COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Advanced Instrumental Analysis	**CHBE 525**	**1**	**3+0**	**3**	**10**

Prerequisites	---

Language of Instruction	English
Course Level	Graduate (Second/Third Cycle Programme)
Course Type	Elective
Course Coordinator	
Instructors	Assist. Prof. Semin Funda Oğuz
Assistants	
Goals	Understanding the principles and components of analytical instruments and their applications in science, Experiencing how to prepare samples for analysis and how to design experiment, Developing capability to resolve analytical problems in science.
Content	This course is advanced instrumental analysis course which emphasizes principles and applications of selected analytical instruments in different fields. The focus will be more on characterization and separation techniques. Lecture topics cover mainly molecular spectroscopy (UV-VIS, IR, NMR, and mass spectrometry), separation methods (GC, LC, and HPLC), atomic spectroscopy (AAS, AES, and ICP-MS), electroanalytical methods (potentiometry, voltammetry, impedance spectrometry) and thermal analysis methods (DSC, TGA, DMA). In the laboratory, students gain hands-on experience by performing special experiments, the results of which will be discussed in the class.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Ability to understand the working principles of modern instrumentations	1	1,2,3	A,B,C
2) Ability to define application areas of instrumentation techniques	1,2	1,3	A, B, C
3) Ability to apply the instrumentation techniques for specific problems	5	3,4	B, C, D

4) Ability to interpret the instrumental analyses results	1, 5, 8	1, 3, 4	A,B,C
5) Ability to follow the improvements in instrumentation techniques	3, 8	1, 4	C, D

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT

Week	Topics	Study Materials
1	Introduction to Molecular Spectroscopy	Textbook
2	UV/VIS Spectroscopy	Textbook
3	IR Spectroscopy	Textbook
4	Mass Spectrometry/ UV/VIS Experiment	Textbook/Web sources
5	NMR Spectroscopy/ IR Spectroscopy Experiment	Textbook/Web sources
6	NMR Spectroscopy/ Mass Spectrometry Experiment	Textbook/Web sources
7	Separation Techniques and Liquid Chromatography	Textbook
8	Liquid Chromatography	Textbook
9	Gas Chromatography	Textbook
10	HPLC and GC Experiments	Web sources
11	Atomic Spectroscopy/ Atomic Spectroscopy Experiment	Textbook
12	Electroanalytical Methods/ Electroanalytical Experiment	Textbook
13	Thermal Analysis Methods/ Thermal Analysis Experiment	Web sources
14	Presentations	Textbook/Web sources

RECOMMENDED SOURCES

Textbook	Skoog, Holler and Niemann, ”Principles of Instrumental Analysis”, 5th Edition, Brooks/Cole
Additional Resources	Rouessac F. and Rouessac A., “Chemical Analysis, Modern Instrumentation Methods and Techniques”, 2nd Edition, Wiley

MATERIAL SHARING	
Documents	
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-term	1	40
Assignment	2	20
Lab Report	1	20
Term Project Presentation	1	20
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		30
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		70
Total		**100**

COURSE CATEGORY	Field Course

COURSE'S CONTRIBUTION TO PROGRAM						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Acquire expanded and in-depth information via performing scientific research in the field of Chemical Engineering, evaluate, interpret and implement knowledge.				X	
2	Be knowledgable in the contemporary techniques and methods applied in Chemical Engineering and their respective constraints.				X	
3	Be cognizant of the novel and developing applications of his/her profession, study and learn them as required.				X	

4	Formulate Chemical Engineering problems, develop methods to solve them and implement innovative techniques in solutions					
5	Design and conduct analytical modeling and experimental research, analyze and interpret complex problems encountered in this process.					X
6	Develop novel and/or original ideas and methods; conceive innovative solutions in systems, component and process design					
7	Complete information via processing limited or incomplete data by the use of scientific methods and implement it; integrate knowledge from different disciplines					
8	Communicate in at least one foreign language at the level of European Language Portfolio B2 orally and in writing.					X
9	Communicate stages and results of his/her studies in a systematic and clear manner orally or in writing in intra or interdisciplinary national and international settings.					
10	Defines societal and environmental aspects of Chemical Engineering applications					
11	Observe social, scientific and ethical values during collection, interpretation, and dissemination of data and in all professional activities.					
12	Lead multidisciplinary teams, develop solution methodologies for complex problems and take responsibility					

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	10	140
Midterm examination	1	2	2
Homework	2	10	20

Laboratory Reports	1	15	15
Project	1	20	20
Final examination	1	3	3
Total Work Load			242
Total Work Load / 25 (h)			
ECTS Credit of the Course			10