

## SYLLABUS:

<b>Date / Revision</b>	23 May 2015 / 02 May 2017 / PP
<b>Faculty</b>	Life Sciences (LS)
<b>Study Programs</b>	Biomedical Engineering (BME), Chemical Engineering (CHE), Food Technology (FTE)

## SUBJECT: Chemistry Laboratory

### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Chemistry Laboratory</b>
<b>1.02</b>	<b>Semester</b>	2
<b>1.03</b>	<b>Level</b>	1
<b>1.04</b>	<b>SKS</b>	1
<b>1.05</b>	<b>Mandatory / Curriculum</b>	D-02
<b>1.06</b>	<b>Subject Code</b>	CHEM
<b>1.07</b>	<b>Subject Code</b>	BME-FTE-CHE-D-LS-117
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, OFSE, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	All Faculty of Life Sciences Students
<b>1.12</b>	<b>Pre-requisite</b>	Chemistry
<b>1.13</b>	<b>Responsible</b>	Dr. Tutun Nugraha
<b>1.14</b>	<b>Revision</b>	15-05-2017/pp

### 2 Description of Subject

In the chemistry laboratory, students will examine, test, and establish for themselves the chemical principles studied in class and from text-books. The students will collect experimental data, compile them and process these data accordingly to make it suitable for reporting as well as for drawing conclusion out of the data. They will use their reasoning to draw logical conclusions about the meaning of these data.

### 3 Objectives

Chemistry is one of the fundamental courses that are required for all Life Sciences students. Chemistry will become the fundamentals for many of the more intermediate and applied courses to be given in the upper years in the curriculum. This laboratory work in chemistry will strengthen and deepen student knowledge in chemistry while at the same time build new skills and experiences in practical chemistry.

### 4 Competency

After having the course, students are expected to:

- Demonstrate the ability to make scientific predictions of natural phenomena using chemical concepts learned in the lab based on concepts in fundamental chemistry which are given in classroom
- Develop skills in collecting and managing data in order to express their results in a precise and reliable quantitative or qualitative form on lab reports
- Apply chemical concepts to draw logical conclusions about the applicability of data to real world problems
- Develop teamwork skills that include not only the efficient acquisition of experimental data but also the awareness of safety in the laboratory setting
- Develop capability to write scientific report in the field of chemistry

### 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

### 6 Evaluation

5.1	<b>Absence maximum</b>	25%
5.2	<b>Participation in Discussion</b>	-
5.3	<b>Homework / Classwork/Report</b>	30
5.4	<b>Presentation /Simulation</b>	-
5.5	<b>Daily Quiz</b>	10
5.6	<b>Final Examination</b>	60 Points
	<b>Total</b>	100 Points

## 7 Text Book and Reference

<b>1</b>	<b>Main Text Book:</b> Chemistry, Steven S. Zumdahl, Susan A. Zumdahl, 9th Edition, ISBN-13: 978-1133611097, Brooks Cole (Cengage), 2013 Estimated Price of Book: Rp 400,000,-
<b>2</b>	<b>Supplemental Textbooks:</b> Chemistry, 6th Edition, International Student dan Lecture Version James E. Brady, Neil D. Jespersen, Alison Hyslop, John Wiley & Sons

## 8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	<b>Introduction</b> <ul style="list-style-type: none"> <li>In this meeting students will receive instruction on regulations including schedule, safety regulations, Lab journal book, Lab reports, Lab safety</li> <li>Some discussion on the importance of significant figures are also given</li> </ul>	Safety lecture, safety video	3 × 50 min
2	<b>Basic Laboratory Measurements and Skills</b> <ul style="list-style-type: none"> <li>Introduction to measurements, introduction to laboratorium apparatus and safe use of the laboratory</li> <li>Students will learn to read apparatus such as burette, pipetor, weighing of chemicals, mixing and heating</li> <li>Students will create solutions of different concentrations, or different pH and performing calculations in chemistry including basic stoichiometry to support the activity described above</li> </ul>	Zumdahl (Review Chapter on Acid and Bases )	3 × 50 min
3	<b>Electrolytes and Non-electrolytes</b> <ul style="list-style-type: none"> <li>In this experiment, several different types of solutions will be tested for its electrical conductivity and these solutions will be grouped into electrolyte and non-electrolyte types of solutions.</li> <li>Students will also learn to create solutions of salts at a designated concentrations to be used in the tests, including its calculations, weighing and safe handling of the chemicals.</li> </ul>	Chemistry Lab Manual Zumdahl (Chapter 2, 3 and 4)	3 × 50 min
4	<b>pH Scale, pH indicators, and acid/base calculations</b> <ul style="list-style-type: none"> <li>In this experiment, students will learn to Create a solution of acids and bases in various concentrations and link these concentrations to their pH value</li> <li>Students will also learn to use of indicator papers (color based) for pH</li> <li>Furthermore, students will also be measuring the pH of the solution using electronic portable pH meter and compare the results with the previous method</li> </ul>	Chemistry Lab Manual Zumdahl Chapter 14, 15	3 × 50 min
5	<b>Post Lab discussion</b>		3 × 50 min

6	<p><b>pH Indicator and acid/base titration</b></p> <ul style="list-style-type: none"> <li>In this experiment, students will learn to use pH indicator utilizing color indicator such as phenolphthalein and link it to the activity of titration</li> <li>Students will see that when the indicator is put into the solution, the solution will change color in accordance with the specification of the indicator</li> <li>Student will learn to tie up the phenomena they observe in the lab with chemical reactions that are taking place and must provide explanation and discussion in their report</li> <li>Strong acid and strong base are used</li> </ul>	Chemistry Lab Manual Zumdahl Chapter 13, 14, and 15	3 × 50 min
7	<p><b>Chemical Equilibrium and weak acid titration with strong base</b></p> <ul style="list-style-type: none"> <li>This experiment couples the concept of chemical equilibrium and the concepts of weak acid/base titration</li> <li>Students will perform titration and will have to determine the end point of titration using both pH indicator and pH meter to decide the end point</li> <li>Students will then learn to use this data to determine the value of equilibrium constant for weak acid that was used in the titration</li> <li>Graphical method is involved in this experiment, thus the students will also learn to use computer software such as Microsoft Excel to create the appropriate graph</li> </ul>	Chemistry Lab Manual Zumdahl Chapter 13, 14, and 15	3 × 50 min
8	<b>Midterm break</b>		
9	Post lab Discussion		3 × 50 min
10	<p><b>Stoichiometry of chemical reactions and basic gravimetry</b></p> <ul style="list-style-type: none"> <li>In this experiment students will study the reactions between Sodium hydroxide (NaOH) with copper (II) sulphate (CuSO<sub>4</sub>).</li> <li>This reaction will produce precipitate that can be filtered and trapped for further drying and weighing</li> <li>Based on the weight of the precipitate students can compare the experimental data with stoichiometric calculation that they performed before the experiment</li> <li>Basic methodology in gravimetry analysis will also be given in this experiment</li> </ul>	Chemistry Lab Manual Zumdahl Chapter 9, 10 and 11	3 × 50 min
11	<b>Post lab discussion</b>		
12	<p><b>Thermochemistry</b></p> <ul style="list-style-type: none"> <li>In this experiment, student will learn the phenomena of exothermic reaction in the process of dissolution of NaOH in water</li> <li>Students will dissolve different amount of NaOH crystal in deionized water and measure the changes in temperature of the solution as the NaOH is dissolved</li> <li>Students will then make a plot of the changes of temperature against time and see the increase in temperature until final condition is achieved (resolution 0.1°C)</li> <li>Students will then have to calculate the heat of dissolution in Joule/mol</li> <li>In the process students will also learn the basic principle of a calorimetric measurement system</li> </ul>	Chemistry Lab Manual Zumdahl Chapter 6	3 × 50 min

13	Post lab Discussion		3 × 50 min
14	<b>Voltaic Cell</b> <ul style="list-style-type: none"> <li>In this experiment student will apply the principles of electrochemistry into practice</li> <li>Students will learn to make a voltaic cell made of solutions of salts connected with a salt bridge</li> <li>Students will make measurement of the voltage accross the cell</li> </ul>	Chemistry Lab Manual Zumdahl Chapter 18	3 × 50 min
15	Post lab Discussion		3× 50 min
16, 17	<b>Final Examination</b>		