

INTER AMERICAN UNIVERSITY OF PUERTO RICO
CAMPUS _____
DEPARTMENT OF _____
CHEMISTRY PROGRAM

PRONTUARIO

I. GENERAL INFORMATION

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|-------------------------------|---|--------------------|
| Course title | : | Chemistry Research |
| Code and number | : | CHEM 3900 |
| Number of credits | : | 1-3 Credits |
| Academic term | : | |
| Name of the Professor | : | |
| Place and office hours | : | |
| Office phone number | : | |
| Email | : | |

II. COURSE DESCRIPTION

Chemistry research practical work in a laboratory. Training through the development of a project, using the scientific method and modern research techniques. Requires presentation of an oral and written report of the student's research work. Requirements: CHEM 2221, authorizations from the Department Chair and the Professor in charge of the research.

III. OBJECTIVES

It is expected that, upon completion of the course, the student will be able to:

1. Carry out a project related to the research work of the professor selected by the student.
2. Search for scientific information in available databases to access primary and secondary information sources.
3. Communicate research results in a written and oral form.
4. Apply modern techniques for the purification and identification of organic/inorganic compounds.
5. Perform experiments or methodological procedures following the safety rules in the laboratory, institutional chemical hygiene plan, and data from safety data sheets ("Safety Data Sheet," SDS).

V. CONTENT (This part will depend on the chemical research laboratory)

A. Use of basic purification techniques

1. Recrystallization at low temperature and/or with the use of a solvent mixture

2. Continuous and direct extraction
 3. Centrifugation
 4. Thin-layer (TLC) and column chromatography, including "Flash" and/or HPLC column
 5. Distillation
 - a. Fractionated and under reduced pressure
 - b. Using drying agents, CaH_2 , P_2O_5 , Na, Mg, and under an inert atmosphere
- B. Preparation of standard solutions starting from a pure solid or liquid
- C. Preparation of dilutions starting from a standard solution.
- D. Handling, precautions, use, and disposal of moisture-sensitive substances; sodium, *n*-butyllithium, phosphorus pentoxide (P_2O_5), calcium hydride (CaH_2), lithium aluminum hydride, or lithium tetrahydroaluminate (LiAlH_4), *n*-butyllithium (*n*-BuLi), and others.
- E. Reactions under nitrogen, argon, helium, and acetone-dry ice bath temperatures.
- F. Use and apply Fourier Transform spectrometers in infrared spectroscopy, nuclear magnetic resonance, absorption spectrophotometry in the UV-Visible region, and fluorescence.

TEACHING ACTIVITIES AND STRATEGIES:

- a) Use of specialized software according to the research needs
- b) Troubleshooting
- c) Use of computer programs such as Excel, Word, PowerPoint
- d) Presentation of written works
- e) Group work
- f) Scientific research in the laboratory
- g) Group discussions
- h) Uses of Databases

VI. EVALUATION

The course evaluation will consist of:

| | Points | % of Final grade |
|-------------------------|--------|------------------|
| Weekly research reports | 300 | 40 |
| Final report | 100 | 20 |
| Oral presentations | 50 | 10 |
| Notebook and spectrums | 50 | 10 |
| Laboratory attendance | 50 | 10 |

| | | |
|--|------------|------------|
| Use of personal protective equipment (PPE) and compliance with the laboratory safety rules | 50 | 10 |
| Total | 600 | 100 |

- The weekly reports must contain a results section and their discussion.
- The final report must critically and analytically discuss the results obtained in the research and possible sources of error. The report must contain the following parts: 1) introduction where the literature related to the research topic will be reviewed as well as the problem statement; 2) specific objectives of the research; 3) methodology; 4) research results; 5) discussion of the results; 6) conclusions, and 7) annotated bibliography
- The oral presentation of the research results will be carried out in group meetings.

VII. EDUCATIONAL RESOURCES

Since CHEM 3900 is a research course, educational resources will depend on the research area and the resources available in the laboratory and campus.

- a. Microsoft Office
- b. Molecular modeling and other specialized programs
- c. Scientific Databases
- d. Scientific Equipment User Manuals

VIII. SPECIAL NOTES

Auxiliary Services or Special Needs

All students who require auxiliary services or special assistance must request them at the beginning of the course or as soon as they acquire knowledge of those they need, through the corresponding registry in the Office of the Professional Counselor, _____, located in the University Counselling Program.

2. Honesty, fraud, and plagiarism

Dishonesty, fraud, plagiarism, and other inappropriate behavior concerning academic work constitute major infractions sanctioned by the General Student Regulations. As provided in the General Student Regulations, major offenses may result in suspension from the University for a defined period of more than one year or permanent expulsion from the University, among other sanctions.

3. Use of electronic devices

Cell phones and any other electronic device that could interrupt the teaching and learning processes or alter the environment conducive to academic excellence will be disabled.

Urgent situations will be addressed as appropriate. The handling of electronic devices that allow accessing, storing, or sending data during evaluations or exams is prohibited.

4. Compliance with the provisions of Title IX

The Federal Higher Education Law, as amended, prohibits discrimination based on sex in any academic, educational, extracurricular, athletic activity or any other program or employment, sponsored or controlled by an institution of higher education regardless of whether it is carried out inside or outside the institution's premises if the institution receives federal funds.

In accordance with current federal regulations, an Assistant Title IX Coordinator has been appointed in our academic unit who will provide assistance and guidance in relation to any alleged incident that constitutes discrimination based on sex or gender, sexual harassment or sexual assault. . You can contact the Assistant Coordinator, _____, at the telephone _____ extension _____ or by email _____.

The **Normative Document entitled Norms and Procedures to Address Alleged Violations of the Provisions of Title IX** is the document that contains the institutional rules to channel any complaint presented based on this type of allegation. This document is available on the website of the Inter American University of Puerto Rico (www.inter.edu).

VII. BIBLIOGRAFÍA

- a. Artículos y/o referencias suplidas por el profesor.
- b. Robinson, M.; Stoller, F. L. "*Write like a chemist*". Oxford University Press, Oxford. ISBN: 978-0-19-536742-3
- c. "*The ACS Style Guide: A Manual for Authors and Editors*", 3rd ed.; Coghill, A.; Garson, L., Eds.; American Chemical Society: Washington, DC. ISBN-13: 978-0841239999
- d. Mohrig, J.; Alberg, D. G.; Hofmeister, G. E.; Schatz, P. F.; Hammond, C. N. "Laboratory Techniques in Organic Chemistry". W. H. Freeman and Company, New York, NY. ISBN-13: 978-1464134227
- e. University of Pennsylvania. Drying agents. <http://www.sas.upenn.edu/~marisa/documents/drying.pdf>
- f. Rydzewski, R. M. "*Real World Drug Discovery: A Chemist's Guide to Biotech and Pharmaceutical Research*", Elsevier, Oxford, UK. ISBN: 9780080466170
- g. Cornils, B.; Herrmann, W. A.; Xu, J. H.; Zanthoff, H.W." *Catalysis from A to Z: A Concise Encyclopedia*", 5th ed.; John Wiley and Sons, New Jersey, US, ISBN: 978-3-527-34311-9.
- h. Kurti, L.; Czako, B. "*Strategic Applications of Named Reactions in Organic Synthesis*", 1st ed.; Academic Press, MA, US, ISBN: 9780124297852.

- i. Greene, T. W.; Wuts, P. G. M. “ *Protective Groups in Organic Synthesis*”
3rd ed.; John Wiley and Sons, New Jersey, US, ISBN:9780471160199.

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