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|  **1** | **Course title** | **PHARMACEUTICAL CLINICAL BIOCHEMISTRY**  |
| **2** | **Course number** | **1203451** |
| **3** | **Credit hours** |  2(theory) |
| **Contact hours (theory, practical)** | 32 (theory) |
| **4** | **Prerequisites/corequisites** | Prerequisite: Pathophysiology for pharmacy (1203301) + Biochemistry II (1203253) |
| **5** | **Program title** | Pharmacy |
| **6** | **Program code** |  |
| **7** | **Awarding institution**  | The University of Jordan |
| **8** | **School** | Pharmacy |
| **9** | **Department** | Biopharmaceutics & Clinical Pharmacy |
| **10** | **Level of course**  | undergraduate |
| **11** | **Year of study and semester (s)** | First semester of the 4th year |
| **12** | **Final Qualification** | Pharmacy |
| **13** | **Other department (s) involved in teaching the course** | NA |
| **14** | **Language of Instruction** | English |
| **15** | **Teaching methodology** | [ ] Blended [ ] Online CLASSES |
| **16** | **Electronic platform(s)** | [ ] Moodle [x] Microsoft Teams [ ] Skype [ ] Zoom [ ] Others………… |
| **17** | **Date of production/revision** | Oct. 17 2021 |

**18 Course Coordinator:**

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| Name: Prof. Areej AssafOffice number: 132Phone number: 2336Email: areej\_assaf@ju.edu.jo |

**19 Other instructors:**

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| Name:Office number:Phone number:Email: |

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| This two hours credit course provides an overview of the key aspects of clinical biochemistry “ the science behind many of the diagnostic tests used in medicine. This course provides the student with an introduction to the principles of the biochemical analysis of clinical samples and with an understanding of how biochemical investigations can be employed in the diagnosis, management, and prevention of disease. Case studies are used extensively to highlight and explain the biochemical disorders underlying clinical diseases. |

**20 Course Description:**

**21 Course aims and outcomes:**

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| A- Aims:After completion of this course the student will be able to:1. Describe the principle involved in the measurement of analytes in the clinical biochemistry laboratory.
2. Outline how biochemical analysis can be employed to differentiate between normal and diseased conditions.
3. Discuss the function, structure, laboratory investigation and diseases of the different body systems.
4. Describe how chemical and biochemical analysis are applied to the study of disease.
5. Outline a step-by-step approach to the use of the laboratory in diagnosis.
6. Correlate laboratory findings in clinical samples to pathological processes.
7. Perform complex data handling exercises associated with biochemical analysis.
8. At the end of this course, the student will be introduced to:
9. The principles of laboratory tests and their use in diagnosis.
10. The normal water and electrolytes balance in our body and the effect of diseases on this balance.
11. The effect of the different diseases on renal function, calcium metabolism, lipid metabolism, amino acids and proteins, liver function and carbohydrate metabolism.

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course, students will be able to:Accomplish the followings: **A. Knowledge and Understanding:** Student is expected toA1- Demonstrate an understanding of quality management in and its relevance to patient management A2- Understand the role of clinical biochemistry in clinical diagnosis A3- Be proficient in the interpretation of results of routine clinical biochemistry investigations A4- Have developed problem-solving skills relevant to the practice of clinical biochemistry A5- Be familiar with the literature in Clinical Biochemistry and able to extract and present relevant information A6- The student is expected to know and understand the followings: **A6.1- Biochemical Tests**Us of the laboratory, interpretation of results, and reference ranges.**A6.2- Water and Sodium Balance**Water, intake, AVP and the regulation of osmolality, sodium, aldosterone, hypernatraemia, and hyponatraemia.**A 6.3- Potassium**Potassium metaboloism, serum potassium, hyperkalaemia, and hypokalaemia.**A6.4- Hydrogen Ion Homoeostasis and Blood Gases**Hydrogen ion concentration, buffering, hydrogen ion excretion, role of the lungs and kidney, and acid-base disorders.**A6.5- Calcium, Phosphate, and Magnesium**Calcium metabolism, serum calcium, hypocalcaemia, hypercalcaemia, calcium and phosphate homeostasis, disorders of calcium, and phosphate and magnesium metabolism.**A6.6- The Kidney**Structure and function, tests of tubular functions, tests of glomerular function, and kidney disorders.**A6.7- The Liver**Structure and function, metabolism of bilirubin, markers of liver damage, markers of cholestasis, markers of function, liver disease, and potential pitfalls in the interpretation of liver profiles.**A6.8- Lipids and Lipoproteins**Triglycerides, cholesterol, and phosholipids, classification of lipoproteins, lipoprotein metabolism, and disorders of lipoprotein metabolism.**B. Intellectual Analytical and Cognitive Skills:** Student is expected to B1- Explain molecular basis of diseases.B2- Relate the signs and symptoms to the molecular basis of diseases.B3- Relate the changes in water and electrolytes balance, hydrogen ion homoeostasis and blood gases to diseases.B4- To interpret the changes in calcium metabolism to renal and bone diseases.B5- Relate the changes in liver function tests to liver diseases.B6- Relate the changes in carbohydrate metabolism, the plasma proteins, lipids and lipoproteins, to diseases.**C. Subject-Specific Skills:** Student is expected toC1- Students will be encouraged to read widely & to research the various topics using the assigned texts, libraries and relevant web sitesC2-The use of other information resources is essential if students are to gain maximum benefit from their studies. C3- This approach to the subject is in part designed to encourage students to be more responsible for their own learning and to become lifelong learners**D. Transferable Key Skills:** Students is expected toD1- Develop of problem solving and critical thinking skills.D2- Communicate effectively with the medical team concerning the use of laboratory tests in the diagnosis of diseasesD3- Interpret laboratory findings preformed in clinical practice.D4- Use of videos and animation to effectively understand the concepts.D5- The ability to use simple word and IT skills (i.e., data processing, software, internet, and multimedia) and the library to find information.D6- The ability to be self-motivated learners and responsive to feedback.D7- Working in team (i.e., sharing presentations and discussions and solving problem).D8- Enhancement of research capability through working in independent projects. |

**22. Topic Outline and Schedule:**

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| **Week** | **Lecture** | **Topic** | **Teaching Methods\*/platform** | **Evaluation Methods\*\*** | **References** |
| 1 | 1.1 |  **Introduction and specimen collection**Blood and urine collection, factors affecting analyte determinations. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 1.2 |  **Introduction and specimen collection**Blood and urine collection, factors affecting analyte determinations. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 2 | 2.1 |  **Water, electrolytes and acid-base disturbances**Water, sodium and potassium balance, buffers, metabolic and respiratory acidosis and alkalosis. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 2.2 |  **Water, electrolytes and acid-base disturbances**Water, sodium and potassium balance, buffers, metabolic and respiratory acidosis and alkalosis. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 3 | 3.1 |  **Water, electrolytes and acid-base disturbances**Water, sodium and potassium balance, buffers, metabolic and respiratory acidosis and alkalosis. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 3.2 |  **Water, electrolytes and acid-base disturbances**Water, sodium and potassium balance, buffers, metabolic and respiratory acidosis and alkalosis. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 4 | 4.1 |  **Water, electrolytes and acid-base disturbances**Water, sodium and potassium balance, buffers, metabolic and respiratory acidosis and alkalosis. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 4.2 |  **Calcium metabolism** Calcium regulation, hypo- and hypercalcemia | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 5 | 5.1 |  **Calcium metabolism** Calcium regulation, hypo- and hypercalcemia | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 5.2 |  **Investigation of renal function** Acute and chronic renal failure, renal calculi. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 6 | 6.1 |  **Investigation of renal function** Acute and chronic renal failure, renal calculi. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 6.2 |  **Investigation of renal function** Acute and chronic renal failure, renal calculi. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 7 | 7.1 |  **Investigation of renal function** Acute and chronic renal failure, renal calculi. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 7.2 |  **Investigation of renal function** Acute and chronic renal failure, renal calculi. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 8 | 8.1 | **Midterm Exam**  |  |  |  |
| 8.2 |  **Lipid metabolism**Lipoproteins metabolism, lipid profile and lipid disorders | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 9 | 9.1 |  **Lipid metabolism**Lipoproteins metabolism, lipid profile and lipid disorders | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 9.2 | **Lipid metabolism**Lipoproteins metabolism, lipid profile and lipid disorders  | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 10 | 10.1 | **Lipid metabolism**Lipoproteins metabolism, lipid profile and lipid disorders  | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 10.2 |  **Amino acids and plasma proteins**Aminoacidurea, albumin and immunoglobulins. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 11 | 11.1 | **Amino acids and plasma proteins**Aminoacidurea, albumin and immunoglobulins. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 11.2 | . **Amino acids and plasma proteins**Aminoacidurea, albumin and immunoglobulins. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 12 | 12.1 |  **Liver function and disease**Liver function tests and their relations to liver diseases. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 12.2 |  **Liver function and disease**Liver function tests and their relations to liver diseases. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 13 | 13.1 |  **Liver function and disease**Liver function tests and their relations to liver diseases. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 13.2 |  **Liver function and disease**Liver function tests and their relations to liver diseases. | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 14 | 14.1 |  **Haematology** | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 14.2 |  **Haematology** | Microsoft Teams | Exams, Quizzes | **1 & 2** |
| 15 | 15.1 |  Final Exam Weeks |   |  |  |
| 15.2 |  Final Exam Weeks |   |  |  |

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* Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
* Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz…etc

**23 Evaluation Methods:**

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| Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

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| **Evaluation Activity** | **Mark** | **Topic(s)** | **Period (Week)** | **Platform** |
|  Assignment |   5 |  Will be decided later |  Later  |  e-learning |
| Drop Quiz |  5 | During Lecture meetings | 1-14 | Class |
|  Quiz |   10 |  Calcium metabolism |  10 | Class |
|  Mid-Term Exam |   30 |  To the end of Water, electrolytes and acid-base disturbances |  8 |  Classes  |
| Final Exam |  50 | All |  | Classes |
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**24 Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform…etc):**

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| Students should have a computer or smart phone with internet.Have Microsoft Teams using the University email.Lectures will be once a week online/ in class for each student and the drop quizzes will be done for all ( in class and on line).  |

**25 Course Policies:**

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| **A- Attendance policies:** All students should attend the meetings. Those who should be in class and those who are online will all be with the same policies as in class rooms.**B- Absences from exams and submitting assignments on time:** Is not allowed unless with an acceptable reason. **C- Health and safety procedures:** **D- Honesty policy regarding cheating, plagiarism, misbehavior:****E- Grading policy:****F- Available university services that support achievement in the course:** |

**26 References:**

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| A- Required book(s), assigned reading and audio-visuals:Required book (s), assigned reading and audio-visuals:* 1. **Clinical Biochemistry: An illustrated colour text.** Gaw et al. Churchill Livingston.3rd edition. 2004. **ISBN:** **443072698**
	2. **Tietz Textbook of Clinical Chemistry.** Burtis et al. Saunders. 4th edition. 1994. **ISBN:** **721644724**
	3. **Clinical Chemistry in Diagnosis and Treatment**, Mayne P.D. 1994. **ISBN: 0340576472**
	4. **Clinical Chemistry**, Marshall W.J.,2004. **ISBN: 0723433283**
	5. **Textbook of Biochemistry with Clinical Correlations**

 T.M. Devlin Editor, Wiley-Liss, John Wiley & Sons, Inc. 2011. **ISBN: 9780470281734**B- Recommended books, materials and media:1. Course Notes:

 Lecture and Practical Notes. By staff members1. Facilities Required for Teaching and Learning

 Audio-visual aids. Intelligent screen |

**27 Additional information:**

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| All exams will be in class and students should either have two shots from the COVID vaccine or a negative PCR result 72hrs before exam. |

Name of Course Coordinator: ----Prof. Areej Assaf----Signature: ------------------ Date: 17.10.2021---

Head of Curriculum Committee/Department: ---------------------------- Signature: --------------------------

Head of Department: ------------------------------------------------------------ Signature: -----------------------

Head of Curriculum Committee/Faculty: ---------------------------------------- Signature: -------------------

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