



OUTCOMES-BASED TEACHING-LEARNING SYLLABUS

Chem124 Molecular Spectroscopy

I. UNIVERSITY INFORMATION

1. Vision of the University

A globally competitive university for science, technology, and environmental conservation

2. Mission of the University

Development of a highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

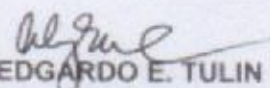
3. VSU Quality Policy Statement

The Visayas State University (VSU), a globally competitive university of science and technology and environmental conservation, is created by law to develop highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

Towards this end, we, at the Visayas State University, commit to:

- Produce highly competent, quality and world-class manpower in science and technology, especially for agriculture, environmental management and industry who are proficient in communication skills, critical thinking and analytical abilities;
- Generate and disseminate relevant knowledge and technologies that lead to improved productivity, profitability and sustainability in agriculture, environment and industry; and
- Satisfy the needs and applicable requirements of the industry, the community and government sectors who are in need of quality graduates and technology ready for commercialization through the establishment, operation, maintenance and continual improvement of a Quality Management System (QMS) which is aligned with the requirements of ISO 9001:2015.

It shall be the policy of the university that the quality policies and procedures are communicated to and understood by all faculty, staff, students and other stakeholders and that the system be continually improved for its relevance and effectiveness.


EDGARDO E. TULIN
President
v0 07-16-2019

4. Quality Goals of the College of Arts and Sciences

- (1) To produce quality manpower and graduates in Biology, Biotechnology, Chemistry, English, Liberal Arts and Behavioral Sciences, Mathematics, Physics and Statistics to serve the development needs of the region;
- (2) To uplift the economic well-being of the region through relevant R&D and extension programs; and
- (3) To enhance regional development of the Visayas for global competitiveness.

5. Quality Objectives of the Department of Pure and Applied Chemistry

- (1) Produce highly qualified and skilled Chemists and Chemical technicians for the industry and academia;
- (2) Generate relevant knowledge and technologies through basic and applied multi- and inter-disciplinary researches; and
- (3) Achieve strong linkages and cooperation with domestic and international institutions and agencies involved in the pursuit of sustainable development.

II. PROGRAM INFORMATION

1. Name of the Program	Bachelor of Science in Chemistry
2. CHED CMO Reference	CMO 36 s. 1998
3. BOR Approval	BOR 15b s. 1988; BOR 87 s. 2018

4. Program Educational Objectives and Relationship to Institution Mission

Program Educational Objectives	Mission*		
	a	b	c
1. Occupy supervisory or managerial positions in academic and research institution and industries both local and international.	√	√	√
2. Participate in multidisciplinary or cross-disciplinary research team.	√	√	√
3. Establish own chemical-based business/industries.	√	√	√
4. Pursue graduate studies and/or specialized training program in chemistry and related fields.	√	√	√
5. Pursue other degree programs.	√	√	√

*a - development of a highly competitive human resource, b - cutting-edge scientific knowledge, c - innovative technologies for sustainable communities and environment

III. COURSE INFORMATION

1. Course Code	Chem 124
2. Course Title	Molecular Spectroscopy
3. Pre-requisite	Chem 148 – Analytical Chemistry II
4. Co-requisite	Chem 128 – Organic Chemistry II
5. Credit	3 units
6. Semester Offered	First Semester
7. Number of hours	3 hours lecture
8. Course Description	Spectroscopic techniques for structural elucidation of organic compounds

9. Program Outcomes (POs) in relation to the Program Educational Objectives (POEs)	
Program Outcomes (POs)	Program Educational Objectives

		1	2	3	4	5
A	Demonstrate a broad and coherent knowledge and understanding in the core areas of chemistry: inorganic, organic, physical, biological and analytical chemistry; and the necessary background in mathematics and physics	✓	✓	✓	✓	✓
B	Gather data using standard laboratory equipment, modern instrumentation and classical techniques		✓	✓	✓	✓
C	Identify & solve problems involving chemistry, using current disciplinary and inter-disciplinary principles	✓	✓	✓	✓	
D	Qualify for the study and/or for entry level professional employment in the general workplace	✓	✓	✓	✓	✓
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 (PQF level 6 descriptor)	✓	✓	✓	✓	
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" (RA 7722)	✓	✓		✓	✓

10. Course Outcomes (COs) and Relationship to Program Outcomes (POs)														
After completing this course, the student must be able to perform the following COs:	Program Outcomes Code													
	A	B	C	D	E	F	G	H	I	J	K	L	M	
CO1: Familiarize the different spectroscopic techniques for structural elucidation;	I	I	I	I	I			E	E					
CO2: Understand the theoretical principles behind UV, IR, NMR and Mass spectroscopic techniques;		I	I	I	I	I		E	E					
CO3: Solve simple structural problems using Proton- and Carbon-NMR spectroscopy; and	I	I	I	E	E	E		D	D	D				
CO4: Appreciate the combination of spectroscopic techniques in the elucidation of organic molecules.	D	E	D	E	D	E	I	I	I	I				

Legend: I – Introductory, E – Enabling, D – Demonstrative

Each letter indicates the expected level of competency that each CO should provide for each PO.

11. Course Content and Plan					
Week	Topics	Learning Outcomes	Teaching and Learning Activities		Assessment Tasks
			Teaching Activities	Learning Activities	
Class Orientation					

1	<p>OBTL Course Syllabus (including VSU Vision Mission, and Quality Policy Statement)</p> <p>Class Policies</p> <p>Requirements</p> <p>Grading System and Activities</p> <p>Learning Guide / Instructional Workbook / Laboratory Manual</p> <p>Submission of requirements</p> <p>Values Integration: Relevance Integrity Truth Excellence Satisfaction</p>	<p>At the end of the lesson, the students will be able to:</p> <ul style="list-style-type: none"> Promote the Vision, Mission, Goals, Objectives and Core Values of the University 	<p>F-2-F Mode: F2F Meeting #1/</p> <p>Viewing of recorded presentation: Q & A for clarification, setting of expectations, and getting-to-know-each other</p> <p><i>Class interaction</i></p> <p><i>Sharing of Ideas</i></p> <p><i>Feedbacks</i></p>	<p>Online Mode: Power point and video presentations</p> <p>Offline Mode:</p>	<p>Oral recitation</p>
CO1: Familiarize the different spectroscopic techniques for structural elucidation;					
2	<p>Module No. 1 (Introduction to Molecular Spectroscopy)</p> <p>Lesson No. 1.1 (Spectroscopic approaches and methods)</p>	<p>Differentiate the different spectroscopic techniques for structural identification of organic substances;</p>	<p>F2F Mode: Class Meeting #2:</p> <p>PowerPoint Presentation</p>	<p>Online Mode: VSUEE/VC: Note-taking Downloading resource materials</p> <p>Offline Mode: Solving assigned tasks</p>	<p>Pre-Test 1 Due Date: Week 2</p> <p>Learning Task 1: Due Date: Week 2</p>
3	<p>Module No. 1 (Introduction to Molecular Spectroscopy)</p> <p>Lesson No. 1.2 (Principle of absorption spectroscopy)</p>	<p>Understand the principle of absorption spectroscopy;</p>	<p>F2F Mode: Class Meeting #3</p> <p>Power point presentation; Class recitation</p>	<p>Online Mode: VSUEE/VC: Note-taking Downloading resource materials</p> <p>Offline Mode:</p>	<p>Quiz 1: Due Date: Week 3</p> <p>Post-Test: Due Date: Week 3</p>

				Answering lesson exercises	
CO2: Understand the theoretical principles behind UV and IR spectroscopic techniques;					
4	Module No. 2 (Ultraviolet Spectroscopy) Lesson No. 2.1 (Electronic transitions)	Draw structure of conjugated hydrocarbons and its derivatives using UV spectroscopy;	F2F Mode: Class Meeting #4: Learning Guide; Independent study	Online Mode: VSUEE/VC: Note-taking Downloading resource materials Offline Mode: Solving assigned tasks	Pre-Test 2 Due Date: Week 4 Learning Task 2: Due Date: Week 4
5	Module No. 2 (Ultraviolet Spectroscopy) Lesson No. 2.2 (Quantitative determination of lambda max)	Examine the lambda max of hydrocarbons for their identity;	F2F Mode: Class Meeting #5: Power point presentation; Class discussion	Online Mode: VSUEE/VC: Note-taking Downloading resource materials Offline Mode: Answering lesson exercises	Quiz 2 Due Date: Week 5 Post-Test: Due Date: Week 5 First Long Examination (Modules 1 and 2) Due Date: Week 5
6	Module No. 3 (Infrared Spectroscopy) Lesson No. 3.1 (Band intensities and molecular vibrations)	Determine the functional group and type of organic molecule through IR spectroscopy;	F2F Mode: Class Meeting #6: Class recitation	Online Mode: VSUEE/VC: Note-taking. Downloading resource materials Offline Mode: Solving assigned tasks	Pre-Test 3 Due Date: Week 6 Learning Task 3: Due Date: Week 6

7	Module No. 3 (Infrared Spectroscopy)	Analyze the IR spectrum of organic molecule for its identity;	F2F Mode: Class Meeting #7:	Online Mode: VSUEE/V C: Note-taking Downloading resource materials	Quiz 3 Due Date: Week 7
	Lesson No. 3.2 (IR spectrum and analysis)		Power point presentation;	Offline Mode: Answering lesson exercises	Post-Test 3 Due Date: Week 7
CO3: Solve simple structural problems using Proton- and Carbon-NMR spectroscopy; and					
8	Module No. 4 (Nuclear Magnetic Resonance (NMR) Spectroscopy)	Explain the difference in responses of spinning nuclei with the external magnetic field;	F2F Mode: Class Meeting #8:	Online Mode: VSUEE/V C: Note-taking. Downloading resource materials	Pre-Test 4 Due Date: Week 8
	Lesson No. 4.1 (Principles in nuclear magnetic resonance spectroscopy)			Offline Mode: Solving assigned tasks	Learning Task 4: Due Date: Week 8 Quiz 4 Due Date: Week 8 Post-Test 4 Due Date: Week 8
9	Module No. 5 (Proton-NMR Spectroscopy)	Illustrate the position and connection of hydrogen atoms in a molecule using Proton-NMR spectroscopy;	F2F Mode: Class Meeting #9:	Online Mode: VSUEE/V C: Note-taking Downloading resource materials	Pre-Test 5 Due Date: Week 9
	Lesson No. 5.1 (Proton resonance in magnetic fields)		Power point presentation;	Offline Mode: Answering lesson exercises	Learning Task 5 Due Date: Week 10
	Module No. 5 (Proton-NMR		F2F Mode:	Online Mode:	Quiz 5: Due Date: Week 10

10	Spectroscopy) Lesson No. 5.2 (Multiplicity and coupling of proton signals)	Relate the multiplicity of signals with the interaction of adjacent protons in a molecule;	Class Meeting #10: Learning Guide; Independent study	VSUEE/C: Note-taking Downloading resource materials Offline Mode: Solving assigned tasks	Post-Test 5 Due Date: Week 10 Midterm Examination (Modules 1-4) Due Date: Week 10
11	Module No. 6 (Carbon-NMR spectroscopy) Lesson No. 6.1 (The CMR spectrum and chemical shifts)	Identify the multiplicity and chemical shifts of carbon resonances in the presence of substituents;	F2F Mode: Class Meeting #11: Power point presentation; Class recitation Learning Guide (independent study)	Online Mode: VSUEE/C: Note-taking Downloading resource materials Offline Mode: Answering lesson exercises	Pre-Test 6 Due Date: Week 11 Learning Task 6 Due Date: Week 11
12	Module No. 6 (Carbon-NMR spectroscopy) Lesson No. 6.2 (Multiplicity of signals and spectral editing)	Apply modern methods of CMR in spectral editing;	F2F Mode: Class Meeting #12: Learning Guide; Independent study	Online Mode: VSUEE/C: Note-taking Downloading resource materials Offline Mode: Solving assigned tasks	Quiz 6 Due Date: Week 12 Post-Test 6 Due Date: Week 12
CO4: Appreciate the combination of spectroscopic techniques in the elucidation of organic molecules.					
13	Module No. 7 (Mass Spectrometry) Lesson No. 7.1 (Processes in MS	Derive the molar mass and	F2F Mode: Class Meeting #13:	Online Mode: VSUEE/C: Note-	Pre-Test 7 Due Date: Week 13

	analysis)	molecular structure of substances using mass spectral data; and	Power point presentation; Group discussion	taking Downloading resource materials	
			Learning Guide (independent study)	Offline Mode: Answering lesson exercises	Learning Task 7 Due Date: Week 13
14	Module No. 7 (Mass Spectrometry) Lesson No. 7.2 (Mass spectrum and spectral analysis)	Compare the fragmentation pattern with the charge-to-mass ratios for spectral analysis;	F2F Mode: Class Meeting #14: Learning Guide; Independent study	Online Mode: VSUEE/VC: Note-taking Downloading resource materials Offline Mode: Solving assigned tasks	Quiz 7 Due Date: Week 14 Post-Test 7 Due Date: Week 14 Second Long Examination (Modules 5 and 6) Due Date: Week 15
15-16	Module No. 8 (Combined Spectroscopy) Lesson No. 8.1 (Combined IR and Mass spectrometry)	Elucidate the structure of organic substances through combined IR & Mass spectroscopic techniques; and	F2F Mode: Class Meeting #15-16: Power point presentation; Class activity Learning Guide (independent study)	Online Mode: VSUEE/VC: Note-taking Downloading resource materials Offline Mode: Answering lesson exercises	Pre-Test 8 Due Date: Week 15 Learning Task 8 Due Date: Week 16
17-18	Module No. 8 (Combined Spectroscopy) Lesson No. 8.2 (Combined Proton- and Carbon-NMR)	Generate the structure of organic	F2F Mode: Class Meeting #17-18: Learning Guide;	Online Mode: VSUEE/VC: Note-taking	Quiz 8 Due Date: Week 17

spectroscopy)	substances through combined proton- and carbon-NMR spectroscopy.	Independent study	Downloading resource materials	Post-Test 8 Due Date: Week 17
			Offline Mode: Solving assigned tasks	Final Examination Due Date: Week 18

* VSUEE/VC – VSU E-Learning Environment/ Virtual Classroom

12. Life-long Learning Opportunities

This course is designed to enable students acquire knowledge and understanding on the principles of spectroscopy. It is envisioned for the students to appreciate how these spectroscopic techniques can be applied for structural elucidation of organic molecules. These experiences will help and better equip them in their future career.

13. Contribution of Course to Meeting the Professional Component (%)

General Education: 0 %

Basic Education (Foundation): 0 %

Professional Education (Major Field): 100 %

14. References and Other Learning Resources

A. Textbook(s)/ E-Books

- Brown, J.M. 2020. Molecular Spectroscopy. Oxford University Press, USA. 96pp.
- Bruice, P.Y..2016. Organic Chemistry. 8th Edition. Pearson Publishing, London, England. 1344pp.
- Field, L.D., S. Sternhell and J.R. Kalman. 2006. Organic Structures from Spectra. Third Edition. John Wiley & Sons Ltd. The Atrium, Southern Gate, Chichester West Sussex, England.
- Klein, D.R. 2017. Organic Chemistry Student Solution Manual & Study Guide. 3rd Edition. Wiley Publisher, USA. 1104 pp.
- Ozaki, Y., M.J. Wojcik and J. Popp. 2019. Molecular Spectroscopy: A Quantum Chemistry Approach, Volume 1. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany. 612pp.
- Pavia, D.L., G.M. Lampman, G.S. Kriz and J.R. Vyvyan. 2019. Introduction to Spectroscopy. Fifth Edition. Cengage Learning, Inc., Massachusetts, USA. 786pp.
- Salas, F.M. and Y.A. Salas. 2022. Learning Guide in Organic Spectroscopy. Department of Pure & Applied Chemistry, College of Arts and Sciences, Visayas State University, Visca, Baybay City, Leyte.
- Silverstein, R.M., F.X. Webster and D. Kiemle. 2005. Spectroscopic Identification of Organic Compounds. John Wiley & Sons, Inc. New York, USA.
- Singh, D.K., M. Pradhan and A. Materny. 2021. Modern Techniques of Spectroscopy. Springer Nature Pte Ltd, Singapore. 660pp.
- Solomons, T.W.G. C.B. Fryhle and S.A. Snyder. 2016. Organic Chemistry. 12th Edition. John Wiley & Sons, Inc., New Jersey, USA.
- Wade, L. and J. Simek. 2016. Organic Chemistry. 9th Edition. Pearson Publisher, London, England. 1392pp.
- Watson, J.T. and O.D. Sparkman. 2013. Introduction to Mass Spectrometry: Instrumentation, Applications, and Strategies for Data Interpretation. Fourth Edition. John Wiley & Sons Ltd, West Sussex, England.

B. Other Learning Resources

Journals

Vision:
Mission:

A globally competitive university for science, technology, and environmental conservation.
Development of a highly competitive human resource, cutting-edge scientific knowledge and innovative technologies for sustainable communities and environment.

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No. 22-DPAC-1-04

- Connor, M.C., B.H. Glass and G.V. Shultz. 2021. Development of the NMR Lexical Representational Competence (NMR-LRC) Instrument as a Formative Assessment of Lexical Ability in ¹H NMR Spectroscopy. *Journal of Chemical Education*, 98(9):2786-2798.
- Fernandes, H.S. N.M.F.S.A. Cerqueira and S.F. Sousa. 2021. Developing and Using BioSIMAR, an Augmented Reality Program to Visualize and Learn about Chemical Structures in a Virtual Environment on Any Internet-Connected Device. *Journal of Chemical Education*, 98(5):1789-1794.
- Gehman, C.A., E.R. Hantz and C.S. Hamann. 2021. Distinguishing Vinylic and Aromatic ¹H NMR Signals Using Selectively Deuterated Chalcones. *Journal of Chemical Education*, 98(7):2323-2332.
- Jones, O.A.H., P.G. Stevenson, S.C. Hameka, D.A. Osborne, P.D. Taylor and M.J.S. Spencer. 2021. Using 3D Printing to Visualize 2D Chromatograms and NMR Spectra for the Classroom. *Journal of Chemical Education*, 98(3):1024-1030.
- Kasprowiak, A., C. Moitessier, F. Cazier-Dennin and P.E. Danjou. 2021. Contribution of Benchtop NMR Spectroscopy to the Identification of Unknown Liquids Separated by Fractional Distillation. *Journal of Chemical Education*, 98(7):2398-2402.
- Longoni, M. and S. Bruni. 2021. Identification of Synthetic Organic Pigments in Contemporary Artists' Paints by FT-IR and FT-Raman: An Advanced Analytical Experiment. *Journal of Chemical Education*, 98(3):966-972.
- Lynch, H.N., A.H. Hamage and A.L. Pathiranage. 2021. Gas Chromatography–Mass Spectrometric Analysis of Derivatives of Dibenzalacetone Aldol Products. *Journal of Chemical Education*, 98 (11):3572-3579.
- Maher, C., B. Schazmann, I.B. Gornushkin, K. Rurack and A.B. Gojani. 2021. Exploring An Application of Principal Component Analysis to Laser-Induced Breakdown Spectroscopy of Stainless-Steel Standard Samples as a Research Project. *Journal of Chemical Education*, 98(10):3237-3244.
- Marquioni, V., F.M.F. Nunes and M.T.M Novo-Mansur. 2021. Protein Identification by Database Searching of Mass Spectrometry Data in the Teaching of Proteomics. *Journal of Chemical Education*, 98(3):812-823.
- Sen, S. 2021. ChemistDice: A Game for Organic Functional Groups. *Journal of Chemical Education*, 98(2):535-539.
- Sumera, F.C. and F.M. Salas. 1994. Synthesis and application of tetramorpholino Bisamides as insecticides. *Kimika*, 10:1-10.
- Thrall, E.S., S.E. Lee, J. Schrier and Y. Zhao. 2021. Machine Learning for Functional Group Identification in Vibrational Spectroscopy: A Pedagogical Lab for Undergraduate Chemistry Students. *Journal of Chemical Education*, 98(10):3269-3276.
- Zapata, F., A. Lopez-Fernandez, F. Ortega-Ojeda, G. Quintanilla, C. Garcia-Ruiz and G. Montalvo. 2021. Introducing ATR-FTIR Spectroscopy through Analysis of Acetaminophen Drugs: Practical Lessons for Interdisciplinary and Progressive Learning for Undergraduate Students. *Journal of Chemical Education*, 98(8):2675-2686.
- Zhang, C.D., X.Y. Hu, H.S. Wang and F. Yan. 2021. GC–MS Analysis of Essential Oil Extracted from *Acori tatarinowii* Rhizoma: An Experiment in Natural Product Analysis. *Journal of Chemical Education*, 98(9):3004-3010.

Videos

<https://www.youtube.com/watch?v=atN5fqNGTfA>

Web Links:

https://ph.seekweb.com/Quality_Info/Accessed20August2021
<https://pubchem.ncbi.nlm.nih.gov/compound/1-Hexene/Accessed20August2021>
<https://pubchem.ncbi.nlm.nih.gov/compound/2-Hexene/Accessed20August2021>
<https://pubchem.ncbi.nlm.nih.gov/compound/cis-3-Hexene/Accessed20August2021>
<https://pubchem.ncbi.nlm.nih.gov/compound/trans-3-Hexene/Accessed20August2021>
<https://webbook.nist.gov/chemistry/Accessed20August2021>
<https://www.sciencedirect.com/topics/engineering/isothermal-compression>

<https://www.sciencedirect.com/topics/engineering/clausius-statement>
<https://www.sciencedirect.com/topics/mathematics/legendre-transformation>
<https://www.toppr.com/ask/question/entropy-change-for-an-irreversible...>

15. Course Assessment and Evaluation

The performance of students will be assessed and evaluated based on the following:

$$50\% \text{ Midterm} + 50\% \text{ Final Term} = 100\% \text{ (Overall Final)}$$

Item No.	Assessment Tasks	Percentage Contribution (1)	No. of Times in the Semester (2)	Individual Task % Contribution (1/2)
1	Quizzes	15	8	1.88%/Q
2	Learning Tasks	30	8	3.75%/A
3	Long Exam	25	2	12.50%/LE
4	Term Exam	30	2	15.00%/TE
		100%		

COs	Assessment Tasks	Weight in Percent	Minimum Average for Satisfactory Rating	Target and Standards
CO 1	Assignment 1 & quiz 1	5.625	60 %	At least 70 % of the students have at least 60 % score
CO 2	Assignment 2, Homework 1, Problem Set 1 & quizzes 2, 3 & 5 and Midterm Exam	31.875	60 %	At least 70 % of the students have at least 60 % score
CO 3	Homework 2-3, quizzes 4 & 8, Long Exam 1; and Final Exam	38.75	60 %	At least 70 % of the students have at least 60 % score
CO 4	Assignment 3, Problem Set 2 & quizzes 6 & 7, Long Exam 2	23.750	60 %	At least 70 % of the students have at least 60 % score
TOTAL		100%		

Grading System (% Passing: 60 %)

Range	Grade	Range	Grade
96-100	1.00	72 - 75	2.25
91- 95	1.25	68 - 71	2.50
86- 90	1.50	64 - 67	2.75
81- 85	1.75	60 - 63	3.00
76- 80	2.00	1 - 59	5.00

16. Course Policies

- 1) The official virtual classroom is VSU E-Learning Environment (VSUEE) (<https://elearning.vsu.edu.ph>). A class orientation will be done in relation to the use and navigation of the platform.
- 2) ZOOM or Google Meet will be used for web-conferencing and real-time class meetings. Username and password link will be posted in VSUEE/VC.

- 3) Attending the virtual meeting is highly - encouraged but not compulsory. If you cannot attend due to internet connection limitation, there is no problem. Just keep up with the lessons and do all the necessary exercises that is required of you.
- 4) The face-to-face classroom meeting is our avenue for synchronous learning. Class interaction and participation is encouraged, sharing of ideas, feedbacking of your outputs and other related concerns in the subject will be done during this time.
- 5) All requirements will be submitted preferably through the VSUEE or email but if internet connection is not stable or you do not have an internet connection, you may submit your activities to the office or during the F2F class meeting.



ONLINE Submission:

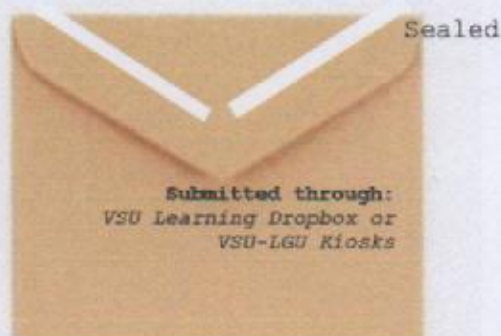
Scan (.pdf) / take a picture (.jpg) / MS Word file (.docx) of the Learning task/activity then send through the VSUEE/VC or email.



OFFLINE Submission:

Place your answers in a SEALED BROWN ENVELOPE. On the envelope, write your FULLNAME, YEAR LEVEL, COURSE, CONTACT NUMBER, EMAIL ADDRESS, COURSE NUMBER, COURSE TITLE, and DATE OF SUBMISSION, COURSE PROFESSOR.

<p>JUAN DELA CRUZ 3rd year BSSED - Math 0920 - 1234567 juandelacruz@gmail.com Course Title: _____ Date submitted: _____ Course Professor: _____ Department _____, College _____</p>
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Submit through a courier: The office address is DEPARTMENT OF CHEMISTRY, COLLEGE OF ARTS AND SCIENCES, Visayas State University, Baybay City, Leyte, Philippines.

VSU Learning Dropbox: Drop your outputs and look for the VSU Learning Dropbox (College of Arts and Sciences), located at the parking space near ATM Machine, Lower Guard Post 2.

VSU - Academic/LGU Kiosks: Drop your outputs in the designated VSU - Academic/LGU Kiosks of your respective LGU.

- 6) Original copies of all answers, solutions, and laboratory reports should be kept by the student, put in a folder/envelope one after the other, and should be bound together to form a "portfolio" as part of the final requirements of the course.
- 7) In answering the Learning Task/Activities, it can be done in any of the following:
 - a. Use the Learning Guide in Chemistry 124 (type of IM), in answering the given activities/tasks. Additional sheet of paper may be used as necessary.
 - b. Handwritten or encoded in MS Word file format
 - c. General format for additional sheet either handwritten/Word file:
 - i. A4 size bond paper
 - ii. 1" margin all sides
 - iii. Arial, 12 font size, double space (for encoded outputs)
- 8) Quizzes is set on VSUEE - VC. All quizzes are announced and will open every after a topic has been discussed.
- 9) This Learning Guide in Chem 124 (type of IM) is our official instructional material in this subject. It will serve as your guide for the whole semester. Whether you have internet connection or not, use it.
- 10) In the submission of activities, there are deduction for late submissions, thus ON-TIME submission is much appreciated.
- 11) If you have any inquiries/clarifications, you may contact the course instructor/professor during official class schedule; Monday to Friday only.
- 12) All students are reminded to observe all policies, regulations, and rules of the university and other related laws of the land and are advised to read, understand, and practice the provisions of the VSU Student Manual.
- 13) Lastly, as we embark in this "new normal". Let us have an open mind and heart as we adjust in this new way of delivering the teaching-learning process and still continue to aim for quality in education.

This class policy serves as our written agreement for the whole semester. If there are any changes to enhance the class learning opportunity within the semester, it will be communicated accordingly.


17. Course Materials and Facilities Available

- Lecture notes and videos
- LCD/LED Projector and Projector Screen
- Classroom filled with armchairs
- Electric fans and fluorescent light
- Computer table, whiteboard, and markers
- Updated periodic table

18. Revision History

Revision number	Date of Revision	Date of implementation	Highlights of Revision
0	25 November 2021	August 1, 2021	New Normal/ISO Format; OBTL-compliant.
1	16 August 2022	September 12, 2022	New Normal (F2F)/ISO Format; OBTL-compliant.

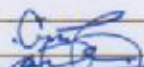
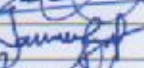
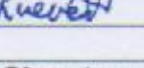
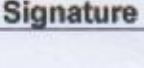
19. Preparation

Prepared by	Name	Signature	Date Signed
	FELIX M. SALAS		17 August 2022

III. INSTRUCTOR/PROFESSOR INFORMATION

1. Name of Instructor/Professor	Felix M. Salas
2. Office and Department	Department of Pure and Applied Chemistry
3. Telephone/Mobile Numbers	Office: 053-565-0600 (loc 1032); Mobile: 09088103742; Residence: 053-563-0271
4. Email Address	felix.salas@vsu.edu.ph; and fmsalas_dopac@yahoo.com
5. Consultation Time	TBA

20. Department Instructional Materials Review Committee:

Committee	Name	Signature	Date Signed
Member	ATOZ A. VASQUEZ		Sept. 08, 2022
Member	JACOB GLENN F. JANSALIN		Sept 15, 2022
Chairperson	MARIA ROBELYN A. INSIK		Sept 8, 2022
Department Head	ELIZABETH S. QUEVEDO		Sept. 12, 2022

	Name	Signature	Date Signed
Verified by:	MA THERESA P. LORETO Dean, CAS		
Validated by:	NANCY D. ABUNDA Head, IMD		

Note:

- 1) The number of POs will depend on each degree program offered
- 2) COs and Relationship to POs
 - a. (I) - **Introductory** – an Introductory Course to an outcome
 - b. (E) - **Enabling** – an Enabling Course or a course that strengthens the outcome
 - c. (D) - **Demonstrated** – a Demonstrative Course or a course demonstrating an outcome.

Distribution of copies: OIMD, College, Department, Faculty and ODQA



EVALUATION OF OUTCOMES-BASED EDUCATION (OBE) COURSE SYLLABUS

Course No.: Chem 124 and Course Title: Molecular Spectroscopy
 1st Semester and A.Y. 2022-2023

Name of Faculty : FELIX M. SALAS
 Department/Institute : Department of Pure and Applied Chemistry
 College : College of Arts and Sciences

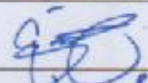
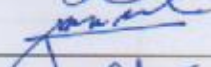
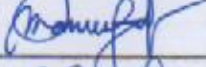
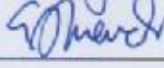
CRITERIA	Complied	Partially Complied	Not Complied	Remarks
FORMAT				
1) The OBE course syllabus follows the university-prescribed format	✓			
2) The course syllabus covers the required number of weeks in one academic term	✓			
3) Course policies and grading system are clearly defined	✓			
4) The syllabus is designed to align with the CMO-prescribed curriculum in relation to:				
a. Program Educational Objectives to VSU Vision, Mission, and Quality Policy Statement	✓			
b. Program Outcomes to Program Educational Objectives	✓			
c. Course Outcomes to Program Outcomes	✓			
CONTENT				
1) Learning outcomes are clearly articulated (<i>Specific, Measurable, Attainable, Realistic, Time-bounded (SMART) and anchored on Bloom's Taxonomy of Objectives</i>)	✓			
2) Course coverage completely follows the course description	✓			
3) Topics/lessons are arranged in a logical – sequence	✓			
4) Gender-sensitivity and values education are integrated in the syllabus whenever applicable	✓			
5) References are relevant, varied and updated. Contains at least five book titles copyrighted within the last 5 years as prescribed by CHED	✓			
TEACHING-LEARNING				
1) Teaching-learning activities are:				
a. varied and relevant	✓			
b. outcomes-based	✓			

c. encourage active learning	✓			
d. develop the students' critical – thinking skills and reflective judgment	✓			
LEARNING ASSESSMENT				
1) Learning outcomes and methods of assessment are aligned	✓			
2) Assessment methods used are varied and relevant	✓			
3) Schedule and frequency of assessment, and expected outputs are clearly defined	✓			

General Recommendation (Pls. check):

✓	APPROVED for use
	Needs to be REVISED (<i>please see comments</i>)

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	Name	Signature	Date Signed
Verified by ^{1/} :	MA. THERESA P. LORETO Dean, CAS		
Validated by ^{2/} :	NANCY D. ABUNDA Head, IMD		

^{1/} Means of Verification: Ratings on Individual evaluation sheets of the DIMRC members

^{2/} Means of Validation: Final action of the College Dean

REMINDER:

1. The author should not be part of the DIMRC.
2. *If the author is the Department Head, he/she will be replaced by another chairperson from among the senior faculty members.
3. **If the author is the College Dean, the Head of Instructional Materials Development will approve.
4. Follow the next higher supervisor, no same person
5. For the component campuses, if the author is the College Dean, the Director for Academic Affairs will approve.
6. If the author is the Department Head and at the same time the College Dean, the Director for Academic Affairs will be the Chairperson of the DIMRC, and the Chancellor will approve it.

(3) Distribution of copies: OHIMD, Department, Faculty,