of endurance performance. Med Sci Sports Exerc. 2000 Jan; 32(1):70-84. doi: 10.1097/00005768-200001000-00012. PMID: 10647532.
15. Poole DC, Rossiter HB, Brooks GA, Gladden LB. The anaerobic threshold: 50+ years of controversy. J Physiol.

		2021 Feb; 599(3):737-767. doi: 10.1113/JP279963. Epub 2020 Nov 19. PMID: 33112439. 16. Beneke R, Leithäuser RM, Ochentel O. Blood lactate diagnostics in exercise testing and training. Int J Sports Physiol Perform. 2011 Mar; 6(1):8-24. doi: 10.1123/ijspp.6.1.8. PMID: 21487146. 17. Faude O, Kindermann W, Meyer T. Lactate threshold concepts: how valid are they? Sports Med. 2009; 39(6):469-90. doi: 10.2165/00007256-200939060-00003. PMID: 19453206. 18. Jones AM, Carter H. The effect of endurance training on parameters of aerobic fitness. Sports Med. 2000 Jun; 29(6):373-86. doi: 10.2165/00007256-200029060-00001. PMID: 10870864.
	Module 5 (Week 10-11)	**Mandatory Bibliography** **Digital Multimedia Material** • Presentations on the topics in module 5 **Articles/Conference Proceedings:** 1. Kraemer WJ, Ratamess NA. Hormonal responses and adaptations to resistance exercise and training. Sports Med. 2005; 35(4):339-61. doi: 10.2165/00007256-200535040-00004. PMID: 15831061. 2. Kraemer WJ, Ratamess NA, Hymer WC, Nindl BC, Fragala MS. Growth Hormone(s), Testosterone, Insulin-Like Growth Factors, and Cortisol: Roles and Integration for Cellular Development and Growth With Exercise. Front Endocrinol (Lausanne). 2020 Feb 25;11:33. doi: 10.3389/fendo.2020.00033. PMID: 32158429; PMCID: PMC7052063. 3. Neves RS, da Silva MAR, de Rezende MAC, Caldo-Silva A, Pinheiro J, Santos AMC. Salivary Markers Responses in the Post-Exercise and Recovery Period: A Systematic Review. Sports (Basel). 2023 Jul 18; 11(7):137. doi: 10.3390/sports11070137. PMID: 37505624; PMCID: PMC10386489. 4. Papacosta E., Nassis G.P. Saliva as a tool for monitoring steroid, peptide and immune markers in sport and exercise science. J. Sci. Med. Sport. 2011; 14:424–434. doi:10.1016/j.jsams.2011.03.004.

5. Severinsen MCK, Pedersen BK. Muscle-Organ Crosstalk: The Emerging Roles of Myokines. Endocr Rev. 2020 Aug 1; 41(4):594–609. doi: 10.1210/endrev/bnaa016. Erratum in: Endocr Rev. 2021 Jan 28; 42(1):97-99. PMID: 32393961; PMCID: PMC7288608.
6. Walsh N.P., Gleeson M., Shephard R.J., Gleeson M., Woods J.A., Bishop N.C., Fleshner M., Green C., Pedersen B.K., Hoffman-Goetz L., et al. Position statement. Part one: Immune function and exercise. Exerc. Immunol. Rev. 2011; 17:6–63.
7. Walsh NP, Gleeson M, Pyne DB, Nieman DC, Dhabhar FS, Shephard RJ, Oliver SJ, Bermon S, Kajeniene A. Position statement. Part two: Maintaining immune health. Exerc Immunol Rev. 2011;17:64-103. PMID: 21446353.
8. Owens DJ, Twist C, Cobley JN, Howatson G, Close GL. Exercise-induced muscle damage: What is it, what causes it and what are the nutritional solutions? Eur J Sport Sci. 2019 Feb; 19(1):71-85. doi: 10.1080/17461391.2018.1505957. Epub 2018 Aug 15. PMID: 30110239.
9. Hotfiel T, Freiwald J, Hoppe MW, Lutter C, Forst R, Grim C, Bloch W, Hüttel M, Heiss R. Advances in Delayed-Onset Muscle Soreness (DOMS): Part I: Pathogenesis and Diagnostics. Sportverletz Sportschaden. 2018 Dec; 32(4):243-250. English. doi: 10.1055/a-0753-1884. Epub 2018 Dec 11. PMID: 30537791.
10. Lundberg TR, Howatson G. Analgesic and anti-inflammatory drugs in sports: Implications for exercise performance and training adaptations. Scand J Med Sci Sports. 2018 Nov; 28(11):2252-2262. doi: 10.1111/sms.13275. Epub 2018 Sep 2. PMID: 30102811.
11. Mohr AE, Jäger R, Carpenter KC, Kerksick CM, Purpura M, Townsend JR, West NP, Black K, Gleeson M, Pyne DB, Wells SD, Arent SM, Kreider RB, Campbell BI, Bannock L, Scheiman J, Wissent CJ, Pane M, Kalman DS, Pugh JN, Ortega-Santos CP, Ter Haar JA, Arciero PJ, Antonio J. The athletic gut microbiota. J Int Soc Sports Nutr. 2020 May 12; 17(1):24. doi: 10.1186/s12970-020-00353-w. PMID: 32398103; PMCID: PMC7218537.
12. Teissier T, Boulanger E, Cox LS. Interconnections between Inflammageing and Immunosenescence during

		Ageing. Cells. 2022 Jan 21; 11(3):359. doi: 10.3390/cells11030359. PMID: 35159168; PMCID: PMC8834134. 13. Dhabhar FS. Effects of stress on immune function: the good, the bad, and the beautiful. Immunol Res. 2014 May; 58(2-3):193-210. doi: 10.1007/s12026-014-8517-0. PMID: 24798553. 14. Shephard RJ, Shek PN. Exercise, immunity, and susceptibility to infection: a j-shaped relationship? Phys Sportsmed. 1999 Jun; 27(6):47-71. doi: 10.3810/psm.1999.06.873. PMID: 20086724. 15. Gleeson M, Walsh NP; British Association of Sport and Exercise Sciences. The BASES expert statement on exercise, immunity, and infection. J Sports Sci. 2012; 30(3):321-4. doi: 10.1080/02640414.2011.627371. Epub 2011 Dec 1. PMID: 22132765.
	Module 6 (Week 12)	**Mandatory Bibliography** **Digital Multimedia Material** • Presentations on the topics in module 6 **Articles/Conference Proceedings:** 1. Tipton MJ. Environmental extremes: origins, consequences and amelioration in humans. Exp Physiol. 2016 Jan; 101(1):1-14. doi: 10.1113/EP085362. Epub 2015 Oct 16. PMID: 26391095. 2. Foster PP, Butler BD. Decompression to altitude: assumptions, experimental evidence, and future directions. J Appl Physiol (1985). 2009 Feb; 106(2):678-90. doi: 10.1152/japplphysiol.91099.2008. Epub 2008 Dec 12. PMID: 19074573. 3. Niclou A, Sarma M, Levy S, Ocobock C. To the extreme! How biological anthropology can inform exercise physiology in extreme environments. Comp Biochem Physiol A Mol Integr Physiol. 2023 Oct;284:111476. doi: 10.1016/j.cbpa.2023.111476. Epub 2023 Jul 7. PMID: 37423419. 4. Castellani JW, Tipton MJ. Cold Stress Effects on Exposure Tolerance and Exercise Performance. Compr Physiol. 2015 Dec 15; 6(1):443-69. doi: 10.1002/cphy.c140081. PMID: 26756639.

5. Périard JD, Travers GJS, Racinais S, Sawka MN. Cardiovascular adaptations supporting human exercise-heat acclimation. Auton Neurosci. 2016 Apr;196:52-62. doi: 10.1016/j.autneu.2016.02.002. Epub 2016 Feb 12. PMID: 26905458.
6. Cramer MN, Gagnon D, Laitano O, Crandall CG. Human temperature regulation under heat stress in health, disease, and injury. Physiol Rev. 2022 Oct 1; 102(4):1907-1989. doi: 10.1152/physrev.00047.2021. Epub 2022 Jun 9. PMID: 35679471; PMCID: PMC9394784.
7. Périard JD, Racinais S, Sawka MN. Adaptations and mechanisms of human heat acclimation: Applications for competitive athletes and sports. Scand J Med Sci Sports. 2015 Jun; 25 Suppl 1:20-38. doi: 10.1111/sms.12408. PMID: 25943654.
8. Périard JD, Eijsvogels TMH, Daanen HAM. Exercise under heat stress: thermoregulation, hydration, performance implications, and mitigation strategies. Physiol Rev. 2021 Oct 1; 101(4):1873-1979. doi: 10.1152/physrev.00038.2020. Epub 2021 Apr 8. PMID: 33829868.
9. Racinais S, Alonso JM, Coutts AJ, Flouris AD, Girard O, González-Alonso J, Hausswirth C, Jay O, Lee JK, Mitchell N, Nassis GP, Nybo L, Pluim BM, Roelands B, Sawka MN, Wingo J, Périard JD. Consensus recommendations on training and competing in the heat. Br J Sports Med. 2015 Sep; 49(18):1164-73. doi: 10.1136/bjsports-2015-094915. Epub 2015 Jun 11. PMID: 26069301; PMCID: PMC4602249.
10. Treml B, Gatterer H, Burtscher J, Kleinsasser A, Burtscher M. A Focused Review on the Maximal Exercise Responses in Hypo- and Normobaric Hypoxia: Divergent Oxygen Uptake and Ventilation Responses. Int J Environ Res Public Health. 2020 Jul 20; 17(14):5239. doi: 10.3390/ijerph17145239. PMID: 32698542; PMCID: PMC7400084.
11. Mujika I, Sharma AP, Stellingwerff T. Contemporary Periodization of Altitude Training for Elite Endurance Athletes: A Narrative Review. Sports Med. 2019 Nov; 49(11):1651-1669. doi: 10.1007/s40279-019-01165-y. PMID: 31452130.

		12. Patterson SD, Hughes L, Warmington S, Burr J, Scott BR, Owens J, Abe T, Nielsen JL, Libardi CA, Laurentino G, Neto GR, Brandner C, Martin-Hernandez J, Loenneke J. Blood Flow Restriction Exercise: Considerations of Methodology, Application, and Safety. Front Physiol. 2019 May 15;10:533. doi: 10.3389/fphys.2019.00533. Erratum in: Front Physiol. 2019 Oct 22;10:1332. PMID: 31156448; PMCID: PMC6530612. 13. Wortman RJ, Brown SM, Savage-Elliott I, Finley ZJ, Mulcahey MK. Blood Flow Restriction Training for Athletes: A Systematic Review. Am J Sports Med. 2021 Jun; 49(7):1938-1944. doi: 10.1177/0363546520964454. Epub 2020 Nov 16. PMID: 33196300.
Assessment	The evaluation of the course includes activities of continuous / formative assessment (formative), self-evaluation (self-evaluation and debriefing / final evaluation (summative). Specifically, the evaluation of this course includes the following: final written exam, 2 evaluation assignments, 2 evaluative online interactive discussions, various weekly educational activities such as interactive activities, interactive presentations/ videos and self-assessment activities. From the above, the following are scored: • Evaluation work 1 (20%) • Evaluation work 2 (15%) • Online interactive activity 1 (7.5%) • Online interactive activity 2 (7.5%) • Final exam (50%) All assignments (except the final exam) are assigned and delivered to the online platform, as well as a plagiarism check through the turnitin tool. The final exam is developed by the instructor and completed by the students on a special platform used exclusively for the exams.	
Language	English / Greek	