

SYLLABUS:

Date / Revision 23 May 2015 / 02 May 2017 / PP
Faculty Life Sciences (LS)
Study Program Chemical Engineering (CHE), Food Technology (FTE)

SUBJECT: Analytical Chemistry

1 Basic Information

1.01	Subject Name	Analytical Chemistry
1.02	Semester	3
1.03	Level	1
1.04	SKS	2
1.05	Mandatory / Curriculum	D-02
1.06	Subject Code	ANCH
1.07	Subject Code	CHE- D-LS-117
1.08	Year	2017 (7)
1.09	Quality Control	Final Test, OFSE, see evaluation
1.10	Limitations	Min 12 and Max 32 students in one class
1.11	Combined with	Food Technology (FTE) and Chemical Engineering (CHE)
1.12	Pre-requisite	Chemistry, Chemistry Laboratory
1.13	Responsible	Dr. Tutun Nugraha
1.14	Revision	15-05-2017/pp

2 Description of Subject

This Analytical Chemistry course is designed for students who are majoring in the faculty of life Sciences particularly in Food Technology and Chemical. This course assumes that an adequate degree of understanding in Chemistry added by some experience of its application in the chemistry laboratory already exist. This course will study in detail the analytical process including the techniques and methods used to isolate and quantify specific analytes in samples of materials, followed by its characterization through the use of various chemical methods. Major topics that will be discussed in this course include sample preparation, chemical equilibrium, titrations, electrochemistry, spectrophotometry, spectrometry and separations for purifications. This course will focus on the quantitative procedures of measurement using chemical and instrumental methods in order to compare analysis to theoretical information obtained from equilibrium and stoichiometry using statistical methods.

3

Objectives

This course introduces students into the science of chemical analysis as well as the related instrumentations that are utilized in the analysis. Furthermore, students will also be introduced into the mathematical/statistical analysis to finally come up with relevant information for final reporting required in such analysis. This course will further be supplemented by practical course in analytical chemistry laboratory.

4

Competency

Through this subject students will understand various concepts relevant to analytical chemistry which includes

- The general principle of Analytical Chemistry including the principles of basic chemistry that are involved
- Measurement techniques and instruments that are involved in the process.
- The link between fundamental concepts in chemistry to the techniques developed to carry out analysis will be emphasized.
- Critical thinking and logic are needed particularly when they need to select and design the most appropriate route of analysis for any particular application in the field.

5

Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/presentations

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Evaluation

5.1	Absence maximum	25%
5.2	Participation in Discussion	5 Points
5.3	Homework / Classwork	15 Points
5.4	Presentation /Simulation	-
5.5	Daily Quiz	20 Points
5.6	Final Examination	60 Points
	Total	100 Points

7 Text Book and Reference

1	Main Text Book: <ul style="list-style-type: none"> Fundamentals of Analytical Chemistry, Skoog, West, Holler, and Crouch, Brooks/Cole, Cengage Learning, Cengage technology Edition
2	Supplement Textbooks:

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1	Introduction to Analytical Chemistry <ul style="list-style-type: none"> What is analytical Chemistry Approach to the Study of Analytical Chemistry The role of Analytical Chemistry in research and in Industry Random Errors in Chemical Analysis and the role of Statistics 	Skoog, West, Holler, Crouch, Chapter 1, 5, 6	1 x 2 x 50 minutes
2	Titrations in analytical Chemistry and principles of calculations <ul style="list-style-type: none"> Neutralization titrations in acid base system Titration curves Complexations and Precipitation reactions Applications of titrations 	Skoog, West, Holler, Crouch, Chapter 13, 14	1 x 2 x 50 minutes
3	Titrations in analytical Chemistry and principles of calculations <ul style="list-style-type: none"> Complexations and Precipitation reactions Organic Complexing agents EDTA titration curves Applications of titrations 	Skoog, West, Holler, Crouch, Chapter 15, 16, 17	1 x 2 x 50 minutes
4,5	Gravimetry Analysis <ul style="list-style-type: none"> Introduction Stoichiometry and precipitation in gravimetry analysis Techniques in gravimetry Application of gravimetry and Calculations in gravimetry analysis 	Skoog, West, Holler, Crouch, Chapter 12	2 x 2 x 50 minutes
6,7	Electrochemical Methods <ul style="list-style-type: none"> Review of principles of electrochemistry Redox Titration curves Oxidation reduction titrations Potentiometry and potentiometer titrations Electrogravimetry and Coulometry Voltametry 	Skoog, West, Holler, Crouch, Chapter 6	2 x 2 x 50 minutes
8	MIDTERM SEMESTER BREAK		

9, 10	Separations techniques <ul style="list-style-type: none"> • Introduction to analytical separations • Separations by precipitation • Separation by distillation • Separation by extraction • Separation by ion exchange • Chromatographic separation techniques 	Skoog, West, Holler, Crouch, Chapter	2 x 2 x 50 minutes
11,12	Spectrochemical Analysis <ul style="list-style-type: none"> • Introduction to spectrochemical Methods • Electromagnetic radiations • Absorption of radiation • Deriving Beer's law • Instruments for Optical Spectrometry Molecular absorption spectrometry <ul style="list-style-type: none"> • Ultraviolet and Visible absorption spectrometry • Infra-red Absorption spectrometry • Fluorescence Spectrometry 	Skoog, West, Holler, Crouch, Chapter 24, 25, 26, 27	2 x 2 x 50 Minutes
12	Atomic Spectroscopy <ul style="list-style-type: none"> • Introduction • Atomic Emission Spectrometry • Atomic Absorption Spectrometry • Atomic Fluorescence Spectrometry • Instruments in atomic Spectrometry 	Skoog, West, Holler, Crouch, Chapter 28	1 x 2 x 50 Minutes
13	Mass spectrometry <ul style="list-style-type: none"> • Principles of Mass spectrometry • Mass Spectrometer • Atomic mass spectrometry • Molecular mass Spectrometry 	Skoog, West, Holler, Crouch, Chapter 29	1 x 2 x 50 minutes
14	Gas Chromatography <ul style="list-style-type: none"> • Instruments for gas Chromatography • Chromatographic column & stationary phase • Gas chromatography/mass spectrometry 	Skoog, West, Holler, Crouch, Chapter 32	1 x 2 x 50 minutes
15	Liquid Chromatography <ul style="list-style-type: none"> • Introduction to liquid chromatography • Instrumentations • Liquid Chromatography/mass spectrometry (LC/MS) and LC/MS/MS • Partition chromatography • Ion Chromatography • Size exclusion chromatography 	Skoog, West, Holler, Crouch, Chapter 32	1 x 2 x 50 minutes
16, 17	Final Examination		