Annual Report 2024-2025

Nairmen Mina, Ph.D.

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I. General Information of the Dean's Office and Associated Units

a. Mission and Vision
   1. Mission
      a. To offer academic programs of excellence, both at the undergraduate and graduate levels, as well as high-quality research programs. To generate knowledge that contributes to the development of society and the solution to the problems which affect it. Contribute to the scientific culture of the academic community and society in general.

   2. Vision
      a. Prepare professionals in the discipline of chemistry and related areas. Contribute to the development and dissemination of knowledge in the fundamental, applied and interdisciplinary areas of chemical sciences.

b. Organizational Structure

   2. Organizational Chart of associated units under the Dean's Office

II. Report on Initiatives, Activities, and Achievements in Accordance with the Strategic Plan and International Activity

a. Executive Summary

During the academic year 2024-2025 the Department of Chemistry offered the courses in four different modalities: face-to-face, hybrid, online and distance learning. During this academic year we continue working on the rehabilitation of the first floor and the ground floor east side of the building. As a result of these circumstances, great challenges were presented for the department that were attended administratively. In academic terms, the offerings of the laboratories of Physics Chemistry I, (QUIM4101), Physics Chemistry II, (QUIM4102), and Instrumental Methods of Analysis were relocated for that year on the third and second floor, respectively, and offered in the face-to-face modality.

The graduate seminar program continued to be active with guest speakers, professors of the department and the university, representatives of the chemical and pharmaceutical industries as well as graduate students. In terms of service to students, we continue to use the tool to attend the student registration request (tickets), but we also attended students in person. New students were also welcomed in person. In regards to research, 50 proposals were approved. Graduate students have continued with their research projects following established safety protocols. In the 2024-2025 academic year, 51 new undergraduate students were accepted. On the other hand, 36 students completed their B.S. degree in Chemistry, 6 completed their MS degree in Chemistry, and 4 students completed their Ph.D. degree in Applied Chemistry.

b. Objective 1: Institutionalize a culture of strategic planning and assessment

During the 2020-2021 academic year, Dr. Rodolfo Romañach was appointed as representative to the faculty for the Strategic Planning Committee and currently continues to work on this committee.

c. Objective 2: To lead higher education throughout Puerto Rico while guaranteeing the best education for our students

- The faculty of the Department of Chemistry approved in the spring of 2020 that Chemistry lecture courses can be offered in hybrid or distance modality, following Certification 19-85 of the Academic Senate of the RUM. This allowed that in the academic year 2024-2025 several courses were offered in Distance and Hybrid modality by the professors who have the CREAD Certification.
- We continue with the offer of the Certification in Biochemistry.
- A new General Chemistry for Engineering course was created for engineering students. This course was approved for the Chemistry faculty. It also has been approved by the university Academic Senate.
- The Doctoral Seminar program was active throughout the year 2024-2025, using the modalities: virtual, hybrid and face-to-face. This was coordinated and directed by Dr. Carmen Amaralis Vega Olivencia.

Seminars offered in the Department of Chemistry during the academic year 2024-2025

DATE	LECTURER	TITLE	INSTITUTION
30/ago/2024	Dhaval Patel	"Facilitating the implementation of continuous manufacturing within pharmaceutical industry, A focus on overcoming challenges"	Candidato doctoral UPRM
6/sept/2024	Nicole M. Torres Colón	In-line monitoring of organic flow synthesis using Raman and IR spectroscopy	Candidata doctoral UPRM
20/sept/2024	Nathay A. Movilla Meza	The Use of a Closed Feed Frame for the Development of Near-Infrared Spectroscopic Calibration Model to Determine Drug Concentration	Candidato doctoral UPRM
27/sept/2024	Dr. Andrés Moya Rodríguez	Integrating Personal and Research Experiences to Develop Biomedical Technologies	Catedrático Auxiliar - Departamento de Química - UPRM
4/oct/2024	Dr. Rachel Davidson	Electroactive Light Metal Nanostructures and Composites: A Roadmap to Atom-Precise Functional Architectures	Catedrática, Departamento de Química y Bioquímica, universidad de Delaware
18/oct/2024	Dr. Ricardo Javier Vázquez	Developing Organic Materials for Bioanalytical and Electrochemical Contexts	Departamento de Química, Universidad de Indiana
25/oct/2024	Dr. Kazunori Koide	Bioorthogonal Transition Metal Catalysis	Profesor - Departamento de Química Universidad de Pittsburgh
1/nov/2024	Dr. Matías J. Cafaro	Impulsando el Ecosistema de Investigación en el RUM	Decano Asociado Facultad Artes y Ciencias UPRM
22/nov/2024	Mariola Mari Flores Rivera	Synthesis, Characterization, and Biomedical Application of Ferrocene–Hormone Complexes	Candidata doctoral UPRM
2/feb/2025	Dra. Belinda Pastrana	Harnessing Extracellular Matrix and Extracellular Vesicles	Departamento de Química-UPRM
21/feb/2025	Dra. Barbara Alvarado y otros	Experiencias laborales en la industria farmacéutica	Merck Pharmaceutical USA
28/feb/2025	Dr. Joshua Reyes	Single-Entity Electrochemistry: From Synthesis and Application to Fundamental Research	UAGM / Gurabo
14/marzo/2025	Dr. Camilo Mora	Harnessing Extracellular Matrix and Extracellular Vesicles for Biomedical Applications	Ingeniería Química – UPRM
21/marzo/2025	Dr. Juan A. Santana	Integrating Research and Education in Computational Chemistry	UPR /Cayey
28/marzo/2025	Dr. Hamsel Montalvo	Single-Entity Electrochemistry: From Synthesis and Application to Fundamental Research	Ingeniería Química / UPRM
4/abril/2025	Dr. Francheska Colón	QUANTUM CASCADE LASER AND RAMAN SPECTROSCOPY-BASED	Candidato Doctoral UPRM
11/abril/2025	Ms.Tamara Felix	Vibrational Spectroscopy for the Study of Chemical and Biological Threats and Other Important Targets Adsorbed on Au Nanorods	Candidata Doctoral / UPRM
25/abril/2025	Mr. Mike Torres	GC-MS PHYTOCHEMICAL PROFILING, TOXICITY ASSESSMENT, AND BIOINSECTICIDE POTENTIAL OF THE LEAF EXTRACTS FROM THREE MEDICINAL PLANTS OF PUERTO RICAN FOLKLORE	Candidato Doctoral / UPRM
2/mayo/2025	Esaí S. Rosa Cortés	Analytical method development using mid-ir lasers for determining low Portable Fluidic Sensor for Urinalysis: Spectroscopic Quantification of Metabolic Biomarkers	ESTUDIANTE ESCUELA SUPERIOR CROEM

d. Objective 3: To increase and diversify the Institution's sources of revenue

Proposals submitted by the Department of Chemistry during the academic year 2024- 2025

Proposal Tittle	Principal Investigator	Total Cost	Proposal Status	Sponsor Name
SENTRY-SOFT TARGET ENGINEERING TO NEUTRAL	SAMUEL P. HERNANDEZ RIVE	$ 38,481.00	Activos	NORTHEASTERN U
SENTRY-SOFT TARGET ENGINEERING TO NEUTRAL	SAMUEL P. HERNANDEZ RIVE	$ 1,500.00	Activos	NORTHEASTERN U
CSTWR2/MARCOS DE JESUS	MARCO A. DE JESUS RUIZ	$ 193,093.21	Activos	RCSE
CSTWR2/FELIX ROMAN	MARCO A. DE JESUS RUIZ	$ 205,092.38	Activos	RCSE
CSTWR2/DAVID SULEIMAN	MARCO A. DE JESUS RUIZ	$ 113,259.38	Activos	RCSE
CSTWR2/MATIAS CAFARO	MARCO A. DE JESUS RUIZ	$ 113,348.85	Activos	RCSE
CSTWR2/PEDRO TARAFA	MARCO A. DE JESUS RUIZ	$ 112,956.18	Activos	RCSE
PAREO/CSTWR2	MARCO A. DE JESUS RUIZ	$ 375,000.00	Activos	RCSE
INNOVATIVE WIDE AREA SENSING MITIGATION T	SAMUEL HERNANDEZ	$ 497,555.00	Activos	DHS-ARI
PART/SUPPORT INNOVATIVE WIDE AREA SENSING	SAMUEL HERNANDEZ	$ 2,440.00	Activos	DHS-ARI
A KNOWLEDGE MANAGEMENT SYSTEM FOR CONTINU	RODOLFO ROMANACH	$ 73,000.00	Activos	NIPTE
YR2/INNOVATIVE WIDE AREA SENSING MITIGATI	SAMUEL HERNANDEZ	$ 499,994.00	Activos	DHS-ARI
CONTINUOUS DRUG SUBSTANCE MANUFACTURING F	RODOLFO ROMANACH	$ 170,419.00	Activos	NIPTE
YR4/INNOVATIVE WIDE AREA SENSING MITIGATI	SAMUEL HERNANDEZ	$ 499,660.00	Activos	DHS-ARI
YR3-INNOVATIVE WIDE AREA SENSING MITIGATI	SAMUEL HERNANDEZ	$ 499,994.00	Activos	DHS-ARI
ADVANCING STRUCTURAL BIOLOGY TECHNOLOGIES	JOSE A CARMONA NEGRON	$ 72,930.00	Activos	DOE
EFFECT OF UPR PATENT ON SARS COVID 3 CELL	MIGUEL CASTRO ROSARIO	$ 249,018.00	Activos	DEPT OF COMMER
MULTIFUNCTIONAL ZEOLITE-CHITOSAN COMPOSIT	JOSELYN DEL PILAR ALBALA	$ 272,496.97	Activos	BATTELLE SAVAN
P/S: MULTIFUNCTIONAL ZEOLITE-CHITOSAN COM	JOSELYN DEL PILAR ALBALA	$ 2,490.00	Activos	BATTELLE SAVAN
SUBW:(SRNL) MULTIFUNCTIONAL ZEOLITE-CHITO	JOSELYN DEL PILAR ALBALA	$ 39,773.00	Activos	BATTELLE SAVAN
RISE: ENHANCING BIOMEDICAL ACHIEVEMENT IN	MIGUEL CASTRO	$ 263,694.00	Activos	NIH
YR2 RISE: ENHANCING BIOMEDICAL ACHIVEMENT	MIGUEL CASTRO	$ 78,994.68	Activos	NIH
P/S RISE YR2	MIGUEL CASTRO	$ 171,616.32	Activos	NIH

RISE YR3	MIGUEL CASTRO	$ 75,173.64	Activos	NIH
P/S RISE YR3	MIGUEL CASTRO	$ 175,437.36	Activos	NIH
SUPLEMENT YR3/ RISE	MIGUEL CASTRO	$ 83,927.00	Activos	NIH
RISE YR4	MIGUEL CASTRO	$ 75,173.64	Activos	NIH
RISE YR4 P/S	MIGUEL CASTRO	$ 175,437.36	Activos	NIH
RISE/YR5	MIGUEL CASTRO	$ 75,173.64	Activos	NIH
RISE/P/S YR5	MIGUEL CASTRO	$ 175,437.36	Activos	NIH
CYTATION 5 MULTIMODE IMAGING SYSTEM FOR U	JOSE A CARMONA NEGRON	$ 244,901.00	Activos	NIH
PR IDEA NETWORK FOR BIOMEDICAL EXCELLENCE	JUAN LOPEZ GARRIGA	$ 39,888.00	Activos	RCSE
PR IDEA NETWORK FOR BIOMEDICAL EXCELLENCE	ELSIE I. PARES MATOS	$ 75,000.00	Activos	RCSE
PR IDEA NETWORK FOR BIOMEDICAL EXCELLENCE	ELSIE I. PARES MATOS	$ 32,203.00	Activos	NIH
BIOENERGY & WATER FOR AGRI RESEARCH	FELIX R. ROMAN VELAZQUEZ	$ 244,895.00	Activos	UNIV TEXAS AT
RENOVATIO OF NUCLEAR MAGNETIC RESONANCE F	ENRIQUE MELENDEZ	$ 430,070.00	Activos	USDA
ENHANCING EXPERIENTIAL LEARNING BY ASSESS	SAMUEL HERNANDEZ	$ 678,286.00	Activos	USDA
P/S ENHANCING EXPERIENTIAL LEARNING...	SAMUEL HERNANDEZ	$ 166,714.00	Activos	USDA
SUBAWARD:ENHANCING EXPERIENTIAL LEARNING	SAMUEL HERNANDEZ	$ 155,000.00	Activos	USDA
1890-HSI PARTNERSHIP TO ENHANCE GRADUATE	FELIX R. ROMAN VELAZQUEZ	$ 64,999.00	Activos	USDA - DEPARTM
PROBING THE EFFECTS OF NANOPARTICLE MORPH	MARCO A. DE JESUS RUIZ	$ 454,623.00	Activos	NSF
MRI:TRACK 1: ACQUISITION OF A ZEISS 560 V	MARCO A. DE JESUS	$ 988,884.00	Activos	NSF
SLOAN FOUNDATION	RODOLFO ROMANACH	$ 498,065.00	Activos	ALFRED P. SLOA
IMPROVING THE ACCURACY OF A NEAR INFRARED SPECTROSCOPIC METHOD	RODOLFO ROMANACH	$ 42,039.00	Activos	AVARA
STRATEGIC SOLVOTHERMAL SYNTHESIS DESIGN F	JOSELYN DEL PILAR ALBALA	$ 14,427.00	Activos	PR SCIENCE TEC
A NIR SPECTROSCOPIC CALIBRATION MODEL FOR	RODOLFO ROMANACH	$ 42,037.00	Activos	AVARA
PHASE1-FEASIBILITY STUDY FOR THE CONTINUO	RODOLFO ROMANACH	$ 102,402.00	Activos	McNeil HEALTHC
COMMERCIALIZATION OF AN INTEGRATED SYSTEM	RODOLFO ROMANACH	$ 150,000.00	Activos	PR SCIENCE,TE
GENERAL DEVELOPMENT AND SUPPORT	RODOLFO ROMANACH	$ 23,253.00	Activos	VARIOS (DONATIVOS)

e. Objective 4: To implement efficient and expedient competitive creative endeavors

- Roadmaps continue to be used for administrative procedures.
- In the week of the administrative staff, an activity was carried out to recognize all the staff with the contributions of the Department faculty members.
- The meetings of the different committees were held in person, hybrid and virtually.
- The administrative staff of the Department of Chemistry continues to take training in the use of technology to carry out administrative procedures, to hold meetings, and to serve students virtually and in person.

f. Objective 5: To strengthen research and competitive creative endeavors

During the 2024-2025 academic year, researchers from the Department of Chemistry, for the most part, continued with the development of their research projects and the mentoring of graduate and undergraduate students.

Scientific Articles of the Department of Chemistry published during the academic year 2024-2025

1. Garcia-Cortes, C. G.; **Pares Matos, E. I**., New Regulatory roles for Human Serum Amyloid A. International Journal of Research in Oncology 2024, 3 (1), 1-8.

2. Caballero-Agosto, E. R.; Sierra-Vega, N. O.; Rolon-Ocasio, Y.; **Hernandez-Rivera, S. P**.; Infante-Degró, R. A.; Fontalvo-Gomez, M.; Pacheco-Londoño, L. C.; Infante-Castillo, R., Detection and quantification of corn starch and wheat flour as adulterants in milk powder by near- and mid-infrared spectroscopy coupled with chemometric routines. Food Chemistry Advances 2024, 4, 100582.

3. Espinosa-Garavito, A. C., Quiroz, E. N., Galán-Freyle, N. J., Aroca-Martinez, G., **Hernández-Rivera, S. P.**, Villa-Medina, J., Méndez-López, M., Gomez-Escorcia, L., Acosta-Hoyos, A., Pacheco-Lugo, L., Espitia-Almeida, F., & Pacheco-Londoño, L. C. (2024). Surface-enhanced Raman Spectroscopy in urinalysis of hypertension patients with kidney disease. Scientific Reports, 14(1), 3035. https://doi.org/10.1038/s41598-024-53679-9

4. Carrión-Roca, W., Colón-Mercado, A. M., Castro-Suarez, J. R., Caballero-Agosto, E. R., Colón-González, F. M., Centeno-Ortiz, J. A., Ríos-Velázquez, C., & **Hernández-Rivera, S. P**. (2024). Chemical sensing of common microorganisms found in biopharmaceutical industries using MIR laser spectroscopy and multivariate analysis. Journal of Biophotonics, 17(6). https://doi.org/10.1002/jbio.202300391

5. Lugo-Avilés, L. E.; **López-Moreno, M. L**.; **Roman-Velazquez, F. R**.; Lugo-Rosas, J., Biosolid Mixtures Applied in Tropical Soils and Their Effect on Coriandrum sativum and Ocimum basilicum Nutritional Uptake. Agriculture 2024, 14 (4), 561.

6. Luciano-Velázquez, J., López-Cruz, I., Rivera-Ortíz, A. A., Moreno-Echevarría, G. D., Bailón-Ruiz, S. J., & **López-Moreno, M. L.** (2024). Effect of TGA coated ZnS Quantum Dots on growth development of basil (Ocimum basilicum) plants. Plant Nano Biology, 9, 100084. https://doi.org/10.1016/j.plana.2024.100084.

7. Barragan-Galvez, J. C., Gonzalez-Rivera, M. L., Jiménez-Cruz, J. C., Hernandez-Flores, A., de la Rosa, G., **Lopez-Moreno, M. L**., Yañez-Barrientos, E., Romero-Hernández, M., Deveze-Alvarez, M. A., Navarro-Santos, P., Acosta-Mata, C., Isiordia-Espinoza, M. A., & Alonso-Castro, A. J. (2024). A Patent-Pending Ointment Containing Extracts of Five Different Plants Showed Antinociceptive and Anti-Inflammatory Mechanisms in Preclinical Studies. Pharmaceutics, 16(9), 1215. https://doi.org/10.3390/pharmaceutics16091215

8. Ortiz-Román, M. I.; Casiano-Muñiz, I. M.; **Román-Velázquez, F. R.**, Ecotoxicological Effects of TiO2 P25 Nanoparticles Aqueous Suspensions on Zebrafish (Danio rerio) Eleutheroembryos. Nanomaterials 2024, 14 (4), 373.

9. Casiano-Muñiz, I. M.; Ortiz-Román, M. I.; Lorenzana-Vázquez, G.; **Román-Velázquez**, F. R., Synthesis, Characterization, and Ecotoxicology Assessment of Zinc Oxide Nanoparticles by In Vivo Models. Nanomaterials 2024, 14 (3), 255.

10. Casiano-Muñiz, I. M., Ortiz-Román, M. I., Carmona-Negrón, J. A., & **Román-Velázquez, F. R**. (2024). UV filter benzophenone-2: Effects on zebrafish (Danio rerio) cytochrome P450. Aquatic Toxicology, 273, 106973. https://doi.org/10.1016/j.aquatox.2024.106973

11. Ortiz-Román, M. I., Casiano-Muñiz, I. M., & **Román-Velázquez, F. R.** (2024). Toxicity of UV Filter Benzophenone-3 in Brine Shrimp Nauplii (Artemia salina) and Zebrafish (Danio rerio) Embryos. Journal of Xenobiotics, 14(2), 537–553. https://doi.org/10.3390/jox14020032

12. Lorenzana-Vázquez, G.; Adams, D. G.; Reyna, L. G.; **Meléndez, E**.; Pavel, I. E., Experimental and Theoretical Screening of Core Gold Nanoparticles and Their Binding Mechanism to an Anticancer Drug, 2-Thiouracil. Molecules 2024, 29 (1), 121.

13. Patel, D. S.; Méndez, R.; **Romañach, R. J**., Cleaning of direct compression continuous manufacturing equipment through displacement of API residues by excipients. Int. J. Pharm. 2024, 652, 123849.

14. Valentin Román, N.; Alvarado Hernández, B.; De Hoyos Ruperto, M.; **Romañach**, **R. J**., Engineering, Validation, Automation and Service companies in the Pharmaceutical Manufacturing Ecosystem,. Pharmaceutical outsourcing, 2024, 25 (1), 12-15.

15. Zimmermann, L., Lee, H. L., Koishybay, A., Vlaar, C. P., Monbaliu, J.-C. M., **Romañach, R. J**., Noor-E-Alam, Md., Myerson, A. S., & Stelzer, T. (2024). Measurements and Correlation of Timolol Maleate Solubility in Biobased Neat and Binary Solvent Mixtures. Journal of Chemical & Engineering Data, 69(6), 2369–2379. https://doi.org/10.1021/acs.jced.4c00060

16. Echevarria Altamar K, Sierra Vega NO, González Lugo C, Resto Irizarry PJ, **Romañach RJ.** Determination of Glucose Content in Blends of different powdered cell culture media by hand held Raman spectroscopy. The 11th World Conference on Sampling and Blending [Internet]. Johannesburg: The Southern African Institute of Mining and Metallurgy; 2024, p. 207 – 16.

17. Nasrala Alvarez JM, Mendez Roman R, Romañach RJ. A stream sampler for Process Analytical Technology of Powder Blends. The 11th World Conference on Sampling and Blending [Internet]. Johannesburg: The Southern African Institute of Mining and Metallurgy; 2024 [cited 2024 Sep 22]. p. 217–24.

18. Romañach RJ. The Theory of Sampling in Advanced Pharmaceutical Manufacturing. The 11th World Conference on Sampling and Blending [Internet]. Johannesburg: The Southern African Institute of Mining and Metallurgy; **2024** [cited 2024 Sep 22]. p. 201–6.

g. Objective 6: To impact our Puerto Rican society

- Welcome to new undergraduate graduates – August 1, 2024.
- Welcome to new graduate students – August 5, 2024 and January 8, 2025.
- The university held the Open House in October 2024.
- Chemistry Fest for students, professors and administrative personals- April 30, 2025.
- During the summer of 2025, The College of Arts and Sciences camp was carry out for high school students. The chemistry department had the participation of associations, staff, professors and graduate's students.

h. Objective 7: To strengthen school spirit, pride, and identity

- The ACS visited 3 schools during the 2024-2025 academic year.
- The ACS, also participated in the Chemistry Festival held in San Juan, PR, during the month of April. This was during the celebration of National Chemistry Week. The purpose of this festival is to impact the community of the Island and share the Knowledge of Chemistry through experiments, demonstrations and other practical activities of a chemistry scientific nature.
- The ACS carried out coastal cleanups on the beaches.