Course Syllabus

1. **Course Title:** Experiments on Wastewater Treatment
2. **Course Code**: EOWT326510
3. **Credit Units:** 2 credits (0/2/6) (0 units of theory/ 2 unit of practice/ 6 units of self-study)

   Duration: 6 weeks (0 hours of theory+10 hours of practice, and 20 hours of self-study per week)
4. **Course Instructors:**

   1 / Dr. Nguyen My Linh

   2 / Dr. Nguyễn Thái Anh
5. **Course Requirements:**

   Prerequisite courses: None

   Previous courses: Experiments on Environmental Chemical Engineering

   Parallel courses: Wastewater treatment.
6. **Course Description:**

   The basic knowledge of physical, chemical, biological methods in wastewater treatment is reinforced after course. Students operate the wastewater treatment systems, such as activated sludge, color adsorption, SBR, MBR, sedimentation, ...
7. **Course goals**

Goals	Goal description	Programme ELOs
G1	Specialized knowledge in the field of wastewater treatment.	ELO3
G2	Practise calculation, present, plot, explain the results and the phenomenon in the experiment.	ELO5, ELO8
G3	Practise team-work skill.	ELO9
G4	Deploy the design and operation of supply water treatment systems in reality.	ELO15

8. Course Learning Outcomes (CLOs)

CLOs		CLO Description	Programme ELOs
G1	CLO1	Summarize the principles and technical process of chemicals and equipment using in wastewater treatment.	ELO3
	CLO2	Interpret the theory of supply wastewater treatment methods learned.	
G2	CLO3	Operate several supply wastewater treatment models.	ELO5
	CLO4	Evaluate experiments's result.	
	CLO5	Perform a precise, meticulous manual in experiments.	
	CLO6	Demonstrate honesty in experiments's reporting as well as in scientific research.	ELO8
G3	CLO7	Work in team	ELO9
G4	CLO8	Deploy the design and operation of wastewater treatment systems in reality.	ELO15

9. Learning Resources

- Textbooks:

1. Textbook of experiments on wastewater treatment, Environmental technology Department, HCMC University of Technology and Education.

- References:

1. Lam Minh Triet, Microorganism and wastewater, Construction Publishing House, 2006
2. Trinh Xuan Lai, Industrial wastewater treatment, Construction Publishing House, 2009
3. Tomonori Matsuo, Advances in water and wastewater treatment technology, Elsevier Science B.V., 2001.
4. 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					**15**
BT#1	Summarize and present document of experiments on wastewater treatment before class.	Weeks 2-5	Small questions in class	CLO1 CLO2	15
Essay - Report					**35**

BL #1	Report process of experiments, results, all exercises of experiments.	Week 6	Report	CLO4 CLO5 CLO6 CLO7 CLO8	35
Final exam					**50**
	The content covers all of course outcomes.		Wtiting / practical test	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8	50

11. Course Content:

Week	Contents	CLOs
1	**Unit 1: PHYSICAL-CHEMICAL METHOD IN WASTEWATER TREATMENT (0/20/40)**	
	A/ Teaching content in classroom :(10) **Content** 1.1. Theory of coagulation and flocculation 1.2. By wastewater flocculation system alum / polymer anion 1.3. Coagulation of wastewater with $FeCl_3$ / anionic polymer 1.4. Coagulation of wastewater with PAC / anionic polymer 1.5. Coagulation of wastewater with Chitosan / anionic polymer **Summary of teaching methodology:** + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8
	B/ Self-study content (20) The contens of home self-study + Compare the optimal pH and the effectiveness of treatment with different coagulants.	CLO1 CLO2 CLO3

	+ Do the report + Prepare the test lesson for the next class.	CLO4 CLO5 CLO6 CLO7 CLO8
2	**Unit 2: ADSORPTION METHOD IN WASTEWATER TREATMENT (0/10/20)**	
	A/ Teaching content in classroom :(10) **Content** 2.1. Test 1: Determinate the relation of Color and Absorbance 2.2. Test 2: Adsorption level 1 2.3. Test 3: Adsorption level n **Summary of teaching methodology:** + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8
	B/ Self-study content (20) + Compare the effectiveness of adsorption level 1 and level n + Do the report + Prepare the test lesson for the next class.	
3	**Unit 3**: **CHEMICAL METHOD IN WASTEWATER TREATMENT (0/10/20)**	
	A/ Teaching content in classroom :(10) **Content** 3.1. Advanced oxidation by homogeneous Fenton system) 3.2. Advanced oxidation by heterogeneous Fenton system **Summary of teaching methodology:** + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8
	B/ Self-study content (20) + Compare the effectiveness of the treatment by homogeneous and heterogeneous Fenton system + Do the report	CLO1 CLO2 CLO3 CLO4

	+ Prepare the test lesson for the next class.	CLO5 CLO6 CLO7 CLO8
4-5	**Unit 4 : BIOLOGICAL METHOD IN WASTEWATER TREATMENT (0/20/40)**	
	A/ Teaching content in classroom :(10) **Content** 4.1. Wastewater treatment by activated sludge system 4.2. Wastewater treatment by membrane in aerobic condition 4.3. Wastewater treatment by SBR **Summary of teaching methodology:** + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8
	B/ Self-study content (40) + Do the report + Compare the effectiveness of models	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8
6	**Unit 5: Disinfection (0/10/20)**	
	A/ Teaching content in classroom :(10) **Content** 5.1 Definition 5.2 Practice **Summary of teaching methodology:** + Presentation of lecture + Group discussion + Guide to how to manual experiments, do the report	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8

	B/ Self-study content (20) + Do the report + Compare the effectiveness of models	CLO1 CLO2 CLO3 CLO4 CLO5 CLO6 CLO7 CLO8

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 Wastewater treatment.	Instructor: **Dr. Nguyen My Linh** Head of Department: **Dr. Tran Thi Kim Anh**