

## Liverpool John Moores University

Title: QUANTITATIVE METHODS FOR PHARMACEUTICAL SCIENCE AND PRACTICE  
Status: Definitive  
Code: **5005PPPHAR** (113381)  
Version Start Date: 01-08-2014

Owning School/Faculty: Pharmacy & Biomolecular Sciences  
Teaching School/Faculty: Pharmacy & Biomolecular Sciences

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**Academic Level:** FHEQ5      **Credit Value:** 12.00      **Total Delivered Hours:** 43.00  
**Total Learning Hours:** 120      **Private Study:** 77

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	23.000
Practical	6.000
Workshop	11.000

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	exam	Exam 1. Calculations and MCQs covering all learning outcomes except 9	80.0	2.00
Exam	dose exam	Exam 2. MCQs covering learning outcome 9	5.0	1.00
Practice	assignment	Coursework	15.0	

<b>Competency</b>	Pharmacy Based Calculation
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## Aims

To achieve or enhance theoretical understanding and to develop practical competence in the use of quantitative methods relevant to pharmaceutical science and practice. The areas covered are:

- 1) *Pharmacokinetics - The mathematical parameters that describe the movement of drugs into and around the body and their elimination. The rational design of dosage regimen based upon these concepts.*
- 2) *The evaluation of clinical trial evidence - The detection of differences in clinical outcomes in terms of both statistical and practical significance.*
- 3) *Pharmaceutical calculations - A revision and re-inforcement of concepts initially introduced in year 1.*

## Learning Outcomes

After completing the module the student should be able to:

- 1 Describe the physical meaning and pharmaceutical significance of pharmacokinetic parameters
- 2 Recognise circumstances where drug disposition is likely to be significantly altered
- 3 Perform dosage calculations based upon population data and therapeutic drug monitoring data
- 4 Recognise that some drugs display non-linear kinetics and the therapeutic significance of this
- 5 Critically appraise the methods of randomisation used in an experiment or clinical trial
- 6 Test hypotheses, utilising parametric statistical methods that compare two or more mean values and interpret the results both in terms of statistical significance and in terms of practical superiority, equivalence or non-inferiority
- 7 Recognise the difference between classification and measurement data and apply suitable tests to classification data
- 8 Identify those aspects of any trial/experiment that will influence necessary sample size
- 9 Perform basic pharmaceutical dosage calculations

## Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

main exam	1	2	3	4	5	6	7	8
dosage exam	9							
assignment	1	2	3	6	7			

Pharmacy Based  
Calculation

## Outline Syllabus

*i) Pharmacokinetic parameters - volume of distribution, absorption and elimination*

- rate constants, bioavailability, salt factors, half life, area under the curve, extraction ratio and clearance
- ii) Pathological and physiological factors causing significant changes in kinetics and drug interactions
  - iii) Specific regimen - single iv bolus injection into one or two compartment systems, constant iv infusion, multiple dosing
  - iv) Design and monitoring of therapeutic regimen for digoxin, lithium, theophylline and aminoglycosides
  - v) Simple, block and dynamic randomisation
  - vi) Two independent samples t-test, paired samples t-test, one and two way analyses of variance, interaction, Dunett's & Tukey's tests for multiple comparisons, data transformations
  - vii) Equivalence limits, practical/clinical superiority, equivalence and non-inferiority
  - viii) Mann-Whitney, Wilcoxon paired samples & Kruskal-Wallis tests and Spearman rank correlation
  - ix) Chi-square tests for goodness-of-fit and contingency tables
  - x) Power and calculation of necessary sample size
  - xi) Pharmaceutical calculations including concentrations, dilutions, dosages based upon body weight, number of dosage units required, isotonicity, and trituration

## Learning Activities

Lectures, tutorials, workshops and computer based workshops

## References

<b>Course Material</b>	Book
<b>Author</b>	Winter ME
<b>Publishing Year</b>	2004
<b>Title</b>	Basic clinical pharmacokinetics
<b>Subtitle</b>	
<b>Edition</b>	4th ed
<b>Publisher</b>	Lippincott Williams & Wilkins
<b>ISBN</b>	0-7817-4147-5

<b>Course Material</b>	Book
<b>Author</b>	Campbell MJ & Machin D
<b>Publishing Year</b>	1999
<b>Title</b>	Medical statistics
<b>Subtitle</b>	A commonsense approach
<b>Edition</b>	3rd ed
<b>Publisher</b>	Wiley
<b>ISBN</b>	0-471-98721-2

<b>Course Material</b>	Book
<b>Author</b>	Zar, JH
<b>Publishing Year</b>	1999

<b>Title</b>	Biostatistical analysis
<b>Subtitle</b>	
<b>Edition</b>	4th ed
<b>Publisher</b>	Prentice Hall
<b>ISBN</b>	0-13-082390-2

<b>Course Material</b>	Book
<b>Author</b>	Rowe, PH
<b>Publishing Year</b>	2007
<b>Title</b>	Essential statistics for the pharmaceutical sciences
<b>Subtitle</b>	
<b>Edition</b>	
<b>Publisher</b>	Wiley
<b>ISBN</b>	0470034682

<b>Course Material</b>	Book
<b>Author</b>	Rowe, PH
<b>Publishing Year</b>	2012
<b>Title</b>	Pharmacokinetics
<b>Subtitle</b>	
<b>Edition</b>	1st ed
<b>Publisher</b>	BookBoon ( <a href="http://bookboon.com/en/textbooks/biology-biochemistry/pharmacokinetics">http://bookboon.com/en/textbooks/biology-biochemistry/pharmacokinetics</a> )
<b>ISBN</b>	9788740300901

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## Notes

Examination 2 (Covering learning outcome 9) must be passed with a mark of at least 60% in order to pass the module.

The module gives students sufficient expertise in quantitative methods to allow them to apply pharmacokinetic principles in a clinical setting, appreciate the use of statistics in published research and to carry out analyses of their own data. It also allows them to progress towards full competence in pharmaceutical calculations.