

Course title	Basic Physiology and Pharmacology				
Course code	GEMD-104				
Course type	Required				
Level	Undergraduate				
Year / Semester	Year 1, Semester 2				
Teacher's name	Course lead: Katerina Prokopiou				
ECTS	13	Teaching Periods per Week			
		Large Group Learning	Small Group Learning	Laboratories & Skills	Clinical Practice
		2	4	2	2
Course purpose and objectives	<p>The aim of this course is to:</p> <ul style="list-style-type: none"> • Introduce students to basic physiology and the concept of homeostasis. • Understand the fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body. • Provide a detailed understanding on membrane, nerve, and muscle physiology, which is fundamental for the understanding of the other organ systems. • Introduce students to the basic principles of pharmacology • Describe the principles of pharmacodynamics and understand the significance of the effect of drugs on the human body. • Describe the principles of pharmacokinetics and understand the significance of the effects of the human body on drugs. • Outline the principles of drug interaction, drug dependence and appreciate the effect of polypharmacy and the outcome of adverse drug reactions. • Introduce students drug dosage calculations. • Familiarize students to some basic clinical skills. 				
	<p>At the end of the course the student will be able to:</p> <p><i>Knowledge</i></p> <p><u>Introduction to Basic Physiology</u></p>				

Learning outcomes

1. Describe a eukaryotic cell, its cell membrane and the different organelles and account for cells' overall function.
2. Understand the levels of cellular organization and outline the body's organ systems.
3. Describe the different channel and receptor types and their effector systems (including secondary messengers) at the molecular level, including the different types of intercellular messengers.
4. Discuss how channels and receptors can be targets for drugs.
5. Describe the various body fluid compartments and their ionic composition (intracellular, extracellular – interstitial/plasma).
6. Revise the terms osmolarity, osmolality and tonicity.
7. Explain the concept of homeostasis and outline major mechanisms contributing to body fluid homeostasis.
8. Understand how physiological adaptation occurs during extreme conditions (e.g. environmental changes and acute infection).
9. Describe the transport of substances across cell membranes (passive diffusion and active transport) and the concept of osmosis.
10. Outline neuronal resting membrane potentials and the action potential generation and propagation.
11. Describe the organization and structure (pre- and post-synaptic neurons) of the peripheral nervous system, its functions, receptors and neurotransmitters involved.
12. Describe the organization and structure (pre- and post-synaptic neurons) of the central nervous system (brain and spinal cord), its functions, receptors and neurotransmitters involved.
13. Describe the principles of skeletal and smooth muscle excitation and contraction (the E-C coupling) and the sliding filament theory.
14. Describe the nervous and hormonal control of skeletal and smooth muscle contraction, including motor units.
15. Compare and describe the differences between the skeletal muscle, smooth muscle, and cardiac muscle.
16. Outline the different types of skeletal muscles depending on their function.
17. Discuss the types of muscle fibers and explain how physiological adaptation occurs depending on the different types of external stimulation (e.g. during exercise).
18. Outline the physiological changes that occur with aging and list some of the most common conditions that arise in the elderly.

Introduction to Basic Pharmacology

19. Discuss how channels and receptors can be targets for drugs.

20. Describe the drug - receptor interaction and effect.
21. Briefly outline the process of receptor desensitization and sensitization and provide examples of drugs that affect these processes.
22. Describe the various drug terms: agonist, antagonist, affinity, efficacy, potency.
23. Describe the four main processes of pharmacokinetics (absorption, distribution, metabolism and excretion).
24. Define the terms first-pass effect, bioavailability and volume of distribution.
25. Describe briefly the blood brain barrier and list the considerations that determine whether a drug will gain access to the central nervous system.
26. Understand the role of the liver in drug metabolism and how CYP450 inducers or CYP450 can affect overall drug metabolism.
27. Discuss the role of the kidney in drug excretion and overall drug elimination.
28. Classify the different drug categories that work in the peripheral nervous system depending on their mode of action (cholinergic, anti-cholinergic, adrenergic, anti-adrenergic drugs).
29. Define the terms: clearance, steady-state, zero-order and first-order kinetics and understand their clinical relevance.
30. Define the terms half-life, infusion rate, loading dose and maintenance dose and practice on calculations to determine these parameters.
31. Classify the different drug categories that work in the central nervous system depending on their mode of action (sedatives, anti-seizure drugs, local anesthetics, Parkinson disease drugs, anti-psychotics and anti-depressants).
32. Identify the various routes of administration and outline the considerations for choosing an appropriate route of administration.
33. Briefly discuss the principles of drug abuse, addiction, and dependence.
34. Outline the mechanism of action and uses of muscle relaxants.
35. Describe the mode of action, indications and side effects of non-steroidal anti-inflammatory drugs.
36. Outline the types of drug interactions that can occur from multiple drug therapy.
37. Understand and recognize the different types of adverse drug reactions.
38. Appreciate how drug interactions and adverse drug reactions can be minimized through recognition and prevention of medical errors.
39. Explain the stages of drug discovery and development, including the four types of clinical trials.

Skills

40. Introduction to clinical skills
41. Perform Basic Life Support

	<p>42. Perform and practice measurement of the vital signs: temperature, pulse, blood pressure, respiratory rate, oxygen saturation, GCS</p> <p>43. Perform urinalysis with the urine dipstick and practise interpreting the results</p> <p>44. Practise measuring blood glucose using a glucometer</p> <p>45. Calculate the body mass index (BMI) and explain its significance</p> <p>46. Gain an initial experience in the use of a stethoscope and listen to the normal breath and heart sounds</p> <p>47. Practice phlebotomy (obtain a blood sample) from a mannequin</p> <p>48. Calculate drug dosages based on patient weight or eGFR/creatinine clearance</p> <p><i>Professional competencies</i></p> <p>49. Describe the various routes of drug administration and outline the considerations for choosing an appropriate route of administration</p> <p>50. Discuss the implications of multiple drug therapy and polypharmacy in elderly patients</p> <p>51. Explain ways to avoid polypharmacy and unnecessary drug prescription.</p> <p>52. Discuss healthy lifestyle factors which can prevent the need for various medications in the future</p> <p>53. Discuss the role of health professionals in raising awareness and influencing public regarding drug abuse and addiction</p> <p>54. Discuss ways to prevent and treat drug dependence</p> <p>55. Recognize and predict potential adverse reactions, arising from giving two or more different medications.</p>		
Prerequisites	None	Required	None
Course content	<ul style="list-style-type: none"> • Introduction to physiology and the concept of homeostasis. • The normal structure and function of the cell. • Membrane physiology • Nerve physiology • Muscle physiology • Introduction to pharmacology and general principles of drug action • The principles of pharmacodynamics and pharmacokinetics. • Drug routes of administration • Drug toxicity 		

	<ul style="list-style-type: none"> • Drug interactions, multiple drug therapy - polypharmacy • Drug abuse, addiction, and dependence • Adverse drug reactions. • Drug development and clinical trials. • Introduction to basic clinical skills (BLS, vital sign, urinalysis, and blood glucose measurement, calculating BMI, how to use the stethoscope, phlebotomy). 																																										
<p>Teaching methodology</p>	<p>Lectures – normally two face-to-face, two on-line p/week</p> <p>Tutorials – two case-based learning small group sessions, two expert-led class discussions/debates</p> <p>Flipped classroom activities</p> <p>Community and/or hospital visits each week, relating to the case of the week</p> <p>Student centred learning/self-study</p>																																										
<p>Bibliography</p>	<p>Required textbooks/reading</p> <table border="1" data-bbox="451 994 1469 1585"> <thead> <tr> <th>Authors</th> <th>Title</th> <th>Edition</th> <th>Publisher</th> <th>Year</th> <th>ISBN</th> </tr> </thead> <tbody> <tr> <td>John E. Hall, Michael E. Hall</td> <td>Guyton and Hall Textbook of Medical Physiology</td> <td>14th Edition</td> <td></td> <td>2020</td> <td></td> </tr> <tr> <td>James M. Ritter, Rod J. Flower, Graeme Henderson, Yoon Kong Loke, David MacEwan, Humphrey P. Rang</td> <td>Rang & Dale's Pharmacology</td> <td>9th Edition</td> <td></td> <td>2019</td> <td></td> </tr> </tbody> </table> <p>Recommended textbooks/reading</p> <table border="1" data-bbox="451 1657 1469 1984"> <thead> <tr> <th>Authors</th> <th>Title</th> <th>Edition</th> <th>Publisher</th> <th>Year</th> <th>ISBN</th> </tr> </thead> <tbody> <tr> <td>Linda S. Costanzo</td> <td>BRS: Physiology</td> <td>7th Edition</td> <td></td> <td>2018</td> <td></td> </tr> <tr> <td>Lauralee Sherwood</td> <td>Human Physiology: from Cells to Systems</td> <td>9th Edition</td> <td></td> <td>2015</td> <td></td> </tr> <tr> <td>Kaplan Medical</td> <td>USMLE Step 1 Lecture Notes 2021:</td> <td>2021 Edition</td> <td></td> <td>2020</td> <td></td> </tr> </tbody> </table>	Authors	Title	Edition	Publisher	Year	ISBN	John E. Hall, Michael E. Hall	Guyton and Hall Textbook of Medical Physiology	14 th Edition		2020		James M. Ritter, Rod J. Flower, Graeme Henderson, Yoon Kong Loke, David MacEwan, Humphrey P. Rang	Rang & Dale's Pharmacology	9 th Edition		2019		Authors	Title	Edition	Publisher	Year	ISBN	Linda S. Costanzo	BRS: Physiology	7 th Edition		2018		Lauralee Sherwood	Human Physiology: from Cells to Systems	9 th Edition		2015		Kaplan Medical	USMLE Step 1 Lecture Notes 2021:	2021 Edition		2020	
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	Sarah Lerchenfeldt, Gary Rosenfeld	BRS: Pharmacology	7 th Edition		2019		
Assessment	The course will be assessed at the end of Semester 2 with a Summative Final Examination consisting of Single Best Answer MCQs (SBAs) and Short Answer Questions (SAQs). A formative midterm exam will take place during the middle of the semester.						
Language	English						