Chemical Technology and Chemical Technology Operator Certificate (CMT & CMTOC)

Chemical Technology (CMT)

Chemical technicians use sophisticated chemical/biochemical methods and cutting-edge instrumentation to analyze chemical and pharmaceutical substances and evaluate their properties.

The Chemical Technology degree program prepares students to become laboratory technicians or research associates in high-tech research and development or quality control laboratories, academic institutions, and government facilities. Graduates often are employed in chemical manufacturing; polymer/plastic labs; or food/beverage, pharmaceutical, or environmental industries and organizations.

Graduates of the Chemical Technology program earn an Associate of Applied Science degree, and many continue their education in a bachelor's degree program in chemistry, biology/biotechnology, chemical engineering, or a pre-professional degree such as pre-pharmacy, pre-medicine, pre-dental, or pre-veterinary medicine.

For more information, please contact the Engineering and Information Technologies Division at (513) 569-1743.

To apply for this program at Cincinnati State, visit the Admissions (http://www.cincinnatistate.edu/academics/admission/) section of the College website.

Chemical Technology Operator Certificate (CMTOC)

The Chemical Technology Operator Certificate prepares students for positions in process technology industries, including chemical blending, processing, and manufacturing; food/beverages; pharmaceuticals; bioscience; and petrochemicals.

Students gain technical skills needed to manage basic control of systems and devices to monitor levels, temperatures, pressures, and transfer of products. Students also learn basic operation of pumps, valves, and vessels, as well as safety and quality standards.

Students who earn the certificate may continue their education in the Chemical Technology associate's degree program.

For more information, please contact the Engineering and Information Technologies Division at (513) 569-1743.

To apply for this program at Cincinnati State, visit the Admissions (http://www.cincinnatistate.edu/academics/admission/) section of the College website.

Chemical Technology (CMT)

Semester 1		**Lec**	**Lab**	**Credits**
CMT 111	Chemical Technology 1 (**T**)	0	3	1
CHE 121 & CHE 131	General Chemistry 1 and General Chemistry 1 Lab (**G**)	4	3	5
ENG 101	English Composition 1 (**G**)	3	0	3
MAT 151	College Algebra (**G**)	3	2	4
FYE 1XX	First Year Experience Elective (**B**)	1	0	1
XXX XXX	Arts/ Humanities or Social/ Behavioral Sciences Elective (**G**)	3	0	3
Semester 2				
CMT 112	Chemical Technology 2 (**T**)	0	3	1
CHE 111	Bio-Organic Chemistry (**B**)	3	3	4
CHE 122 & CHE 132	General Chemistry 2 and General Chemistry 2 Lab (**B**)	4	3	5
MAT 152	Trigonometry (**B**)	4	0	4
Semester 3				
CMT 291	Full-Time Cooperative Education 1: Chemical Technology (**T**)	1	40	2
Semester 4				
CMT 220	Analytical Chemistry (**T**)	3	3	4
COMM 110	Public Speaking (**B**)	3	0	3
ENG 10X	English Composition Elective (**G**)	3	0	3
XXX XXX	Technical Elective 1 (**T**)	2	3	3
XXX XXX	Science Elective 1 (**T**)	3	3	4
Semester 5				
CMT 230	Chemical Instrumental Analysis (**T**)	3	3	4
CMT 285	Chemical Research (**T**)	1	0	1
XXX XXX	Science Elective 2 (**T**)	3	3	4
XXX XXX	Technical Elective 2 (**T**)	1	2	2
XXX XXX	Technical Elective 3 (**T**)	1	2	2

Semester 6				
CMT 292	Full-Time Cooperative Education 2: Chemical Technology (**T**)	1	40	2
Total Credits:		**50**	**116**	**65**

Electives

First Year Experience Elective		
FYE 100	College Success Strategies: Overview	1
FYE 105	College Success Strategies: Overview and Application	2
FYE 110	College Success Strategies: Practice and Application	3
Arts/Humanities Elective or Social/Behavioral Science Elective		
Any ART, CULT, FRN, LIT, MUS, PHI, REL, SPN, THE		3
or, Any CRJ, ECO, GEO, HST, POL, PSY, SOC		3
English Composition Elective		
ENG 102	English Composition 2: Contemporary Issues	3
ENG 103	English Composition 2: Writing about Literature	3
ENG 104	English Composition 2: Technical Communication	3
ENG 105	English Composition 2: Business Communication	3
Technical Electives		
CHE 201 & CHE 211	Organic Chemistry 1 and Organic Chemistry 1 Lab	5
CHE 202 & CHE 212	Organic Chemistry 2 and Organic Chemistry 2 Lab	5
MAT 131	Statistics 1	3
MAT 132	Statistics 2	3
MAT 251	Calculus 1	5
MAT 252	Calculus 2	5
MAT 253	Calculus 3	5
or, Any BIO or PHY listed in Science Electives, if not used as Science Elective		
or, Any EVT, CET, EET, EMET, MET, PSET, SET		
Science Electives		**8**
Select one of the following series:		
BIO 131 & BIO 132	Biology 1 and Biology 2	
PHY 151 & PHY 152	Physics 1: Algebra and Trigonometry-Based and Physics 2: Algebra and Trigonometry-Based	
PHY 201 & PHY 202	Physics 1: Calculus-Based and Physics 2: Calculus-Based	
or, Any two of the following courses:		
EVS 110	Environmental Science: Conservation and Cleanup	
EVS 120	Environmental Geology	
EVS 130	Environmental Science: Ecology and Ecosystems	

Some courses are offered in alternative versions identified with a letter after the course number-- for example, ENG 101 and ENG 101A.

- This curriculum displays only course numbers without the added letter.
- The alternative version, when available, meets the requirements of the course version without the added letter.

The letters G, B, and T (displayed after course titles or elective descriptions) identify types of courses required by the Ohio Department of Higher Education as part of an associate's degree curriculum.

G = General Education course in this curriculum

B = Basic Skills course in this curriculum

T = Technical course in this curriculum

Chemical Technology Operator Certificate (CMTOC)

Semester 1		**Lec**	**Lab**	**Credits**
ENG 101	English Composition 1	3	0	3
CMT 171	Chemical Operator 1	3	2	4
CMT 111	Chemical Technology 1	0	3	1
CHE 100	Basic Chemistry	2	2	3
MAT 124	Applied Algebra and Geometry	3	2	4
Semester 2				
ENG 104	English Composition 2: Technical Communication	3	0	3
CMT 112	Chemical Technology 2	0	3	1
CMT 172	Chemical Operator 2	3	2	4
EVT 115	OSHA 40-Hour Course	2	2	3
EVT 187	Materials Transportation Safety and Security	1	2	2
EVT 160	Solid and Hazardous Waste Management	2	3	3
Total Credits:		**22**	**21**	**31**

Some courses are offered in alternative versions identified with a letter after the course number-- for example, ENG 101 and ENG 101A.

- This curriculum displays only course numbers without the added letter.
- The alternative version, when available, meets the requirements of the course version without the added letter.

Chemical Technology (CMT)

- Students will determine and demonstrate safe lab practices and use of lab safety resources.
- Students will utilize basic laboratory equipment and techniques.
- Students will develop an ability to apply written, oral, and graphical communication in both technical and non-technical environments, and an ability to identify and use appropriate technical literature.
- Students will effectively utilize lab tools in accurate/precise solution preparation.
- Students will apply a variety of lab calculations common in chemical analysis.
- Students will be able to compile and evaluate experimental data.

- Students will design and conduct an individual research project showing mastery of experimental design and project completion.

Faculty

Program Chair/Advisor

Ann Fallon, MS
ann.fallon@cincinnatistate.edu

Co-op Coordinators

Jennifer Geiger, BS
jennifer.geiger@cincinnatistate.edu

James (Doug) Woodruff, MBA
james.woodruff@cincinnatistate.edu

Engineering and Information Technologies Division Advising

Call (513) 569-1743 or Text (513) 569-1600

CHE Courses

CHE 100 Basic Chemistry
3 Credits. 2 Lecture Hours. 2 Lab Hours.
An introductory course on concepts in chemistry. Topics include: dimensional analysis and problem solving, physical and chemical properties of matter, organization of the periodic table, writing and manipulating formulas, stoichiometry, gas laws, equilibrium, and acids and bases.
Prerequisites: MAT 093 or appropriate Math placement, and FYE 120 or placement into ENG 101 (minimum grade C for both)

CHE 105 Everyday Chemistry
3 Credits. 2 Lecture Hours. 2 Lab Hours.
A course for non-science majors on the relevance of basic principles of chemistry to daily life. Topics include: laboratory/data analysis, matter classification, the periodic table, compound formation, chemical reactions, synthesis/analysis of consumer products, and the global impact of consumerism.
Prerequisites: MAT 093 or appropriate Math placement, and FYE 120 or placement into ENG 101 (minimum grade C for both)
Ohio Transfer Module Approved

CHE 110 Fundamentals of Chemistry
4 Credits. 3 Lecture Hours. 3 Lab Hours.
A college-level general chemistry course for non-majors. Topics include: atomic structure, bonding, chemical reactions, properties and states of matter, acids and bases, and equilibrium.
Prerequisites: MAT 096 or MAT 105 or MAT 124 or appropriate Math placement, and FYE 120 or placement into ENG 101 (minimum grade C for all)
Ohio Transfer Module Approved

CHE 111 Bio-Organic Chemistry
4 Credits. 3 Lecture Hours. 3 Lab Hours.
Study of foundational concepts of organic chemistry and biochemistry. Topics include: types of organic compounds and representative reactions, and biochemical compounds and reactions.
Prerequisites: CHE 110 (minimum grade C) or CHE 121 and CHE 131 (minimum grade C for both)
Ohio Transfer Module Approved

CHE 115 General, Organic, and Biological Chemistry
4 Credits. 3 Lecture Hours. 3 Lab Hours.
A survey of basic concepts of general, organic, and biological chemistry. Topics include: dimensional analysis, problem-solving strategies, atomic structure, chemical bonding, reactions, acid-base chemistry, attractive forces, functional groups, structure/reactions of major macromolecules, and metabolism.
Prerequisites: MAT 096 or MAT 124 or appropriate Math placement, and FYE 120 or placement into ENG 101 (minimum grade C for all)
Ohio Transfer Module Approved

CHE 121 General Chemistry 1
4 Credits. 4 Lecture Hours. 0 Lab Hour.
A general chemistry course for science majors. Topics include: measurement systems; composition, properties, and reactions of elements and compounds; states of matter; atomic structure and bonding; and solution chemistry.
Prerequisites: High School Chemistry (within three years, minimum grade B) or CHE 100 or CHE 110 (minimum grade C for both), and MAT 096 or MAT 124 or appropriate Math placement (minimum grade C for both), and FYE 120 or placement into ENG 101 (minimum grade C)
Corequisites: CHE 131: General Chemistry 1 Lab
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 122 General Chemistry 2
4 Credits. 4 Lecture Hours. 0 Lab Hour.
A continuation of CHE 121. Topics include: kinetics, chemical equilibrium, acid-base chemistry, acid-base and solubility equilibrium, thermodynamics, electrochemistry, and chemistry of transition elements.
Prerequisites: CHE 121 and CHE 131 (minimum grade C for both) and MAT 125 or MAT 151 or MAT 153 (minimum grade C for all)
Corequisites: CHE 132: General Chemistry 2 Lab
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 131 General Chemistry 1 Lab
1 Credit. 0 Lecture Hour. 3 Lab Hours.
A laboratory course that accompanies CHE 121.
Prerequisites: High School Chemistry (within 3 years, minimum grade B) or CHE 100 or CHE 110 (minimum grade C for both), and MAT 124 or MAT 096 or appropriate Math placement (minimum grade C for both), and FYE 120 or placement into ENG 101 (minimum grade C)
Corequisites: CHE 121: General Chenistry 1
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 132 General Chemistry 2 Lab
1 Credit. 0 Lecture Hour. 3 Lab Hours.
A laboratory course that accompanies CHE 122.
Prerequisites: CHE 121 and CHE 131 (minimum grade C for both)
Corequisites: CHE 122
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 201 Organic Chemistry 1
3 Credits. 3 Lecture Hours. 0 Lab Hour.
An organic chemistry course for students preparing for science-related employment or additional science education. Topics include: principles of carbon chemistry including bonding, structure, mechanisms, properties, reactions, synthesis, acids, and bases.
Prerequisites: CHE 122 and CHE 132 (minimum grade C for both)
Corequisites: CHE 211
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 202 Organic Chemistry 2
3 Credits. 3 Lecture Hours. 0 Lab Hour.
A continuation of CHE 201. Topics include: mass spectrometry; infrared, ultraviolet/visible, and NMR spectroscopies; aromaticity; chemistry of benzene, carboxylic acids, amines, aldehydes, and ketones; and oxidation and reduction.
Prerequisites: CHE 201 and CHE 211 (minimum grade C for both)
Corequisites: CHE 212
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 211 Organic Chemistry 1 Lab
2 Credits. 0 Lecture Hour. 4 Lab Hours.
A laboratory course that accompanies CHE 201. Laboratory experiences include: general organic laboratory techniques; isolation, purification, and identification of organic compounds; simple synthesis; and determination of unknowns.
Prerequisites: CHE 122 and CHE 132 (minimum grade C for both)
Corequisites: CHE 201
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 212 Organic Chemistry 2 Lab
2 Credits. 0 Lecture Hour. 4 Lab Hours.
A laboratory course that accompanies CHE 202. Laboratory experiences include: simple, complex, and multistep synthesis; and isolation, purification, analysis, and identification of organic compounds.
Prerequisites: CHE 201 and CHE 211 (minimum grade C for both)
Corequisites: CHE 202
Ohio Transfer Module Approved

Ohio Transfer Assurance Guide Approved

CHE 311 Chemistry and Analysis of Food 1
4 Credits. 3 Lecture Hours. 3 Lab Hours.
The first part of a two-semester biochemistry sequence for students seeking a bachelor's degree in Culinary and Food Science. Topics include: structure, nomenclature, chemical reactions, acid-base chemistry, and functionality of food components including water, sugars, carbohydrates, and lipids; and chemistry of changes that occur during food processing, storage, and utilization of these components.
Prerequisites: CHE 115 and MAT 151 (minimum grade C for both)

CHE 312 Chemistry and Analysis of Food 2
4 Credits. 3 Lecture Hours. 3 Lab Hours.
A continuation of CHE 311. Topics include: structure, nomenclature, chemical reactions, acid-base chemistry, and functionality of food components including proteins, enzymes, flavors, colorants, and other food nutrients and additives; chemistry of changes that occur during food processing, storage, and utilization of these components; and analysis of food components.
Prerequisites: CHE 311 (minimum grade C)

CMT Courses

CMT 111 Chemical Technology 1
1 Credit. 0 Lecture Hour. 3 Lab Hours.
A course on fundamental concepts and techniques in chemical technology. Topics include: the chemical technology major at Cincinnati State, career development, professional communication, chemical technicians' roles in industry, using Microsoft Office Suite, industrial/laboratory safety and hygiene, and laboratory statistics.
Prerequisites: None

CMT 112 Chemical Technology 2
1 Credit. 0 Lecture Hour. 3 Lab Hours.
A continuation of CMT 111. Topics include: maintenance, calibration, and use of laboratory glassware and equipment; solution preparation skills; laboratory math and statistics; and using computers for data analysis.
Prerequisites: CMT 111

CMT 171 Chemical Operator 1
4 Credits. 3 Lecture Hours. 2 Lab Hours.
A course on the Process Industry and the roles and responsibilities of Process Technicians. Topics include: applied chemistry and physics; process industry equipment; occupational safety; and skills and attitudes needed to succeed as a Process Technician.
Prerequisites: None

CMT 172 Chemical Operator 2
4 Credits. 3 Lecture Hours. 2 Lab Hours.
A continuation of CMT 171, emphasizing chemical systems and operational processes and responsibilities of a Process Technician. Topics include: instrumentation, systems used in process technology operations, process documentation (P&ID's and PFDs), start-up and shut-down requirements, and process operator responsibilities.
Prerequisites: CMT 171

CMT 191 Part-Time Cooperative Education 1: Chemical Technology
1 Credit. 1 Lecture Hour. 20 Lab Hours.
Students seeking an associate's degree participate in their first part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: None

CMT 192 Part-Time Cooperative Education 2: Chemical Technology
1 Credit. 1 Lecture Hour. 20 Lab Hours.
Students seeking an associate's degree participate in their second part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 191

CMT 193 Part-Time Cooperative Education 3: Chemical Technology
1 Credit. 1 Lecture Hour. 20 Lab Hours.
Students seeking an associate's degree participate in their third part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 192

CMT 194 Part-Time Cooperative Education 4: Chemical Technology
1 Credit. 1 Lecture Hour. 20 Lab Hours.
Students seeking an associate's degree participate in their fourth part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 193

CMT 195 Part-Time Cooperative Education 5: Chemical Technology
1 Credit. 1 Lecture Hour. 20 Lab Hours.
Students seeking an associate's degree participate in their fifth part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 194

CMT 196 Part-Time Cooperative Education 6: Chemical Technology
1 Credit. 1 Lecture Hour. 20 Lab Hours.
Students seeking an associate's degree participate in their sixth part-time field learning experience related to their degree. Students are expected to register for academic courses during the same semester. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 195

CMT 220 Analytical Chemistry
4 Credits. 3 Lecture Hours. 3 Lab Hours.
A course on quantitative and qualitative chemical analysis with emphasis on wet chemical techniques. Topics include: sample preparation; volumetric, gravimetric, electrochemical, and separation methods; and statistical treatment of data.
Prerequisites: CMT 112, CHE 122, and CHE 132

CMT 230 Chemical Instrumental Analysis
4 Credits. 3 Lecture Hours. 3 Lab Hours.
A course on quantitative and qualitative chemical analysis. Topics include: instrumental techniques, electrochemistry, atomic and molecular spectroscopy, gas and liquid chromatography, mass spectrometry, and statistical treatment of data.
Prerequisites: CMT 220
Corequisites: CMT 285: Chemical Research

CMT 285 Chemical Research
1 Credit. 1 Lecture Hour. 0 Lab Hour.
Students apply knowledge of instrumental analysis to complete an independent research project, including developing a procedure, performing necessary testing, applying statistical techniques, and incorporating the data into a formal report and oral presentation.
Prerequisites: CMT 220
Corequisites: CMT 230: Chemical Instrumental Analysis

CMT 291 Full-Time Cooperative Education 1: Chemical Technology
2 Credits. 1 Lecture Hour. 40 Lab Hours.
Students seeking an associate's degree participate in their first full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: None

CMT 292 Full-Time Cooperative Education 2: Chemical Technology
2 Credits. 1 Lecture Hour. 40 Lab Hours.
Students seeking an associate's degree participate in their second full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 291

CMT 293 Full-Time Cooperative Education 3: Chemical Technology
2 Credits. 1 Lecture Hour. 40 Lab Hours.
Students seeking an associate's degree participate in their third full-time field learning experience related to their degree. Students must follow cooperative education policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 292

CMT 294 Internship 1: Chemical Technology
2 Credits. 1 Lecture Hour. 40 Lab Hours.
Students seeking an associate's degree participate in their first unpaid field learning experience related to their degree. Students must follow applicable policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 111

CMT 295 Internship 2: Chemical Technology
2 Credits. 1 Lecture Hour. 40 Lab Hours.
Students seeking an associate's degree participate in their second unpaid field learning experience related to their degree. Students must follow applicable policies and procedures to earn credit. Grades issued are Satisfactory or Unsatisfactory.
Prerequisites: CMT 294