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| **1** | **Course title** | Clinical Pharmacokinetics clerkship |
| **2** | **Course number** | 1203607 |
| **3** | **Credit hours** | 2 (practical) |
| **Contact hours (theory, practical)** | 2 (practical) |
| **4** | **Prerequisites/corequisites** |  |
| **5** | **Program title** | PharmD |
| **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 and second semester of the 6th year |
| **12** | **Final Qualification** | PharmD |
| **13** | **Other department (s) involved in teaching the course** | None |
| **14** | **Language of Instruction** | English |
| **17** | **Date of production/revision** | 30 Sep 2021 |

**18 Course Coordinator:**

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| Name: Dr.Eman ElayehOffice number: 206Phone number: Email: emanelayeh@gmail.come.elayeh@ju.edu.jo |

**19 Other instructors:**

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| Name: Dr. Eman RebhiOffice number:Phone number: 206Email: n.zalloum@ju.edu.jo |

**20 Course Description:**

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| As stated in the approved study plan.The clerkship in clinical pharmacokinetics is intended to allow PharmD students an opportunity to acquire the practical experience in the application of clinical pharmacokinetic principles to various drug therapies with emphasis on the selection and design of antimicrobial therapies. Students will learn how to apply these principles by gathering pertinent clinical information, development of pharmaceutical care and monitoring plans, thorough literature evaluation, and case discussions.  |

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| **21 Course aims and outcomes** A- Aims:1 This course aims to: * Allow students to apply knowledge of pharmacokinetic principles to design optimal drug dosage regimens for individual patients taking into account their clinical and demographic characteristics.
* Establish a standardized pharmacokinetic monitoring approach for patients receiving drugs that are routinely monitored utilizing serum drug concentrations.

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course, students will be able to:**Intended Learning Outcomes:**1. **Knowledge and Understanding:**

Student is expected to* 1. Discuss and understand the basic pharmacokinetic principles and key pharmacokinetic parameters.
	2. Discuss and understand various aspects of a drug’s pharmacokinetic properties and factors affecting them.
	3. Discuss the effect of different disease states on the pharmacokinetics and pharmacodynamics of drugs
	4. Understand the theoretical basis of therapeutic drug monitoring.
1. **Intellectual, Analytical and Cognitive Skills:**

Student is expected to* 1. Perform calculations to predict drug concentration after drug administration.
	2. Given a pharmacokinetic data set, determine the value of pharmacokinetic parameters after different modes of drug administration.
	3. Be able to develop a strategy for therapeutic drug monitoring for a range of narrow therapeutic window drugs.
	4. Identify the problems associated with dosage regimens through analyzing patient data.
	5. Gain therapeutic problem-solving skills.
1. **Subject-Specific Skills:**

Student should be able to1. Recommend initial dosage regimen, or adjust dosage and recommend monitoring strategy to ensure safe and effective drug therapy.
2. Identify clinical manifestations of potential toxicities associated with patient’s medication and recommend the appropriate course of action.
3. Apply the pharmacokinetic principles to specific problems commonly encountered in practice setting.
4. Identify patients who are likely to get maximal benefit from clinical pharmacokinetic monitoring.
5. **Transferable Key Skills:**

Students is expected to1. Use different information sources to solve pharmacokinetics problems.
2. Develop the ability to communicate scientific principles and dosage recommendations to other healthcare professionals.

Program Competencies Achieved:2.3 Identify pathophysiological basis of major human diseases2.4 Assess symptoms and diagnostic tests and correlate them with associated diseases2.8 Identify indications, side effects and contraindications of medicines2.9 Identify drug-drug and drug-food interactions of medicines2.15 Verify that patient therapy is based on best scientific evidence available 2.17 Advise patients and other health professionals on proper usage of medicines including their strength, frequency, dosage form and route of administration2.18 Identify any medicament-related problems and take appropriate actions to resolve them2.19 Recommend necessary modifications to patient therapy to optimize its safety and efficacy7.4 Follow new advances in science related to the profession7.5 Utilize information technology tools to enhance working experience |

**22. Topic Outline and Schedule:**

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| **Day** | **Activity /task** | **Time**  |
| **Saturday** **QUIZ** | * CrCl estimation quiz (self-reading material)
 | **8 pm** **JUEXAMS** |
| **Sunday** | * Vancomycin kinetics discussion
* Distribution of vancomycin cases
* Students should start to calculate vancomycin dose by two methods:
* Initial dose determination
* Revised method.
 |  8-1.0 pm at JUH |
| **Sunday** **QUIZ** | * Pre-assessment quiz
* Phenytoin quiz (quiz material is CPK slides and pages from 487-490 from Applied pharmacokinetics book) … the quiz will be held before discussing phenytoin calculations on JUexams
 | **8 pm** **JUEXAMS** |
| Monday | * Phenytoin dose calculation using Michaelis-Menten equation, orbit graph determination, effect of low albumin on phenytoin conc. (students should read the lecture in advance to participate in the discussion) ……..you should print the orbit graph and have it with you, don’t forget to bring a pencil and ruler to help in drawing.
* Distribution of second and third case
* Informal discussion of case no.1: Review of vancomycin calculations

(Students should discuss the calculated doses by the two methods, and deviation between the prescribed dose and the recommended dose)* Case follow up.
 |  **8-1.0 pm at JUH** |
| **Monday****QUIZ**  | * Aminoglycoside pre-assessment quiz
 | **8 pm** **JUEXAMS** |
| Tuesday | * Cyclosporine kinetics discussion
* Aminoglycosides kinetics discussion
* Review of second and third case calculations
* Case follow up
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| Wednesday | * Digoxin kinetics discussion
* Valproic acid discussion
* Review of second and third case calculations
* Formal Discussion of case 1
* Case follow up
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| Thursday  | Case 2 and 3 formal discussion  |  |
| Next Sunday  | Submission of manual 1, 2, 3 | On MS teamsBy 11 pm  |

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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)** | **Platform** |
| Attitude and evaluation  | 5 | NA | NA |
| Final exam  | 40 |  |  |
| Manuals  | 20 | Vancomycin manual (10), case 2 manual (5), case 3 manual (5) |  |
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| Case 1 Formal discussion  | 5 | Vancomycin | JUH |
| Case 2 Formal discussion  | 5 | Depending on the case | MS teams |
| Case 3 Formal discussion  | 5 | Depending on the case |
| Quizzes (average of 3 topics) | 10 |  |  |
| * Pre-assessment quiz 1
 | 5 | Renal function assessment quiz | JUExams |
| * Pre assessments quiz 1
 | 5 | Phenytoin | JUExams |
| * Pre assessments quiz 2
 | 5 | Aminoglycoside | JUExams |
| * Post assessments quiz (self-reading material)
 | 10 | Tacrolimus and carbamazepine | JUExams27/11/2021 |

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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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**25 Course Policies:**

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| 1. Attendance policies: absence is not allowed.
2. Late submission of manual: one mark will be deducted for each late day (up to 3 days, otherwise, the mark will be zero).
3. Absence from formal discussion: no second chance will be given
4. Absences from exams, pre-assessment and post-assessment quiz: no second chance will be given
5. Health and safety procedures:

NAD- Honesty policy regarding cheating, plagiarism, misbehavior:The participation, the commitment of cheating will lead to applying all following penalties together1) Failing the subject he/she cheated at2) Failing the other subjects taken in the same course3) Not allowed to register for the next semester. The summer semester is not considered as a semester1. Grading policy:

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| Items  | Marks  |
| Case 1 (vancomycin) manual and discussion | 20 marks (10 marks for each) |
| Case 2 manual and discussion  | 10 marks (5 marks for each) |
| Case 3 manual and discussion | 10 marks (5 marks for each) |
| Post assessment Quiz (tacrolimus and carbamazepine)  | 10 marks  |
| Pre-assessment quizzes (2 quizzes):1. Prior to phenytoin
2. Aminoglycosides
 | 10 marks (5 marks for each) |
| Final exam  | 40 marks  |

F- Available university services that support achievement in the course: |

**26 References:**

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| 1. Required book(s), assigned reading and audio-visuals:
2. **Basic clinical pharmacokinetics, By Michael E. Winter. Edition: 5 – 2009**
3. **Applied clinical pharmacokinetics, By Larry Bauer. Edition: 2 – 2008**
4. **Applied pharmacokinetics & pharmacodynamics: principles of therapeutic drug monitoring, By Michael E. Burton. Edition: 4 – 2006**
5. **Pharmacotherapy: A Pathophysiological Approach, ed. DiPiro *et al*, 8th edition, 2011.**

**Other Useful References:**1. **Clinical pharmacokinetics: concepts and applications, By Malcolm Rowland, Thomas N. Tozer. Edition: 4 – 2010**
2. **Handbook of drug monitoring methods: Therapeutics and Drugs of Abuse, By Amitava Dasgupta. Edition: 1 – 2008**
3. **Concepts in Clinical Pharmacokinetics, By Joseph T. DiPiro. Edition:5 – 2010**
4. **Applied Biopharmaceutics & Pharmacokinetics, By Leon Shargel *et al.* Edition:6 – 2012**
5. **Introduction to pharmacokinetics and pharmacodynamics: the quantitative basis of drug therapy, By Thomas N. Tozer, Malcolm Rowland. Edition 1: 2006**
6. **Relevant original and review articles from scientific journals**

B- Recommended books, materials and media:Other learning resources:1. Access Pharmacy: http://accesspharmacy.mhmedical.com/2. UpToDate: www.uptodate.com |

**27 Additional information:**

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Name of Course Coordinator: Dr. Eman Elayeh Signature: ------------------ Date: 30/9/2021

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

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

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

Dean: ---------------------------------------------------------- Signature: -------------------------------------------