1. Course Description

COURSE DESCRIPTION FORM	
Course Code and Title	CHEM371 ENSTRUMENTAL ANALYSIS AND LAB
Course Semester	5
Catalog Description (Content) of the Course	Classification of instrumental methods, electromagnetic radiation and characteristics, devices in optical spectroscopy, molecular UV-Vis spectroscopy, atomic absorption (AAS) and Atomic Emissions spectroscopy (AES), Infrared (IR), Conductimetricand Potentiometric Methods, X-Ray Spectroscopy, Molecular and atomic absorption, Molecular Fluorescence and Chemiluminescence, Flame Atomic spectroscopy, and electro thermal methods, AAS, NMR, voltammetric analysis, surface analysis methods, electron spectroscopy, mass spectrometry (MS), thermal analysis TG, DTA, DSC, chromatographic methods.
Main Textbook	Enstrümantal Analiz İlkeleri (Principles of Instrumental Analysis-A.Skoog, F.J.Holler, S.R. Crouch, 2007,8th edition) ÇevEd: Esma Kılıç ve Hamza Yılmaz)
Supporting Textbooks	Enstrumental Analiz yöntemleri, A.Yıldız, O.Genç, S. Bektaş. Hacettepe Ünv.yayınları.
Course Credit (ECTS)	4
Prerequisites of the Course (Compulsory attendance should be indicated here.)	Attendance at classes is at least 70% for each semester according to the regulations. There is no other prerequisite or co-requisite for the course
Type of the Course	compulsory
Instruction Language of the Course	English
Object and Target of the Course	To teach basic principles of instrumental analysis and basic knowledge about chemical analysis and to introduce the modern techniques and devices used in chemical analysis, to learn spectroscopic, chromatographic and voltammetric devices and methods used in medical and food analysis, to give information about engineering applications of chemistry, to recognize the importance of the environment and the industry.
Learning Outcomes of the Course	1.Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems. 2.Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose. 3.Ability to work efficiently in intra-disciplinary teams. 4.Ability to work efficiently in multi-disciplinary teams; 5.Ability to work individually. 6.Ability to communicate effectively in Turkish/English, both orally and in writing; Ability to write effective reports and comprehend written reports, make effective presentations, 7.Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself. 8.Awareness of professional and ethical responsibility.
Mode of Delivery	This course will only be givenby face-to-face .
Weekly Schedule of the Course	**Week 1**: Electromagnetic radiation, wave and particle properties of light, introduction to spectrometric methods, components of optical devices.

	Week 2: Atomic spectroscopy introduction, Atomic absorption (AAS) EXPERIMENT-1: Cu-Bi Determination by Ultraviolet-Visible Spectroscopy (UV-GB). **Week 3**: Atomic fluorescence spectroscopy (AFS), Atomic emission spectroscopy(AES), Atomic mass and Atomic X-ray spectroscopy. EXPERIMENT-2: Determination of iron (Fe) content by Flammable Atomic Absorption (AAS) **Week 4**: Introduction to Molecular Spectroscopy, Ultraviolet-Visible (UV-VIS) spectroscopy and applications. EXPERIMENT-3: Determination of potassium (K) by flame emission spectroscopy (AES). **Week 5**: Molecular Luminescence spectrometry, photoluminescence, fluorescence and phosphorescence spectroscopy, chemiluminescence. EXPERIMENT-4: Conductivity measurement and neutralization titration by conductimetric method. (Conducti-metric tiration) **Week 6**: Infrared spectrometry (IR) introduction, IR devices, IR applications EXPERIMENT 5: Neutralization titrationby potentiometric method. **Week 7**: Nephelometry and turbidimetry, Raman spectroscopy. EXPERIMENT-6: Polarographic and voltammetricanalysis **Week 8**: Nuclear Magnetic Resonance Spectroscopy (NMR) EXPERIMENT-7: Analysis of single and binary components by UV-VIS spectroscopy (Cr and Mn) **Week 9**: Molecular mass spectrometry (MS), quantitative applications of mass spectrometry. EXPERIMENT-8: Quantitative determination of mixtures by Gas Chromatography (GC). **Week 10:** Spectroscopy and surface analysis by microscopy. X-ray photoelectron spectroscopy (X-PES), ESCA, Auger electron spectroscopy, Scanning Electron Spectroscopy (SEM and TEM) EXPERIMENT-9: Determination of by infrared absorption (IR) spectroscopy. **Week 11**: Electroanalytical methods (potentiometry, polarography, voltammetry, coulometer), potentiometric and conductivity titrations. EXPERIMENT-10: Nuclear Magnetic Resonance spectroscopy (NMR). **Week12**: Separation methods and introduction to chromatographic methods, gas chromatography (GC) and applications. **Week13**: Applications of liquid chromatography, High Performance Liquid Chromatography (HPLC), Electrophoresis. **Week 14**: Thermal methods, thermogravimetric analysis (TGA), differential thermal analysis (DTA), DSC.
Educative Activities *(Credit will be determined based on the time given for these activities. Should be filled carefully.)*	Theoretical Study Hours of Course Per Week Practicing Hours of Course Per Week Preparing Reports Mid-Term and Studying for Mid-Term Final and Studying for Final
Assessment Criteria	

	Quantity	**Total Contribution (%)**
Midterm	2	40
Homework		-
Assignment		-

Projects		-
Practice	1	20
Quiz		
Contribution of In-term Studies to Overall Grade		60
Contribution of Final Examination to Overall Grade		40
Attendance		-

Workload of the Course

Activity	Total Week Count	Weekly Duration (in hour)	Total Workload in Semester
Theoretical Study Hours of Course Per Week	14	2	28
Practicing Hours of Course Per Week	14	2	28
Reading	0	0	0
Searching in Internet and Library	0	0	0
Designing and Applying Materials	0	0	0
Preparing Reports	10	2	20
Preparing Presentation	0	0	0
Presentation	0	0	0
Mid-Term and Studying for Mid-Term	1	10	10
Final and Studying for Final	1	15	15
Other	0	0	0
Total work load			101
Total work load/25			4.04
ECTS of the course			4.0

Course's Contribution To Program

No	Program Outcomes	1	2	3	4	5
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied information in these areas to model and solve engineering problems.				x	
2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.				x	
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.			x		
4	Ability to devise, select, and use modern techniques and tools needed for engineering practice; ability to employ information			x		

		technologies effectively.					
	5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.		X			
	6	Ability to work efficiently in intra-disciplinary teams.				x	
	7	Ability to work efficiently in multi-disciplinary teams;				x	
	8	Ability to work individually.					x
	9	Ability to communicate effectively in Turkish/English, both orally and in writing; Ability to write effective reports and comprehend written reports, make effective presentations,					x
	10	prepare design and production reports, give and receive clear and intelligible instructions.		x			
	11	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.				x	
	12	Awareness of professional and ethical responsibility.				x	
	13	Information about business life practices such as project management, risk management, and change management.		x			
	14	Information about awareness of entrepreneurship, innovation, and sustainable development.		x			
	15	Knowledge about contemporary issues and the global and societal effects of engineering practices on health, environment, and safety.			x		
	16	Knowledge about awareness of the legal consequences of engineering solutions.	x				
	17	Knowledge on standards used in engineering practice.		x			
Name of Lecturer(s) and Contact Information	Name-Surname of Lecturers E-mail address Prof.Dr. Recai İNAM(rinam@gazi.edu.tr) Prof.Dr. Hüseyin ÇELİKKAN(celikkan@gazi.edu.tr)						