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| Course Title             | <b>Clinical Exercise Physiology</b>   |  |  |                   |
| Course Code              | <b>DLSEH503</b>   |  |  |                   |
| Course type              | Elective  |  |  |                   |
| Level                    | Master  |  |  |                   |
| Year / Semester of study | 1 <sup>st</sup> or 2 <sup>nd</sup> / 2 <sup>nd</sup> or 3 <sup>rd</sup>   |  |  |                   |
| Teacher's Name           |   |  |  |                   |
| ECTS                     | 10  | Lectures / week  |  | Laboratories/week |
| Course Purpose           | This course aims to deepen students' knowledge, skills, and competencies in the field of exercise clinical physiology, based on practices based on current scientific knowledge, data from studies and guidelines of exercise and health organizations. The effect of exercise on these processes, but also the rules of prescribing exercise to people with various diseases such as cardiovascular, metabolic, respiratory, etc. Part of the course will be taught through problem solving and case studies. At the end of the course, students will have an in-depth understanding of issues related to pathophysiology, pharmacology, and exercise for various diseases.  |  |  |                   |
| Learning Outcomes        | <p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> <li>• They discuss the process of inflammation and immune response, their role in the pathophysiology of chronic diseases, and the effects of exercise on them</li> <li>• They discuss the basic pathophysiological mechanisms of various diseases and the ways exercise can affect them</li> <li>• They understand the usefulness of exercise in preventing, treating, and managing diseases.</li> <li>• Design safe and effective exercise programs based on up-to-date scientific data and guidelines</li> <li>• Recognise the basics of a healthy cardiogram,</li> <li>• Identify key blockades that indicate abnormalities in the normal functioning of the heart</li> <li>• They define basic principles of pharmacology and drug and exercise interactions</li> <li>• Identify basic principles of pharmacokinetics and pharmacodynamics of frequently prescribed drugs</li> </ul> |  |  |                   |
| Prerequisites            |   | Prerequisites  |  |                   |
| Course Purpose           | Module 1 (Week 1 - 2)   | The first module aims to develop knowledge and understanding of the processes of inflammation and immune response. Students will be taught basic facts about the process of inflammation and immune response. They will be informed about the biological mechanisms that govern them, their role in maintaining the normal functioning of the body and the risks |  |                   |

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|                      |                            | when they are deregulated. Finally, the effects of exercise on both basic mechanisms and chronic inflammation of various diseases will be discussed.  |
|                      | Module 2<br>(Week 3 - 5)   | The second module aims to develop knowledge and skills related to specific chronic diseases and address them through exercise. Specifically, the course will refer to cardiometabolic, respiratory, musculoskeletal, and neoplastic diseases. Students will be informed about epidemiology, pathophysiology, etiology, and disease management. Also, the exercise approach and the possible interactions of exercise with various diseases will be discussed.   |
|                      | Module 3<br>(Week 6 – 8)   | The third module aims to acquire knowledge of reading and analyzing ECG, resting and exercising. Students will be introduced to the step-by-step process of analyzing a normal ECG. They will be informed about the key elements they need to identify, how to assess the label, and the key deviations they need to be able to detect.   |
|                      | Module 4<br>(Week 9 - 10)  | <b>Module 4:</b> General Principles of Pharmacology: Pharmacokinetics and Pharmacodynamics<br><br>The 4th section aims to explain the fundamental principles of Pharmacology, emphasizing on Pharmacokinetics and Pharmacodynamics, which are basic concepts for understanding the action of drugs on the body.   |
|                      | Module 5<br>(Week 11 - 12) | <b>Module 5:</b> Pharmacokinetics and Pharmacodynamics of commonly prescribed drugs<br><br>The 5th module is a continuation of the previous module, focusing on the study of the Pharmacokinetics and Pharmacodynamics of commonly prescribed drugs, including drugs that affect the cardiovascular and respiratory systems, antidiabetic, analgesic and anti-inflammatory agents and psychotropic drugs. More specifically, the module aims to examine the principles governing the absorption, distribution, metabolism and excretion of commonly prescribed drugs, as well as the dynamic interaction of drugs with their receptors. Particular emphasis will be given to specific exercise-related aspects of Pharmacokinetics and Pharmacodynamics.  |
| Teaching Methodology |                            | 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 |

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|              | <p>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.</p> <p><a href="#">About Distance Learning - Frederick University</a></p>        |
| Bibliography | <p>Module 1<br/>(Week 1 - 2)</p> <p><b>Mandatory Bibliography:</b></p> <ul style="list-style-type: none"> <li>● Marshall, J.S., Warrington, R., Watson, W. et al. An introduction to immunology and immunopathology. Allergy Asthma Clin Immunol 14 (Suppl 2), 49 (2018).</li> <li>● Chen L, Deng H, Cui H, Fang J, Zuo Z, Deng J, Li Y, Wang X, Zhao L. Inflammatory responses and inflammation-associated diseases in organs. Oncotarget. 2017 Dec 14; 9(6):7204-7218. doi: 10.18632/oncotarget.23208.</li> </ul> <p><b>Bibliography for Additional Study:</b></p> <ul style="list-style-type: none"> <li>● Cerqueira É, Marinho DA, Neiva HP, Lourenço O. Inflammatory Effects of High and Moderate Intensity Exercise-A Systematic Review. Front Physiol. 2020 Jan 9;10:1550.</li> <li>● Chowdhury S, Schulz L, Palmisano B, Singh P, Berger JM, Yadav VK, Mera P, Ellingsgaard H, Hidalgo J, Brüning J, Karsenty G. Muscle-derived interleukin 6 increases exercise capacity by signaling in osteoblasts. J Clin Invest. 2020 Jun 1; 130(6):2888-2902.</li> <li>● Wedell-Neergaard AS, et al. Exercise-Induced Changes in Visceral Adipose Tissue Mass Are Regulated by IL-6 Signaling: A Randomized Controlled Trial. Cell Metab. 2019 Apr 2; 29(4):844-855.e3.</li> </ul> |
|              | <p>Module 2<br/>(Week 3 - 6)</p> <p><b>Mandatory Bibliography:</b></p> <ul style="list-style-type: none"> <li>● ACSM's guidelines for exercise testing and prescription, 11th edition (2021). Philadelphia: Lippincott Williams &amp; Wilkins. (several pages throughout – look for exercise prescription guidelines for each of the discussed conditions)</li> <li>● Scott, A. and Broom, D. (2022) Exercise management for referred medical conditions. Oxon: Routledge. (several chapters – look for relevant conditions)</li> </ul>  |

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|  |                                   | <p><b>Bibliography for Additional Study:</b></p> <ul style="list-style-type: none"> <li>• Tian D, Meng J. Exercise for Prevention and Relief of Cardiovascular Disease: Prognoses, Mechanisms, and Approaches. <i>Oxid Med Cell Longev.</i> 2019 Apr 9;2019:3756750.</li> <li>• Rausch Osthoff A, Niedermann K, Braun J, et al 2018 EULAR recommendations for physical activity in people with inflammatory arthritis and osteoarthritis <i>Annals of the Rheumatic Diseases</i> 2018; 77:1251-1260</li> <li>• Wang Q, Zhou W. Roles and molecular mechanisms of physical exercise in cancer prevention and treatment. <i>J Sport Health Sci.</i> 2021 Mar; 10(2):201-210.</li> <li>• Xiong T, Bai X, Wei X, Wang L, Li F, Shi H, Shi Y. Exercise Rehabilitation and Chronic Respiratory Diseases: Effects, Mechanisms, and Therapeutic Benefits. <i>Int J Chron Obstruct Pulmon Dis.</i> 2023 Jun 19;18:1251-1266.</li> </ul>   |
|  | <p>Module 3<br/>(Week 7 - 8)</p>  | <p><b>Mandatory Bibliography:</b></p> <ul style="list-style-type: none"> <li>• Oxford Medical Education (2016) ECG (EKG) interpretation, Oxford Medical Education. Available at: <a href="https://oxfordmedicaleducation.com/ecgs/ecg-interpretation/">https://oxfordmedicaleducation.com/ecgs/ecg-interpretation/</a></li> <li>• Simoons ML, Hugenholtz PG. Gradual changes of ECG waveform during and after exercise in normal subjects. <i>Circulation.</i> 1975 Oct; 52(4):570-7.</li> <li>• Practical skills: <a href="https://www.practicalclinicalskills.com/ecg-training-overview">https://www.practicalclinicalskills.com/ecg-training-overview</a></li> </ul> <p><b>Bibliography for Additional Study:</b></p> <ul style="list-style-type: none"> <li>• Thomas, Gregory S., and others, 'Interpretation of the ECG during Exercise and Recovery', in Gregory S. Thomas, L. Samuel Wann, and Myrvin H. Ellestad (eds), <i>Ellestad's Stress Testing: Principles and Practice</i>, 6 edn (New York, 2018; online edn, Oxford Academic, 1 Nov. 2018)</li> </ul> |
|  | <p>Module 4<br/>(Week 9 - 10)</p> | <p><b>Mandatory Bibliography:</b></p> <ul style="list-style-type: none"> <li>▪ Whalen, Karen. (2022) <i>Lippincott Illustrated Reviews: Pharmacology</i> (8th Edition). Wolters Kluwer Health</li> <li>▪ Niederberger E, Parnham MJ. The Impact of Diet and Exercise on Drug Responses. <i>Int J Mol Sci.</i> 2021 Jul 19; 22(14):7692.</li> </ul> <p><b>Bibliography for Additional Study:</b></p> <ul style="list-style-type: none"> <li>▪ Lenz TL. Pharmacokinetic Drug Interactions With Physical Activity. <i>American Journal of Lifestyle Medicine.</i> 2010; 4(3):226-229.</li> <li>▪ Pauli Ylitalo (1991) Effect of Exercise on Pharmacokinetics, <i>Annals of Medicine</i>, 23:3, 289-294</li> </ul>   |

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|            |  | <ul style="list-style-type: none"> <li>▪ van Baak, M.A. Influence of Exercise on the Pharmacokinetics of Drugs. Clin Pharmacokinet 19, 32–43 (1990).</li> </ul>   |
|            | Module 5<br>(Week 11<br>- 12)  | <p><b>Mandatory Bibliography:</b></p> <ul style="list-style-type: none"> <li>● Whalen, Karen. (2022) Lippincott Illustrated Reviews: Pharmacology (8th Edition). Wolters Kluwer Health</li> <li>● Mamrack, Mark D. (2021). Exercise and Sport Pharmacology (2nd Edition). Routledge.</li> </ul> |
| Assessment | <p>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.</p> <p>From the above, the following are scored:</p> <ul style="list-style-type: none"> <li>– 2 Assignment (20 % + 15%)</li> <li>– 2 Online activities (7,5 % +7.5%)</li> <li>– Final Exam (50 %)</li> </ul> <p>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.</p> |   |
| Language   | English / Greek  |   |