האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

BIOMEDICAL SEPARATIONS - 64855

Last update 14-02-2016

HU Credits: *2*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *school of pharmacy*

Academic year: *0*

Semester: *2nd Semester*

Teaching Languages: *English*

Campus: *Ein Karem*

Course/Module Coordinator: *Dr Rachel Ta-Shma*

Coordinator Email: *rachelt@ekmd.huji.ac.il*

Coordinator Office Hours: *by appointment*

Teaching Staff:

Dr. Rachel Ta-Shma
Dr.

Course/Module description:
This course introduces up-to-date instrumental separation techniques suitable for medicinal and biological compounds, their theoretical background and the required equipment. The following Chromatographic methods will be reviewed: Gas chromatography, liquid chromatography (normal phase, reversed phase, ion-exchange, size exclusion), capillary electrophoresis

Course/Module aims:
The purpose of this course is to introduce students to modern instrumental separation techniques suitable for biological and medicinal research, so that they will be able to cope better with analytical problems they encounter in their research.

Learning outcomes - On successful completion of this module, students should be able to:
Evaluate the pros and cons of available separation methods to solve an analytical problem.
Determine what method of separation would be best suited to the problem.
Develop an analytical method, analyze the initial results obtained and conclude what needs to be improved and how.

Attendance requirements(%):
Full attendance

Teaching arrangement and method of instruction: Lectures and tutorials

Course/Module Content:
1. principle of chromatography.
2. Description of system for liquid chromatography (HPLC): system parts (pump and injection system, mixer, column, detector), preparing samples and solvents (filtering, degassing).
3. The stationary phases in NP and RP chromatography: chemical characteristics, particle size and shape, pore size, percent cover and quality, end capping.
4. A general overview of the types of chromtographic systems: TLC, HPTLC, Gas chromatography, SFC (super critical fluid chromatography), HPLC (reversed phase, normal phase, ion exchange chromatography, size exclusion, chiral)
5. How to choose, in advance, the right system for a certain separation.

6. Quantitative parameters used to measure the performance of the chromtographic system and its optimization (especially RP HPLC): the retention factor (ratio of capacity), selectivity, efficiency of the column (number of theoretical plates) and parameters that affect it (Van Deemter eqation), resolution, extra column effects, asymetry (tailing) and reasons, the effect of changing temperature.
7. The mobile phase: transparency, viscosity and toxicityof the mobile phase, changing the pH of the mobile phase, the addition of ion-pair reagents, isokratic vs gradient separation HIC chromatography.
8. Additional refinements of: HPLC: hydrophilic groups at the beginning of the alkyl chain, hybrid materials, HILIC chromatography, using very fine particles(< 2□m) and high pressure (UPLC), Fused-Core particles, monolithic columns.
9. Preperative chromatography (scaling up)
10. Sample preparation for chromatography using SPE (Solid phase extraction).
11. Types of detectors: UV-VIS and additional options with diode array (PDA), fluoresence detector, electrochemical detector, refraction index detector, light scattering detector and mass spectrograph detector (LC-MS).
12. quantitative analysis using HPLC: selectivity, sensitivity, detection limit, stability, linearity, sample rate and size of detectors. External and internal standards, correct integration of peaks.
13. ion exchange chromatography (IC).
14. Capillary electrophoresis.
15. Chiral chromatography (separation of enantiomers).
16. the separation and determination of molecular weight of polymers using GPC(Gel permeation, size exclusion)
17. Gas chromatography: system structure, types of coulmns, types of detectors, optimization of the separation. A brief overview of SFC.
18. Working with simulation software for separation and determination of mixtures in HPLC RP method.

Required Reading:
None

Additional Reading Material:

1. HPLC for pharmaceutical scientists / edited by Yuri Kazakevich, Rosario LoBrutto.

Hoboken, N.J. Wiley Interscience., 2007
QV 25 2007D 5601

2. "Fundamentals of analytical chemistry", 7th ed. 1996
Skoog, Douglas A., West, Donald M., Holler, F. James
Saunders College Pub.
QD 75.2 96D 5385

3. "High Performance Liquid Chromatography", 2nd ed., 1992. Lindsay, Sandie.
QD 79 92D 5376 תירגול הכולל עצמי ללימוד טוב ספר

4. “Practical HPLC method development”,2nd ed. 1997
Lloyd R. Snyder, Joseph J. Kirkland, Joseph L. Glajch.
QD 431 97D 5301

5. "Modern Practice of Gas Chromatography", 2nd ed. 1985
Grob, Robert L.
QD 79 85D 5848

6. "Basic Liquid Chromatography", 1971, Hadden, N.
QD 272 76D 5004

7. “Unified Separation Science”, 1991, Giddings L.C. QD 63 91D 5076

Course/Module evaluation:
End of year written/oral examination 90 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 5 %
Assignments 5 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:
Open for 3rd year pharmacy students