



**Pharmacy - Integrated academic studies**

**SECOND YEAR- Semester IV**

2024/25 School Year

**PROCESSING THE MEASUREMENT RESULTS**

**Name of the course:**

**PROCESSING THE MEASUREMENT RESULTS**

ECTS credits - 5; No. of hours active teaching per week: 4 (Lectures-2, Practice-1, Seminar-1)

## Teachers and instructors:

	Name and surname	E-mail address	Academic rank
1.	Miroslav Sovrlić	<a href="mailto:sofke-ph@hotmail.com">sofke-ph@hotmail.com</a>	Assistant professor
2.	Milan Zarić	<a href="mailto:zaricmilan@gmail.com">zaricmilan@gmail.com</a>	Associate professor
3.	Vladislava Stojić	<a href="mailto:vladislavastojic@gmail.com">vladislavastojic@gmail.com</a>	Assistant professor
4.	Miloš Milosavljević	<a href="mailto:milosavljevicmilos91@gmail.com">milosavljevicmilos91@gmail.com</a>	Assistant professor
5.	Ana Pejčić	<a href="mailto:anapejic201502@yahoo.com">anapejic201502@yahoo.com</a>	Assistant professor
6.	Jovica Tomović	<a href="mailto:jovicatomovic2011@gmail.com">jovicatomovic2011@gmail.com</a>	Assistant professor
7.	Sara Mijailović	<a href="mailto:saramijailovic212@gmail.com">saramijailovic212@gmail.com</a>	Teaching assistant

## Course structure:

Course contents	Weeks	Lectures	Practice	Seminar	Course Coordinator
Fundamental pharmaceutical calculations, measurement systems and error analysis. Statistical methods, probability distributions, and graphical data representation. Parametric and nonparametric tests, correlation, regression, and spectroscopic/chromatographic techniques. Biochemical measurements, chemometric data analysis, multivariate analysis, and experimental design. Pharmaceutical data visualization and hands-on experience with UV-Vis spectroscopy and HPLC. Calculating pharmacokinetic parameters, pharmacodynamics, determining effective, toxic, lethal doses and therapeutic index.	15	2	1	1	Asst. Prof. Miroslav Sovrlić

## Students' knowledge assessment:

Students' knowledge assessment goes on during the whole semester and it includes points gained for attending lectures, completing practice work, term paper and progress tests as well as for the final written exam. The points can be gained according to the following model:

<b>Points</b>	
<b>Pre-exam requirements</b>	<b>60 points</b>
Taking progress tests	30 points
Writing a term paper	15 points
Doing practice work	15 points
<b>Exam requirements</b>	<b>40 points</b>
Written examination	40 points

In order to pass the exam, the student must achieve more than 50 percent of the points in all forms of teaching.

## Grades:

The student gains a final grade which describes the quality of his knowledge and the results achieved in the course. The interrelation between points and final grades are given in the following table:

<b>Num. achieved points</b>	<b>Num. grade</b>	<b>Definition</b>
0 – 50	5	UNSATISFACTORY
<b>51 – 60</b>	6	PASS
61 – 70	7	SATISFACTORY
71 – 80	8	GOOD
81 – 90	9	VERY GOOD
91 – 100	10	EXCELLENT

## LITERATURE:

Textbook	Authors	Publisher	Availability in the library
Pharmaceutical calculations 15 <sup>th</sup> Edition.	Howard C. Ansel	Lippincott Williams & Wilkins, 2012	YES
Handbook of modern pharmaceutical analysis (Vol. 10). Academic press; 2010.	Satinder Ahuja, Stephen Scypinski	Academic press, 2010	YES
Common errors in statistics ( <i>and how to avoid them</i> ).	Phillip I. Good, Hardin W. James	John Wiley & Sons, 2012.	YES
Discovering statistics using SPSS	Field A.	London: Sage, 2009.	YES
Handbook of pharmacology and toxicology	Slobodan M. Janković	Faculty of Medical Sciences, Kragujevac, 2021	YES

All lectures (powerpoint presentations) are available on the website of the Faculty of Medical science: [www.medf.kg.ac.rs](http://www.medf.kg.ac.rs)

# PROGRAM

<b>Lectures (2 classes)</b> Fundamentals of pharmaceutical calculations	<b>UNIT I (FIRST WEEK):</b> <b>Practice (1 classes)</b> Practice problems in pharmaceutical calculations	<b>Seminar (1 class)</b> The importance of accuracy in pharmaceutical calculations: Real-world implications
<b>Lectures (2 classes)</b> Pharmaceutical measurement. International system of units.	<b>UNIT II (SECOND WEEK):</b> <b>Practice (1 classes)</b> Practical applications of SI units in pharmaceutical measurements	<b>Seminar (1 class)</b> Evolution and standardization of pharmaceutical measurement systems
<b>Lectures (2 classes)</b> Fundamental expressions of concentration and physical properties of substances	<b>UNIT III (THIRD WEEK):</b> <b>Practice (1 classes)</b> Determination of density, specific gravity and concentration of pharmaceutical solutions	<b>Seminar (1 class)</b> Interpretation of concentration expressions in pharmaceutical practice
<b>Lectures (2 classes)</b> Measurement errors and uncertainty calculation	<b>UNIT IV (FOURTH WEEK):</b> <b>Practice (1 classes)</b> Estimation of errors in pharmaceutical measurements	<b>Seminar (1 class)</b> Types of measurement errors and their impact on data interpretation
<b>Lectures (2 classes)</b> Basic statistical methods and measures of dispersion	<b>UNIT V (FIFTH WEEK):</b> <b>Practice (1 classes)</b> Calculating mean, median, mode, range, standard deviation, variance, coefficient of variation	<b>Seminar (1 class)</b> Interpretation of dispersion measures in different datasets
<b>Lectures (2 classes)</b> Probability distributions (normal, poisson, and binomial distributions)	<b>UNIT VI (SIXTH WEEK):</b> <b>Practice (1 classes)</b> Using software for probability distributions and checking normality of a dataset	<b>Seminar (1 class)</b> Interpretation of graphs for checking normal distribution (histograms, Q-Q plots, box plots)
<b>Lectures (2 classes)</b> Graphical data representation	<b>UNIT VII (SEVENTH WEEK):</b> <b>Practice (1 classes)</b> Using software to create different types of graphs	<b>Seminar (1 class)</b> Interpretation of different types of graphs
<b>Lectures (2 classes)</b> Parametric and nonparametric tests (Independent and paired t-test, ANOVA, Mann-Whitney U, Wilcoxon Signed-Rank, Kruskal-Wallis, Test selection)	<b>UNIT VIII (EIGHT WEEK):</b> <b>Practice (1 classes)</b> Using software to perform parametric and nonparametric tests	<b>Seminar (1 class)</b> Interpretation of test results in real datasets

**Lectures (2 classes)**  
Correlation and regression  
(Pearson, Spearman,  
Regression line, Least squares  
method)

**UNIT IX (NINTH WEEK):**

**Practice (1 classes)**  
Using software to perform  
correlation and regression  
analysis

**Seminar (1 class)**  
Interpretation of correlation  
coefficients and regression  
results

**Lectures (2 classes)**  
Spectroscopic and  
chromatographic methods and  
measurements in pharmacy and  
data analysis

**UNIT X (TENTH WEEK):**

**Practice (1 classes)**  
UV-Vis spectroscopy and  
HPLC: Hands-on data  
collection and analysis

**Seminar (1 class)**  
Application of spectroscopy  
and chromatography in  
phytochemistry

**Lectures (2 classes)**  
Biochemical measurements

**UNIT XI (ELEVENTH WEEK):**

**Practice (1 classes)**  
Spectrophotometric  
determination of biomolecules

**Seminar (1 class)**  
Analytical techniques in  
biochemical measurements

**Lectures (2 classes)**  
Fundamentals of chemometric  
data analysis

**UNIT XII (TWELFTH WEEK):**

**Practice (1 classes)**  
Data visualization in  
pharmaceutical analysis

**Seminar (1 class)**  
Pharmaceutical research: From  
data to decision

**Lectures (2 classes)**  
Multivariate data analysis and  
experimental design in  
pharmaceutical analysis

**UNIT XIII (THIRTEENTH WEEK):**

**Practice (1 classes)**  
Experimental design and data  
analysis using MVA techniques

**Seminar (1 class)**  
Application of Principal  
Component Analysis (PCA) in  
pharmacy

**Lectures (2 classes)**  
Calculations of the basic  
parameters that determine drug  
absorption: area under the curve  
(AUC) and bioavailability

**UNIT XIV (FOURTEENTH WEEK):**

**Practice (1 classes)**  
Volume of distribution:  
calculation and practical  
implication

**Seminar (1 class)**  
Calculation of parameters that  
determine drug elimination:  
drug clearance, elimination  
half-time and the elimination  
rate constant

**Lectures (2 classes)**  
Pharmacodynamics and  
quantitative relationships  
underlying the actions of drugs

**UNIT XV (FIFTEENTH WEEK):**

**Practice (1 classes)**  
Calculation and estimation of  
effective doses, toxic doses and  
lethal doses

**Seminar (1 class)**  
Calculation of therapeutic  
index

## **SCHEDULE OF LECTURES & PRACTICE**

**FRIDAY**

**08.00-12.00**

Hall at the  
pediatric clinic



## LESSON SCHEDULE FOR THE COURSE PROCESSING THE MEASUREMENT RESULTS

week	form	course unit title	teacher
1	L	Fundamentals of pharmaceutical calculations	Asst. Prof. Miroslav Sovrlić
	P	Practice problems in pharmaceutical calculations	
	S	The importance of accuracy in pharmaceutical calculations: Real-world implications	
2	L	Pharmaceutical measurement. International system of units.	Asst. Prof. Miroslav Sovrlić
	P	Practical applications of SI units in pharmaceutical measurements	
	S	Evolution and standardization of pharmaceutical measurement systems	
3	L	Fundamental expressions of concentration and physical properties of substances	Asst. Prof. Jovica Tomović
	P	Determination of density, specific gravity and concentration of pharmaceutical solutions	
	S	Interpretation of concentration expressions in pharmaceutical practice	
4	L	Measurement errors and uncertainty calculation	Assoc. Prof. Milan Zarić
	P	Estimation of errors in pharmaceutical measurements	
	S	Types of measurement errors and their impact on data interpretation	
5	L	Basic statistical methods and measures of dispersion	Asst. Prof. Vladislava Stojić
	P	Calculating mean, median, mode, range, standard deviation, variance, coefficient of variation	Asst. Sara Mijailović
	S	Interpretation of dispersion measures in different datasets	
6	L	Probability distributions (normal, poisson, and binomial distributions)	Asst. Prof. Vladislava Stojić
	P	Using software for probability distributions and checking normality of a dataset	Asst. Sara Mijailović
	S	Interpretation of graphs for checking normal distribution (histograms, Q-Q plots, box plots)	
7	L	Graphical data representation	Asst. Prof. Vladislava Stojić
	P	Using software to create different types of graphs	Asst. Sara Mijailović
	S	Interpretation of different types of graphs	
	T	<b>PROGRESS TEST 1</b>	

## LESSON SCHEDULE FOR THE COURSE PROCESSING THE MEASUREMENT RESULTS

week	form	course unit title	teacher
8	L	Parametric and nonparametric tests (Independent and paired t-test, ANOVA, Mann-Whitney U, Wilcoxon Signed-Rank, Kruskal-Wallis, Test selection)	Asst. Prof. Vladislava Stojić
	P	Using software to perform parametric and nonparametric tests	Asst. Sara Mijailović
	S	Interpretation of test results in real datasets	
9	L	Correlation and regression (Pearson, Spearman, Regression line, Least squares method)	Asst. Prof. Vladislava Stojić
	P	Using software to perform correlation and regression analysis	Asst. Sara Mijailović
	S	Interpretation of correlation coefficients and regression results	
10	L	Spectroscopic and chromatographic methods and measurements in pharmacy and data analysis	Asst. Prof. Jovica Tomović
	P	UV-Vis spectroscopy and HPLC: Hands-on data collection and analysis	
	S	Application of spectroscopy and chromatography in phytochemistry	
11	L	Biochemical measurements	Assoc. Prof. Milan Zarić
	P	Spectrophotometric determination of biomolecules	
	S	Analytical techniques in biochemical measurements	
12	L	Fundamentals of chemometric data analysis	Asst. Prof. Miroslav Sovrlić
	P	Data visualization in pharmaceutical analysis	
	S	Pharmaceutical research: From data to decision	
13	L	Multivariate data analysis and experimental design in pharmaceutical analysis	Asst. Prof. Miroslav Sovrlić
	P	Experimental design and data analysis using MVA techniques	
	S	Application of Principal Component Analysis (PCA) in pharmacy	

## LESSON SCHEDULE FOR THE COURSE PROCESSING THE MEASUREMENT RESULTS

week	form	course unit title	teacher
<b>14</b>	<b>L</b>	Calculations of the basic parameters that determine drug absorption: area under the curve (AUC) and bioavailability	Asst. Prof. Miloš Milosavljević
	<b>P</b>	Volume of distribution: calculation and practical implication	
	<b>S</b>	Calculation of parameters that determine drug elimination: drug clearance, elimination half-time and the elimination rate constant	
<b>15</b>	<b>L</b>	Pharmacodynamics and quantitative relationships underlying the actions of drugs	Asst. Prof. Ana Pejčić
	<b>P</b>	Calculation and estimation of effective doses, toxic doses and lethal doses	
	<b>S</b>	Calculation of therapeutic index	
	<b>T</b>	<b>PROGRESS TEST 2</b>	
	<b>E</b>	<b>EXAM (June deadline)</b>	