Distinguishing and Dynamic Curriculum: The Master of Science in Chemistry (MS-CHEM) at the University of New Haven is a 2-years and 30-credit-hours program. The curriculum features with a unique integrative approach, i.e., combining theoretical, computational, and experimental chemistry methods, for the purpose of solving important chemistry challenges such as molecular drug discovery, polymer materials design, catalyst design, and chemical analysis for sustainable environment. Graduates trained by this curriculum can be more competitive in career development. Dynamic curriculum designed for industry professionals to meet industry needs.

Career-Oriented Focus Areas: There are 4 optional focus areas (see the following course catalog): 1) Drug Discovery Chemistry, 2) Computational and Materials Chemistry, 3) Analytical and Green Chemistry, and 4) General Chemistry. These focus areas are closely resonant with the needs in academia and industry, such as in pharmaceutical, energy, materials, environmental analysis, and forensic analysis industries.

Exceptional Research Education Plan: Students will be educated for research methods, writing, and ethics, conducting research projects/thesis, and extensive research seminars (for 3 semesters). Research projects funded by NSF, NIH, NASA and industry partners are available to students. Professional networking opportunities will be provided through interactions with external speakers, attending conferences, and internships in industry. Students will work with expert faculty in different fields of chemistry.

Highly Competitive Scholarships: Scholarships are available for applicants with strong academic records. As high as 75% tuition scholarships with a stipend or 50% tuition scholarships are available.

Core Courses
C1. CHEM 6615: Basics of Computational Chemistry (3 credits)
C2. CHEM 6710: Computational Chemistry (3 credits)
C3. CHEM 6631: Advances in Analytical Chemistry (3 credits)
C4. CHEM 6607: Modern Organic Chemistry (3 credits)
C5. ENGR 6780: Research Methods, Writing, and Ethics (3 credits)
C6. CHEM 6682: Graduate Seminar (1 credit), must be taken 3 times for a total of 3 credits

Restricted Electives
R1. CHEM 6685: Graduate Research Project (3 credits)
R2. CHEM 6698: Thesis I (3 credits)
R3. CHEM 6699: Thesis II (3 credits)
R4. CHEM 6688: Graduate Internship (3 credits)

Electives for 4 Focus Areas
E1. CHEM 6650: Medicinal Chemistry (3 credits)
E2. CHEM 6655: Pharmacology (3 credits)
E3. BIOM 6610: Biomedical Polymers (3 credits)
E4. CMBI 6620: Bioinformatics (3 credits)
E5. CSCI 6604: Introduction to Programming/C (3 credits)
E6. CSCI 6610: Intermediate Programming: C/C++ (3 credits)
E7. CSCI 6651: Introduction to Script Programming/Python (3 credits)
E8. MATH 6620: Numerical Analysis (3 credits)
E9. MATH 6624: Applied Mathematics (3 credits)
E10. CHEM 6645: Solid-State Chemistry (3 credits)
E11. CHEM 6635: Chromatography and Separation Science (3 credits)
E12. CIVL 6603: Contaminant Fate and Transport (3 credits)
E13. CIVL 6601: Physical-Chemical Treatment of Aqueous Wastes (3 credits)
E14. CIVL 6661: Air Pollution Fundamentals (3 credits)
PhD Program in Chemistry

Engineering and Applied Science PhD, Chemistry area
The Ph.D. program offers a novel approach to doctoral education that prepares students to be exceptional professionals in their future careers in industry, academia, nonprofits, consulting, or government agencies. Graduates will be prepared to respond to 21st century challenges across a broad range of specialties. The program offers an innovative curriculum that merges coursework, practical research experiences, and mentorship from university faculty into an experience that develops critical and analytical thinking skills over a minimum of three years.

The EAS-Chemistry PhD program requires students to complete at least 51 credits in total. Here is one example worksheet for PhD applicants with MS degree. For PhD applicants without MS degree, >67 credits will be needed to earn the PhD degree.

Students can apply to this PhD program via the following webpage.
https://www.newhaven.edu/engineering/graduate-programs/engineering-applied-science-phd/index.php

<table>
<thead>
<tr>
<th>Course number and title</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>Common Courses (9 credits)</strong></td>
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<tr>
<td>ENGR 7701 Research Methods, Writing, and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 7707 Applied Grant Writing and Management</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 7770 Advanced Topics</td>
<td>3</td>
</tr>
<tr>
<td><strong>Technical Core Courses (optional)</strong></td>
<td></td>
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<tr>
<td><strong>Additional Courses if MS Degree Desired (15 credits)</strong></td>
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<td><strong>Qualifying Exam</strong></td>
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<td>Initial attempt:</td>
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<td>Second attempt (if necessary):</td>
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<tr>
<td><strong>Dissertation Research (45 credits)</strong></td>
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<td>Defense date:</td>
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Career in Chemistry

In addition to pursue for a PhD degree in chemistry in academic institutions, there are various chemistry careers and professional opportunities available for holders of a Master of Science in Chemistry degree. The graduates may find themselves in different specialties, such as chemical synthesis, computational analysis, and instrumental analysis, and working with various subjects such as medicinal chemicals, solid-state or polymeric materials, biological samples, forensic evidence, and environmental sources. Here are a few examples of career in chemistry.

**Chemical Industry Based Chemists:** In various chemistry-related industries (e.g., chemical manufacturing, pharmaceutical companies, and energy companies), chemists may have job opportunities in product R&D, quality control/regulation, and manufacturing. They may also work in sales/marketing and technical support.

**Materials Scientists:** In materials industries, chemists can take on the role of R&D or manufacturing of various synthetic and natural materials, such as metals, glass, ceramics, semiconductors, and polymers.

**Biochemists and Biophysicists:** In this career path, chemists use the principles of chemistry and physics to conduct research on living subjects or biological processes such as cell development, growth, heredity, and disease.

**Forensic Science Technicians:** As a forensic science technician, chemists can aid criminal investigators in collecting and analyzing chemical evidence.

**Environmental Scientists and Specialists, including Health:** In this career path, chemists can conduct research or studies for the purpose of identifying, reducing, or eliminating pollution sources in the environment.

**Natural Sciences Managers:** In this career path, the chemists take the role of supervising scientists including other chemists, physicists, and biologists in activities related to R&D, quality control, and production.

**Consulting:** This career choice is particularly inviting for someone who prefers variety in work assignments.

Previous Students

MS-CHEM is a new program, and we do not yet have program alumni. However, previous students including BS in chemistry and MS in engineering who worked with our affiliated faculty were recruited into graduate programs or employment in the following academic institutions:

- Boston College
- Brown University
- Cornell University
- Duke University
- Georgia Institute of Technology
- Harvard University
- Northeastern University
- Pennsylvania State University
- Pennsylvania State University
- University of Maryland
- University of Massachusetts-Amherst
- University of Rhode Island
- University of Rochester Medical School
- University of Saint Joseph
- Yale University

Some previous students were hired by the following companies.

- Belcan Aerospace and Aviation Company
- MacDermid Enthone
- Honda R&D Americas Inc.
- Innophos
- Laticrete International Inc.
- Pfizer Pharmaceutical Company
- The Mathwork Inc.
- Vertex Pharmaceuticals

MS-Chemistry Program and EAS-Chemistry PhD Program

Department of Chemistry and Chemical Engineering, University of New Haven, West Haven, CT 06516
Application to the MS-CHEM Program

Applicants to the master of science in chemistry program must have earned or be close to earning a bachelor’s degree in chemistry or related STEM fields and must meet some background course requirements in BS-CHEM as specified here. In addition:

- GPA requirement: Admission will usually require a 3.0 grade point average on a 4.0 scale.
- Transcripts: Applicants will submit an official transcript displaying the seal of the institution and signed by the registrar.
- Letters of recommendation: No more than three letters of recommendations are required. Students must submit only three letters written by those best suited to comment on the student’s academic and/or research skills.
- Personal Statement: Students must submit a personal statement about their background including life experiences, why they want to pursue a master’s degree in chemistry, and what are their personal aspirations and career goals.
- TOEFL/IELTS/PTE: A minimum overall score of 75 in TOEFL, a minimum overall score of 6.0 in IELTS, or a minimum score of 50 in PTE. Applicants who have earned or will earn a bachelor’s degree will be exempt from submitting a TOEFL/IELTS score if the degree was earned from an institution where the language of instruction is English.
- GRE: The GRE is NOT required for the master’s program.

Apply Online

Please use the link the below to apply for the MS-CHEM program.

https://graduate.newhaven.edu/apply/

Application to a BS+MS 5-Year (4+1) Program in Liaison with MS-CHEM

For applicants who do not hold a BS degree, you can apply for a special BS+MS 5-year program in Liaison with MS-CHEM. By this program, you will get a BS degree in your chosen major (e.g., Chemistry or Forensic Science) in the 4th year, and a MS degree in chemistry in the 5th year. This program allows you to save one-year of study time and financial cost on earning both BS and MS degrees, and provide you better opportunity to pursue for a PhD study or to excel in your future career.

To apply for this special program, you must meet the admission requirements of your chosen BS program. As long as you maintain an overall GPA of 3.0 or above by the end of your 2nd year of BS program study, you will be advised to take the courses for the BS-MS 5-year program starting in your 3rd-year.

Apply Online

Please use the link the below to apply for an undergraduate program (e.g., Chemistry or Forensic Science) that is in liaison with the MS-CHEM program. Once you are admitted into the BS program, you can contact your BS coordinator or then MS chemistry program coordinator to sign up for the BS+MS (4+1) program.

https://www.newhaven.edu/admissions/apply/

Contact Information

Please contact the graduate program coordinator if you have any questions about the application.

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http://imdcenter.newhaven.edu

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https://www.newhaven.edu/faculty-staff-profiles/art-gow.php

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https://www.newhaven.edu/faculty-staff-profiles/nancy-savage.php

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Postdoc, Yale University
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http://imdcenter.newhaven.edu

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Postdoc, U of Michigan & U of Washington
Research areas: biomaterials
https://www.newhaven.edu/faculty-staff-profiles/kagya-amoako.php

MS-Chemistry Program and EAS-Chemistry PhD Program
Department of Chemistry and Chemical Engineering, University of New Haven, West Haven, CT 06516
Center for Integrative Materials Discovery (IMD)

The IMD Center (http://imdcenter.newhaven.edu) is directed by Dr. Dequan Xiao. The center is interested in developing new theoretical and computational chemistry approaches and integrating them with experiments to discover novel chemical materials such as catalysts, molecular drugs, and polymers. The IMD Center recently has won about $700K in total for research projects, including the supports from NSF, NIH, CT Bio-Innovative Program, and industrial partners. Current projects include:

- Inverse molecular design of green catalysts for converting biomass to liquid fuels
- Devo design of therapeutic molecules for leukemia cancer
- Integrative design of polymer elastomers

Recent Publications:


Research Opportunity
Analytical Core for the Environment (ACE)

ACE, led by Dr. Chong Qiu, focuses on new analytical chemistry instruments and approaches to address environmental issues, especially air pollution caused by aerosol/particulate matters. Some projects are supported by the NSF, are highly interdisciplinary and provide students hands-on experience in building and utilizing state-of-the-art instruments. Current projects include:

- Soot aging and changes in its optical properties
- The fate of amines in the atmosphere
- Field measurements on ozone using portable devices
- Numeric simulation of aerosol composition and property changes

Recent Publications:


The processes to air pollutions and analysis results
Laboratory of Natural Product Synthesis and Medicinal Chemistry

This lab is directed by Dr. Pier Cirillo. He is interested in the synthesis of marine natural products and their analogs. The ultimate aim is to discover new drugs, especially antibiotics against pathogens such as MRSA, or anti-biofilm agents. The compounds are tested in collaboration with microbiologists at UNH or in industry. Current projects include:

- Synthesis of cadiolides and analogs
- Synthesis of depsidones
- Synthesis of polyhalogenated aromatics

Recent Publications:


Biomaterials and Medical Device Innovation Laboratory (BMDiLab)

BMDiLab (www.unhbmdilab.com), led by Dr. Kagya Amoako, focuses primarily on understanding the fundamentals of blood/biomaterial, bacteria/biomaterial, and tissue/biomaterial interactions to prevent medical device related embolic clot formation and infection in order to better support and treat cardiovascular and pulmonary disease patients. BMDiLab is supported by NASA and University Research Scholar Fund. Current projects include:

- Bioinspired Materials Formulation and Characterization
- Antiseptic Medical Devices
- Protein Anti-fouling Materials
- Biological Properties of Nitric Oxide
- Bioactive Materials for Regenerative Medicine/Tissue Engineering
- Low Cost Prosthetic for Above-the-Elbow Amputees

Recent Publications:


Biomaterials being developed at the BMDiLab will be translated into anti-blood adhesion coatings that release biological agents including nitric oxide (NO), a biological molecule which won molecule of the year in 1992 for its multifaceted biological actions. Our research inquiry questions include: how to effectively conjugate NO to biomaterials, how to effectively store and control its release, how to synergize NO with other anti-adhesion materials, how to effectively incorporate this fundamental knowledge into model devices and test for their safety and efficacy before commercialization.

The figure to the left illustrating recent work from the BMDiLab depicts cytocompatibility analysis of antibacterial NO release level from PDMS, fabrication of model catheters with controlled NO release, stent coating with biologically active polymers, and stability evaluation of surface coatings under physiological flows.

MS-Chemistry Program and EAS-Chemistry PhD Program
Department of Chemistry and Chemical Engineering, University of New Haven, West Haven, CT 06516