		Course Code and Title:	CHEM 122 Analytical Chemistry 2		
BICOL UNIVERSITY **Legazpi City**		Term	1st Semester SY 2020-2021	Class Schedule	Lec - F 4:00-7:00 PM
		Revision Date			
		Credit	3-Unit Lecture	Pre-Requisite/s	Chem 121
		Course Placement	3rd Year, BS Chemistry	Type of course	Lecture
College:	SCIENCE	Faculty	MICHAEL V. MONTEALEGRE	Consultation Hours	
Department:	CHEMISTRY	Contact Details	FB Messenger: Michael Montealegre Email: mvmontealegre@bicol-u.edu.ph	Dean/Director	Jocelyn E. Serrano
Program:	BS Chemistry	Department Chair	Michael V. Montealegre		
Vision	A world-class university producing leaders and change agents for social transformation and development	Core Values	Scholarship, Leadership, Character, Service		
Mission	Give professional and technical training, and provide advanced and specialized instruction in literature, philosophy, the sciences, and arts besides providing for the promotion of scientific and technological researches (RA5521, Section 3.0)	Quality Policy	Bicol University commits to continually strive for excellence in instruction, research and extension by meeting the highest level of clientele satisfaction and adhering to quality standards and applicable statutory and regulatory requirements		

Institutional Learning Outcomes:

Every BU graduate should:
1. Demonstrate critical thinking and integrative skills to solve problems and to support lifelong learning;
2. Communicate effectively and appropriately orally and in writing for various purposes with the responsible use ICT tools;
3. Collaborate with diverse people ethically and with mastery of knowledge and skills in given disciplines; and
4. Create knowledge and innovation to promote inclusive development as well as globalization.

Program Learning Outcomes:

The Graduate of the BS Chemistry program should be able to:
A. demonstrate a broad and coherent knowledge and understanding in the core areas of chemistry: inorganic, organic, physical, biological and analytical chemistry; and in addition, the necessary background in mathematics and physics
B. gather data using standard laboratory equipment, modern instrumentation and classical techniques
C. identify and solve problems involving chemistry, using current disciplinary and interdisciplinary principles
D. qualify for further study and/or for entry-level professional employment in the general workplace (To vary for university, colleges and professional schools)
E. work effectively and independently in multi-disciplinary and multi-cultural teams
F. act in recognition of professional, social, and ethical responsibility

G. effectively communicate orally and in writing using both English and Filipino
H. articulate and discuss the latest developments in the specific field of practice
I. interpret relevant scientific data and make judgments that include reflection on relevant scientific and ethical issues
J. preserve and promote "*Filipino historical and cultural heritage*".

Course Description:

A lecture course with accompanying laboratory course designed to develop knowledge and skills for analytical separations and instrumental methods of analysis. Emphasis is placed on the principles of instrumentation, instrument components, the limitations of measurements, and the selection of appropriate techniques for specific analytical samples and problems. The laboratory provides the actual practice of modern analytical chemistry, focused on acquiring laboratory skills in the utilization of these analytical tools in real analytical problems.

Course Learning Outcomes:

	A	B	C	D	E	F	G	H	I	J
1. Use computers in data acquisition and processing and use available software for data analysis and construction of calibration curves.	✓	✓	✓	✓	✓	✓	✓	✓	✓	
2. Demonstrate understanding of the significance of in a linear regression equation.	✓	✓	✓				✓	✓	✓	
3. Apply statistics in evaluating quality of analytical data.	✓	✓	✓	✓	✓	✓	✓	✓	✓	
4. Demonstrate understanding of the general principles of electroanalytical methods and chromatographic methods	✓	✓	✓	✓		✓		✓	✓	
5. Solve problems applying the principles of separation.	✓	✓	✓	✓		✓		✓	✓	
6. Recognize the basic components of instrumentation in electroanalytical methods, molecular spectroscopy, atomic spectroscopy, gas chromatography and liquid chromatography.	✓	✓	✓	✓		✓		✓	✓	
7. Demonstrate critical thinking skills in the use of the instrumental techniques, to solve chemical problems.	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Course Outline:

Specific Learning Outcomes	Learning Content	Instructional Delivery	Instructional Resources	Performance Standard	Assessment Tasks/Outputs	Time Allotment
Relate the role of chemistry to the realization of the mission, vision, and goals of the college and the institution.	**ORIENTATION**	Online Lecture Independent Learning	Course Guide Syllabus Google Classroom Internet	Result of objective test Minimum Performance Level (MPL) is set at 85%		1.5 hrs
1. Define the fundamental principles and methods of atomic and molecular spectroscopy to quantify the amount of EMR responsible for absorption, emission and fluorescence of matter. 2. Demonstrate understanding of the significance of parameters in a linear regression equation. 3. Apply statistics in evaluating quality of analytical data. 4. Identify the general properties of a EMR; 5. Be familiar on how EMR is absorbed or emitted; 6. Apply Beer's Law in the determination of the interaction of analyte and EMR 7. Determine and understand the limitations of Beer's Law; 8. Quantify analyte based on its interaction with EMR; 9. Analyze how electronic state transitions of particles occur in the presence of EMR.	**I. INTRODUCTION TO SPECTROCHEMICAL METHODS** A. Properties of electromagnetic spectrum B. The electromagnetic spectrum C. Absorption of radiation D. Emission of electromagnetic radiation E. The Beer's Law	• Online Lecture • Independent Learning (Reading Materials, Textbook, Online Materials)	Internet Google Classroom/ Form/Spreadsheet	Result of objective test Minimum Performance Level (MPL) is set at 85%	Assigned Tasks via Google Form	12
1. Identify and be familiar of the different components of a spectrophotometer; 2. Determine the similarities and differences of instruments for emission, absorption, and fluorescence spectroscopy;	**II. INSTRUMENTS FOR OPTICAL SPECTROMETRY** A. Instruments' components B. Optical instrument designs	• Online Lecture • Independent Learning (Reading Materials, Textbook, Online Materials)	Internet Google Classroom/ Form/Spreadsheet	Result of objective test Minimum Performance Level (MPL) is set at 85%	Assigned Tasks via Google Form	6

Learning Outcomes	Content	Teaching-Learning Activities	Resources	Assessment	Assigned Tasks	Hours
3. Point out features of the instruments that are independent of wavelength for analysis; 4. Know the optical instrument designs and be able to identify its uses or applicability in a given analyte. 5. Demonstrate understanding of the general principles of optical spectrometry and apply this into chemical analysis. 6. Use computers in data acquisition and processing and use available software for data analysis and construction of calibration curve.						
1. Gain knowledge on separation methods and determine its applicability based on the type of sample given for analysis 2. be familiar with chromatographic separation methods and know the principles behind it 3. know how to prepare samples for analysis for different methods of analysis 4. determine which method to use for every type of analyte/sample 5. Describe each type of spectroscopic techniques and be able to interpret results of analysis	**III. SPECTROCHEMICAL METHODS** A. Molecular absorption spectroscopy B. IR Spectroscopy C. Flourescence Spectroscopy D. Molecular fluorescence spectroscopy E. UV-Vis Spectroscopy F. Atomic absorption spectroscopy G. Atomic emission Spectroscopy H. Applications of spectroscopic methods	• Online Lecture • Independent Learning (Reading Materials, Textbook, Online Materials)	Internet Google Classroom/ Form/Spreadsheet	Result of objective test Minimum Performance Level (MPL) is set at 85%	Assigned Tasks via Google Form	6
	STANDARDIZATION (Additional Topic)					(3)
1. Gain knowledge on separation methods and determine its applicability based on the type of sample given for analysis 2. Be familiar with chromatographic separation methods and know the principles behind it 3. Know how to prepare samples for analysis for different methods of analysis 4. Understand the concept of separation and identify a technique	**IV. SEPARATION METHODS** A. General Principles, calculations and applications B. Introduction to Chromatographic Separations C. Gas-liquid chromatography D. High-Performance Liquid Chromatography E. Supercritical fluid chromatography and extraction F. Application of separation methods	• Online Lecture • Independent Learning (Reading Materials, Textbook, Online Materials)	Internet Google Classroom/ Form/Spreadsheet	Result of objective test Minimum Performance Level (MPL) is set at 85%	Assigned Tasks via Google Form	12

that is applicable to a given analyte and be able to analyse the chrotagram. 5. Recognize the basic components of the instrument and determine its applications and limitations. 6. Evaluate the applications and limitations of the different separation techniques and be able to interpret results of analysis.					
1. Be familiar with electroanalytical methods and techniques; 2. Determine the similarities and differences for each electroanalytical method 3. Know how to prepare samples for analysis 4. Identify samples that can be analyzed using electroanalytical methods	V. ELECTROANALYTICAL METHODS A. Introduction B. Potentiometry C. Cuolometry D. Voltammetry E. Applications	• Online Lecture • Independent Learning (Reading Materials, Textbook, Online Materials)	Internet Google Classroom/ Form/Spreadsheet	Result of objective test Minimum Performance Level (MPL) is set at 85%	Assigned Tasks via Google Form	9

	Additional Topics (Optional)
	
	VI. SURFACE ANALYSIS
	    A. AFM
	    B. SEM
	    C. XRD
	    D. XPS
	    E. DYNAMIC SIMS
	    F. TOF SIMS
	    G. OTHERS
	
	VII. NUCLEAR AND OTHER RELATED ANALYTICAL TECHNIQUES
	 A. Mass Spectrometry
	 B. Nuclear Magnetic Resonance
	 C. X-Ray Fluorescence
	 D. Radio Analytical
						(3)

Course Requirements:

Handouts and Website

Handouts are provided in class with exercises and problems which should be submitted on the deadline. Class announcements, some notes, additional problems and web links are provided on the Google Classroom and/or website (http://buchem.weebly.com).

Course Assessment:

Lowest passing score of 50% is equivalent to 3.0. Only major exams shall be given a makeup provided you have a valid excuse and/or medical certificate if you were ill. The details of the computation of grades will be discussed in class.

LECTURE

Assigned Work/Other Evaluation	40%
Exam (3)	60%
Total	100%

Online record using google spreadsheet can be accessed to check your scores.

References:
Main Textbook:
- Skoog, West, Holler and Crouch. Fundamentals of Analytical Chemistry, , Brooks Cole (or latest edition)

Latest Editions of the following textbooks:
- Harris, D.C. Exploring Chemical Analysis., W. H. Freeman.
- Skoog, D.A, Holler, F.J. and Nieman, T.A Principles of Instrumental Analysis,., Brooks/Cole.
- Harris, D.C. Quantitative Chemical Analysis 5th ed., New York. W.H. Freeman & Co.
- Skoog, West, Holler and Crouch. Analytical Chemistry, An Introduction, Saunders College Publishing, New York
- Harvey, D. Modern Analytical Chemistry, McGraw-Hill, USA
- Rubinson and Rubinson. Contemporary Chemical Analysis, Prentice -Hall, NJ.
- Christian, G. Analytical Chemistry, John Wiley& Sons

Additional materials will be provided on the website or Google Classroom

Academic Integrity Policy:

For this course, the Honor Code is that there will be no plagiarizing on written work and no cheating on exams. Proper citation must be given to authors whose works were used in the process of developing instructional materials and learning in this course. If a student is caught cheating on an exam, he or she will be given zero mark for the exam. If a student is caught cheating twice, the student will be referred to the Office of Student Services and be given a failing grade in accordance with the guidelines as stated in the BU Students Handbook.

Policies on Absences and Tardiness:

According to CHED policy, total number of absences by the students should not be more than 20% of the total number of meetings or 7 Hours for a two-unit-course. Students incurring more than 7 hours of unexcused absences automatically gets a failing grade regardless of class standing. This policy is applicable only for residential (face-to-face) mode of instruction delivery.

Language of Instruction:

The language of Instruction is English. Students are expected to use English in their outputs and reports.

Use of the Learning Management System:

The Bicol University Learning management System (BU-LMS) will be used as the primary Course Site for this course. However, a parallel Google Classroom will also be used for those with difficulty accessing the BU-LMS. Here is the link for the courses:

Google Classroom Code: provided at buchem.weebly.com

For students with zero internet connectivity, communications will via phone and submissions will be through Mail or Drop Box.

Special/Make-Up Quiz/Examinations/Work:
Make-Up Summative Tests will be given to students upon approval of their request for such from the Department Head. No Make-Up Classes for Formative Tests.
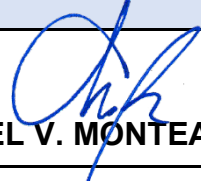
Dress and Grooming Codes:
All students are expected to wear uniform during fac-to-face meetings. Should there be a synchronous activity through online platforms (e.g., Google Meet, Zoom, etc.) a proper attire is expected among participants.

Advising and Support:
Consultation schedule for this course are as follow: Online: Friday, 1-5PM

Caveat: Issues and matters not stated in this syllabus that are important for this course should be consulted with the course Instructor.

Prepared by:	Reviewed by:	Approved:
MICHAEL V. MONTEALEGRE	**MICHAEL V. MONTEALEGRE**	**JOCELYN E. SERRANO**
Assoc. Prof I	Department Head	Dean
Date		