

PHC 427

Course Specification

Internal Quality Assurance Arrangements

Institution: King Saud University
College/Department: College of Pharmacy/Department of Pharmaceutical Chemistry

A Course Identification and General Information

1. Course title and code: Pharmaceutical Instrumental Analysis / PHC 427
2. Credit hours: 4 (3 +1)
3. Program(s) in which the course is offered: B.Sc.
4. Name of faculty member responsible for the course: To be announced
5. Level/year at which this course is offered: Level 9
6. Pre-requisites for this course: PHC 313
7. Co-requisites for this course: NA
8. Location if not on main campus:

B Objectives

By the end of the course the student will have mastered the following knowledge and skills:

- The student will be able to check the feasibility of the electrochemical methods of analysis.
- The student will be able to check the feasibility of the atomic absorption and emission spectrophotometry.
- The student shall be able to obtain the atomic spectrum of the some elements, excitation and emission spectra and the skills for application in pharmaceutical analysis.

- The student will have the basic methodology and the skills to perform polarimetric and refractometric analysis of pharmaceutical compounds.
- The student will have the knowledge on the instrumentation of HPLC, skills to operate the instrument, profession to apply the instrument in separation and analysis of different pharmaceutical compounds.
- The student will have the knowledge on the instrumentation of gas chromatography, skills to operate the instrument, profession to apply the instrument in separation and analysis of different pharmaceutical compounds.
- The student will have the knowledge on the instrumentation of capillary electrophoresis, skills to operate the instrument, profession to apply the instrument in separation and analysis of different pharmaceutical compounds.
- The student will have the basic methodology and have the skills to perform immunoanalytical method and its application to pharmaceutical compounds.

C. Course Description

<p>يختص هذا المقرر بالتحليل الآلي للمركبات الصيدلانية.. يشمل المقرر الطرق المختلفة للتحليل الآلي. يقدم المقرر بشكل تكاملي بين الدروس النظرية و العملية التطبيقية لدراسة كل طريقة من طرق التحليل من حيث المفاهيم الأساسية للتحليل والتعريف بمكونات جهاز التحليل ووظيفة كل مكون وطريقة العمل على جهاز التحليل واستخداماته في المجالات المختلفة من التحليل الصيدلي.</p>
<p>The course is designed to give pharmacy students an overview of the various modern instrumental analytical techniques used in the pharmaceutical research and industry. Basic principles, components, and operation of each technique will be presented in an integrative lecture and laboratory sessions.</p>

PHC 427 (Pharmaceutical Instrumental Analysis) LECTURES' OUTLINE

Week	Lecture number	Date	Topic
1	1		Electrochemical methods Principles and instrumentation of potentiometric analysis
	2		Sign conventions for electrode processes, and application to determination of K_{eq} , K_{sp} , K_a and K_b .
	3		Principles and instrumentation of polarographic analysis.

2	4	Features of polarographic wave: diffusion current and Ilkovic equation.
	5	Atomic absorption and emission spectrophotometry Principles of atomic absorption spectrophotometry
	6	Instrumentation of atomic absorption spectrophotometry
3	7	Quantitative analysis by of atomic absorption spectrophotometry
	8	Principles of atomic emission spectrophotometry
	9	Instrumentation of atomic emission spectrophotometry.
4	10	Applications of atomic emission spectrophotometry
	11	Optical methods Polarization of light, theory and instrumentation of polarimetric analysis.
	12	Applications of polarimetry in pharmaceutical analysis
5	13	Theory and instrumentation of refractometric analysis.
	14	Applications of refractometry
	15	Molecular emission spectrophotometry Theory of light emission
6	16	Fluorescence and phosphorescence
	17	Chemical structure and fluorescence
	18	Instrumentation of fluorometry
7	19	Applications of fluorometry in direct analysis of fluorescent compounds
	20	Applications of fluorometry in non-fluorescent compounds after their derivatization
	21	Immunoanalytical methods Principles of immunoassay
8	22	Immunoanalytical reagents
	23	Separation matrices in immunoassays
	24	Designs, formats, and types of immunoassays
9	25	Detection systems used in immunoassays
	26	Instrumentation of immunoassay.
	27	Specific features of quantitative analysis by immunoassay.
10	28	Applications of immunoassays
	29	High performance liquid chromatography (HPLC) Analytical features of HPLC
	30	Stability-indicating methods of assay.

11	31		Chiral separation of pharmaceutical compounds
	32		Chiral separation of pharmaceutical compounds
	33		Separation and quantification of related substances
12	34		External and internal standard methods for quantitation by HPLC
	35		Gas Chromatographic The thermodynamic of gas chromatography.
	36		The dynamics of gas chromatography.
13	37		Instrumentation of gas chromatography.
	38		Application of gas chromatography.
	39		Capillary electrophoresis Principles and instrumentation of capillary electrophoresis.
14	40		Choice of optimum conditions for electrophoretic resolution.
	41		Modes of electrophoretic separation of compounds.
	42		Applications of capillary electrophoresis in pharmaceutical analysis.

PHC 427 Laboratory Project's Outline

Week	Topic	Project
1	Electrochemical methods	<ul style="list-style-type: none"> ▪ Non-aqueous potentiometric titrations
2	Electrochemical methods	<ul style="list-style-type: none"> ▪ Polarographic determination of cadmium ions.
3	Atomic absorption spectrophotometry	<ul style="list-style-type: none"> ▪ Determination of sodium ions
4	Flame photometry	<ul style="list-style-type: none"> ▪ Determination of calcium ions
5	Optical methods	<ul style="list-style-type: none"> ▪ Polarimetric determination of D-glucose ▪ Polarimetric determination of L-ascorbic acid ▪ Refractometric determination of paraffin oil
6	Fluorometric analysis	<ul style="list-style-type: none"> ▪ Fluorescence spectra of ofloxacin and analysis of its tablets. ▪ Analysis of salicylic acid in ointment.
7	Practical Exam-1	
8	Immunoanalytical methods	<ul style="list-style-type: none"> ▪ Competitive immunoassay for theophylline

9	Immunoanalytical methods	▪ Non-competitive immunoassay for digoxin
10	High pressure liquid chromatography (HPLC)	▪ Factors affecting the separation using HPLC. ▪ Calculation of capacity factor, No. of theoretical plates and resolution factor.
11	High pressure liquid chromatography (HPLC)	▪ Determination of amoxicillin by external and internal standard methods
12	Gas Chromatography	Gas chromatographic separation of some anaesthetics.
13	Capillary electrophoresis	Electrophoretic separation of anti-cough drugs
14	Practical Exam-2	

2 Course components (total contact hours per semester):			
Lecture: 42	Tutorial: NA	Practical/Fieldwork/Internship: NA	Other: 14 Lab.

3. Additional private study/learning hours expected for students per week. NA

4. Development of Learning Outcomes in Domains of Learning. NA
a. Knowledge
(i) Description of the knowledge to be acquired
(ii) Teaching strategies to be used to develop that knowledge 1- Lectures 2- Labs 3- Assignments
(iii) Methods of assessment of knowledge acquired 1- Exams 2- Quizzes 3- Assignments
b. Cognitive Skills: NA

c. Interpersonal Skills and Responsibility: NA
d. Communication, Information Technology and Numerical Skills: NA
e. Psychomotor Skills (if applicable): NA

5. Schedule of Assessment Tasks for Students During the Semester	
COURSE EVALUATION:	
<u>Continuous Assessment:</u>	
First Assessment Test	15%
Second Assessment Test	10%
Term Activity*	10%
Laboratory Test	10%
Final Laboratory Test	15%
Total	60%
<u>Final Examination:</u>	
Final Paper test	40%
Total Marks	100%

D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)
1- Faculty web-page with communication tolls.
2- 2 office hours
3- Lab assistance (Lab technician)

E. Learning Resources

1. Required Text(s): NA
2. Essential References: NA
3- Recommended Books and Reference Material:
❖ Instrumental Methods of Chemical Analysis, Galen Ewing. 5 th Edition. McGraw-Hill, New York (1985).
❖ Instrumental Analysis, Gary D. Christian and James E O'Reilly, 2 nd ed. Printice Hall, New York (1986).
❖ A Textbook of Pharmaceutical Analysis, Kenneth Counors. John Wiley & Sons, New York (1997).

4- Electronic Materials, Web Sites etc. NA
5- Other learning material such as computer-based programs/CD, professional standards/regulations NA

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (ie number of seats in classrooms and laboratories, extent of computer access etc.)
1. Accommodation (Lecture rooms, laboratories, etc.) 1- Lecture room 2- Lab
3. Other resources NA

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching 1- Students evaluation in each semester 2- Meeting with students 3- e-suggestions 4- Open door policy
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department 1- Self evaluation 2- Peer review 3- Annual outsider review 4- Conducting research
3 Processes for Improvement of Teaching 1- Studying reports 2- Training of faculty. 3- Exchanging faculty between different institutions
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution) 1- Taking a sample of assignments and exams to determine validity and reliability
5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. 1- Collecting all reports and evaluations at the end of the year for a reviewing purpose. 2- Conducting a workshop to presents finding of reports and evaluation to share knowledge. 3- Reviewing results of reports and evaluations with outside reviewers

