COURSE GUIDE: 2017-18

COURSE DETAILS

Name :	Wastewater Treatment by Solar Energy (UAL)		
Code :	70801202	Plan :	Master in Chemical Engineering
Academic year :	2016-2017	Level :	Official University Master
Course :	1	Type :	Optional
Semester :	Second semester		

TIME DISTRIBUTION IN ACCORDANCE WITH REGULATION

ECTS :	3	In-class hours:	22,5
		Not in-class hours:	52,5
		Total time (in hours):	75
USE OF VIRTUAL PLATFORM:		Teaching support	

LECTURER DETAILS

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ACTIVITIES ORGANIZATION		
Planned activities for learning and workload distribution per activity (in hours)		
I. STUDENT'S ACTIVITIES (In-class / Online)	• Seminars [Example]	0,0
	• Teaching group [Example]	13,5
	• Work group / small group [Example]	9,0
	Total In-class/Online time :	22,5
II. STUDENT'S AUTONOMOUS ACTIVITIES (not in-class)	•	52,5
	Total not in-class time :	52,5
TOTAL WORKING HOURS		75

ELEMENTS OF INTEREST FOR COURSE LEARNING
Justification of contents
The information and tasks of the subject will provide the student with the necessary knowledge and skills to design and run an AOP to treat wastewater, alone o combined with a biological process. The design should begin with the characterization of the water to treat. The choice of the treatment type will be determined by the aims of the process. The student will acquire the fundamentals of the AOPs mainly the solar driven photocatalytic process.
Other courses related
Advanced Analysis and Design of Chemical Reactors Simulation, Optimization and Control of Chemical Processes Process and Chemicals Products Design R&D in Chemical Engineering
Minimum knowledge required to deal with the Course
Fundamentals of Transfer Operations, Chemical Reactors and Industrial Chemistry

COMPETENCIES
General competencies
General objectives of the University of Almería CG2 – Conceive, plan, calculate and design processes, equipment, industrial facilities and services in the field of chemical engineering and related industrial sectors, in terms of quality, safety, process economy, rational and efficient use of natural resources and environmental protection. CG4 – To carry out the appropriate research, start the design and to direct the development of engineering solutions in unknown or new areas, connecting, creativity, originality, innovation and technology transfer. CB8. That the students are able to integrate knowledge and deal with the complexity of formulating opinions from limited or incomplete information, including reflections on socials responsibilities and ethics linked to the application of their knowledge and opinions.
Other general objectives

CT2 – To use IT tools and software for the treatment and dissemination of the results produced by scientific and technology research.
CT5 – Ethical commitment within the sustainable development framework

Specific competencies developed

CE2.- To design products, processes, systems, and services for the chemical industry, as well as the optimization of others already developed, built from the technology basis of the different areas of chemical engineering including processes and transport phenomena, separation operations and chemical, nuclear, electrochemical and biochemical reaction engineering.
CE6 – To design, built and implement methods, processes and facilities for the comprehensive management of supplies and solid, liquid and gaseous waste, in industry, being able to assess their risks and impacts.

LEARNING OJECTIVES/OUTCOMES

The subject contents and activities will provide the student with the knowledge and skills needed to carry out the design and operation of an advanced oxidation process (AOPs) for wastewater treatment, alone or combined with a biological process. This design should begin with the characterization of the water to be treated. The choice of treatment type will be determined by the aims of the process. The students will learn the fundamentals of AOPs mainly photocatalytics.

CONTENTS

Module	Methodology to carry out the design of a combined system for the treatment of wastewater
Content	Wastewater characterization

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lecture, debate		2,0

Description of autonomous workload

Content	Choice of the correct treatment (only AOP, only BT, AOP-BT, BT-AOP)

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lecture, debate		2,0
Work group	Problem-based learning		1,0
Work group	Information search		1,0

Description of autonomous workload

Module	Kinetics studies of the individual processes and the combined processes		
Content	Modelling		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lecture, debate		2,0
Work group	Problem-based learning		2,0
Description of autonomous workload			
Content	Economic viability study of the process		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lecture, debate		2,0
Work group	Problem-based learning		1,0
Work group	Information search		1,0
Description of autonomous workload			
Content	Facility design		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/ Online*
Teaching group	Lecture, debate		3,5
Teaching group	Evaluation session		2,0
Work group	Problem-based learning		2,0
Work group	Making reports		1,0
Description of autonomous workload			

EVALUATION SYSTEM
Assessment criteria
To write reports and to show calculations in a clear, accurate and specific fashion. To write answer to the questions of the written exams and their calculations in a clear, accurate and specific fashion. To accurately identify the fundamentals and superfluous elements of either their own written report / oral presentation, or that of another. To do the assigned tasks in an appropriate and timely manner. To apply the theoretical knowledge of the subject in order to find a solution to the task at hand. To find the correct solution to the task at hand in a timely manner. Get to know and apply the treatment operations design methods. Get to know and apply the operational design methods based on biological treatment. Skills assessment:

- Presentation of work and activities (70%) Skills evaluated CG4, CB8, CT2, CT5, CE2 and CE6.
- Written tests (30%) Skills evaluated CG2, CE2 and CE6.

Marking system

	Activity	*(Number of hours)*	*Percentage*
I. STUDENT 'S ACTIVITIES (In-class/Online)	• Teaching group	13,5	18%
	• Work group/ small group	9	12%
II. STUDENT'S AUTONOMOUS ACTIVITIES (Autonomous work)	• Individual work [example]	52,5	70%

Assessment instruments

- Tests, exercises, problems.
- Final assessment reports, papers, projects, etc.
- Final tests (written or oral).

Monitoring mechanisms

- Tutorial attendance
- Seminar attendance and participation
- Sign up and access virtual classroom
- Submit class tasks

BIBLIOGRAPHY

Recommended bibliography

- Combination of Advanced Oxidation Processes and biological treatments for wastewater decontamination-A review (Oller, I., Malato, S., Sánchez-Pérez, J.A.)

Bibliography existing in the library of the University of Almeria

http://almirez.ual.es/search/e?SEARCH=DEPURACION DE AGUAS MEDIANTE ENERGIA SOLAR (UAL)

WEB ADRESSES

http://www.ciesol.es/