

Course Syllabus

1. **Course Title:** Experiments on Environmental Analytical Chemistry

2. **Course Code:** EOAC316710

3. **Credit Units:** 1 credits (0/1/2) (0 units of theory/ 1 unit of practice/ 2 units of self-study)

Duration: 5 weeks (0 hours of theory+6 hours of practice, and 12 hours of self-study per week)

4. **Course Instructors:**

1 / Dr. Phan Thi Anh Dao

2 / Dr. Ho Thi Yeu Ly

5. **Course Requirements:**

Prerequisite courses: None

Parallel courses: Environmental Analytical Chemistry.

6. **Course Description:**

The course provides students the knowledge and analytical skills, chemical preparation, to equipment and assessment of physical and chemical properties in water.

7. **Course goals**

Goals	Goal description	Programme Expect learning outcome ELOs
G1	Fundamental knowledge in the field of quantitative practice by chemical methods: laboratory safety, use of measuring instruments, chemical preparation, calibration technique, and determination of differential points, calculation of results, Data management, and evaluation of results.	ELO2
G2	Practise calculation, present, plot, explain the results and the phenomenon in the experiment.	ELO5 ELO8
G3	Practise team-work skill; Communicate though written report.	ELO9,ELO10

8. **Course Learning Outcomes (CLOs)**

CLOs	CLO Description	Programme ELOs
G1	CLO1 Explain the approach and methodology of the subject	ELO2
	CLO2 Demonstrate the principle of discoloration during calibration. Acid-base titration, redox, precipitate and complex.	

	CLO3	Apply formulas and conversion of concentrations into mixing practice and determination of concentration.	
G2	CLO4	Perform accurate operation, meticulous during the experiment.	ELO5
	CLO5	Demonstrate honesty in experiments's reporting as well as in scientific research.	ELO8
G3	CLO6	Work in team	ELO9
	CLO7	Communicate effectively though final report.	ELO10

9. Learning Resources

- Textbooks:

1. Textbook of experiments on environmental analytical chemistry, Environmental technology Department, HCMC University of Technology and Education.

- References:

[1]. 2005, HCMUT, Textbook of analytic environmental engineering chemistry.

[2] Clair N. Sawyer, **Chemistry for environmental Engineering**, McGraw – Hill, 4th, 1994. Udo Wiesmann, Fundamentals of Biological Wastewater Treatment, WILEY-VCH, 2007.

10. Student assessment:

- Grading scale: **10**

- Assessment plan:

Type	Content	Timeline	Assessment method	CLOs	Rate (%)
Subtest					25
BT#1	Calculate the amount needed to get the chemical preparation	Week 1	Small questions in class	CLO2 CLO3 CLO4	5
BT#2	Purpose, principles and procedures for the determination of NaOH and H3PO4	Week 2	Small questions in class	CLO2 CLO3 CLO4	5
BT#3	Purpose, principles, and procedures for the determination of Na2CO3, NaOH and Na2CO3 mixtures	Week 3	Small questions in class	CLO2 CLO3 CLO4	5

BT#4	Purpose, principles, how to determine KMnO_4 and Fe^{2+}	Week 4	Small questions in class	CLO2 CLO3 CLO4	5
BT#5	Purpose, principles, and procedures for the determination of $\text{Na}_2\text{S}_2\text{O}_3$ and Cu^{2+}	Week 5	Small questions in class	CLO2 CLO3 CLO4	5
Essay - Report					15
BL #1	Report process of experiments, results, all exercises of experiments.	Week 5	Report	CLO4 CLO5 CLO6 CLO7	35
Final exam					50
	The content covers all of course outcomes.		Writing / practical test	CLO1 CLO2 CLO3 CLO4 CLO5	50

11. Course Content:

Week	Contents	CLOs
1	Unit 1: Laboratory Safety Guiding the Use of Chemical Blends Unit 2: Standard oxalic acid, determine the concentration of NaOH solution and H_3PO_4 solution (0/6/12)	
	A/ Teaching content in classroom (6) 1.1 Laboratory regulations 1.2. First aid in the laboratory 1.3. Things to keep in mind when working in quantitative analytical laboratories 1.4. How to use some glassware 1.5. How to clean the glassware 1.6. Manipulation of chemicals 2.1. Determine the concentration of NaOH solution 2.2. Determine the concentration of H_3PO_4 solution	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7

	<p>Summary of teaching methodology:</p> <ul style="list-style-type: none"> + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report 	
	<p>B/ Self-study content (12)</p> <p>The contents of home self-study</p> <ul style="list-style-type: none"> + Do the report + Prepare the test lesson for the next class. 	<p>CLO1</p> <p>CLO2</p> <p>CLO3</p> <p>CLO4</p> <p>CLO5</p> <p>CLO6</p> <p>CLO7</p>
2	<p>Unit 3: Dilute 0.1 N HCl - Determine the concentration of a solution of Na₂CO₃ and a mixture of NaOH and Na₂CO₃ (0/6/12)</p>	
	<p>A/ Teaching content in classroom (6)</p> <p>3.1. Determination of Na₂CO₃ solution concentration</p> <p>3.2. Determine the concentration of a mixture of NaOH and Na₂CO₃</p> <p>Summary of teaching methodology:</p> <ul style="list-style-type: none"> + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report 	<p>CLO1</p> <p>CLO2</p> <p>CLO3</p> <p>CLO4</p> <p>CLO5</p> <p>CLO6</p> <p>CLO7</p>
	<p>B/ Self-study content (12)</p> <ul style="list-style-type: none"> + Do the report + Prepare the test lesson for the next class. 	<p>CLO1</p> <p>CLO2</p> <p>CLO3</p> <p>CLO4</p> <p>CLO5</p> <p>CLO6</p> <p>CLO7</p>
3	<p>Unit 4: Preparation of KMnO₄ solution, determination of KMnO₄ solution equilibrium with H₂C₂O₄, determination of Fe²⁺ + content (0/6/12)</p>	
	<p>A/ Teaching content in classroom (6)</p> <p>4.1. Determine the concentration of KMnO₄ solution</p> <p>4.2. Determination of Fe²⁺ + concentration</p>	<p>CLO1</p> <p>CLO2</p> <p>CLO3</p>

	<p>Summary of teaching methodology:</p> <ul style="list-style-type: none"> + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report 	<p>CLO4 CLO5 CLO6 CLO7</p>
	<p>B/ Self-study content (12)</p> <ul style="list-style-type: none"> + Do the report + Prepare the test lesson for the next class. 	<p>CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7</p>
4	<p>Unit 5: Preparation of Na₂S₂O₃ solution, determination of Na₂S₂O₃ solution standard, determination of Cu²⁺ by iodine method (0/6/12)</p>	
	<p>A/ Teaching content in classroom (6)</p> <p>5.1. Determine the concentration of Na₂S₂O₃ solution 5.2. Determination of Cu²⁺ by iodine method</p> <p>Summary of teaching methodology:</p> <ul style="list-style-type: none"> + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report 	<p>CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7</p>
	<p>B/ Self-study content (12)</p> <ul style="list-style-type: none"> + Do the report + Compare the effectiveness of models 	<p>CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7</p>
	<p>Unit 6: Prepare NaCl solution, determine Cl⁻ by precipitation.</p> <p>Unit 7: Determination of water hardness and Al³⁺ by complexon method (0/6/12)</p>	
5	<p>A/ Teaching content in classroom (6)</p> <p>6.1. The mohr method identifies Cl⁻ 6.2. The adsorption indicator method determines Cl⁻</p>	<p>CLO1 CLO2 CLO3</p>

	7.1. Determination of water hardness 7.2. Determine Al ³⁺ Summary of teaching methodology: + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report	CLO4 CLO5 CLO6 CLO7
	B/ Self-study content (12) + Do the report + Prepare the test lesson for the next class.	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7

12. Learning Ethics:

- Students study seriously and follow the instructions of experiments.
- Strictly implement the rules laboratories.
- Students who do not complete the task, banned exam.
- In case of the detection of students who replace the others in the exam, all of them will be suspended or leaved the learning program.

13. Date of first approval: August 1st, 2012

14. Approved by:

Dean

Head of Department

Compiler

A/Prof. Nguyen Van Suc

MSc Nguyen Thi Minh Nguyet

Dr. Nguyen My Linh

15. Date and Up-to-date content

1st time: Date: 2015 - Update content and structure of the programme adjusted in: Updated content of Experiments on environmental analytical chemistry.	Instructor: Head of Department:
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