

Chapter 4

Academic Programs and Course Requirements

The course requirements of academic programs offered by the College over its 144-year history are a reflection of both the College's mission of providing a liberal arts education and addressing the needs of the Western New York community that it serves.

In 1870 when Canisius was founded, the course offerings were by today's standards at the high school and two-year college level. The curriculum expanded as the student body grew and in 1881, the College was incorporated by the New York State Regents to grant a baccalaureate degree. A majority of the course offerings were in the liberal arts along with a few business courses.

By the time this 100-year history begins in 1913, the undergraduate degrees were either Classical, leading to a BA degree or Science, leading to a BS degree.

Shortly therefore, College offered a Master's degree in certain disciplines so that both BS and MS degrees were offered in the late 1920's.

Although Canisius was an all-male college, the need arose to educate future teachers who were mostly women. The College offered undergraduate courses in the evening and the summer that were open to women and alumni records show women graduates from the late 1920's. A large summer school, serving mostly religious nuns, offered primarily education courses.

The chemical industry in Western New York grew rapidly when hydroelectric power was developed after 1900. It created a demand for chemists that the College addressed with course offerings at both the BS and MS level.

At this time, the College also instituted a pre-med curriculum. Medical schools did not require an undergraduate 4-year college degree for admission but only a set of defined courses. The College addressed these admissions requirements with a pre-med program. As a consequence, there were many medical doctors in Buffalo who had not graduated from college.

The Master's Degree program in chemistry experienced maximum enrollment in the 1950's but began to decline along with the chemical industry in WNY. The degree program was discontinued in 1982. A review of the library holdings show that 179 theses, a requirement for the Master's Degree were written between 1927 and 1982.

The undergraduate chemistry program enjoyed sizeable enrollments in the Evening Division for many years. It was popular with chemical technicians with two year degrees who wanted to pursue a BS degree. The Chemistry and Industry Program, described elsewhere in this history, recruited students for the Evening Division during the early 1980's. However the entire undergraduate Evening Division at the College began to gradually decline about this time and was discontinued by 1998.

Biochemistry became a rapidly growing sub-discipline of chemistry and a biochemistry major at the undergraduate level was started in 1968.

To complete the story, the only course offered currently in the Summer Session is General Chemistry.

Evolution of the Curriculum 1913-2014

Liberal Arts Requirements (Core Curriculum)

The curriculum, the set of courses that students undertake at the college has always been a mix of liberal arts courses and major requirements. The liberal arts courses are general study subjects that all students take, traditionally in the disciplines of English, history, mathematics, sciences, philosophy, religious studies and languages.

There was a heavy emphasis on these disciplines in the early days. In Chapter 2, curriculum requirements are given directly from college catalogs to illustrate this point. As examples, the 1930-31 curriculums for a science major consisted of 108 semester hours in the core curriculum (liberal arts) and 48 semester hours in the major field (chemistry). The 1939-40 catalog defines the chemistry major requirements; 2 courses in each of the four areas (inorganic, organic, analytical and physical chemistry) plus scientific German language courses and a thesis based on chemical research.

In the 1950's, the curriculum was still heavy in liberal arts courses. A typical set of courses for a Chemistry major was Chemistry (44 credits), Math and Physics (24 credits), and liberal arts courses (78 credits; including 24 in philosophy and 16 of theology). Two years of military science (ROTC, 8 hrs.) was also required of every student.

In the late 1960's the college faculty engaged in a two-year study to revise the curriculum. The result was that a new core curriculum was introduced and is also reprinted here. This curriculum remained in place for approximately forty years from 1971 to 2010. This core curriculum maintained the liberal arts tradition of the College. It has come under attack as not being relevant and not vocationally oriented as it should be. However, alumni constantly reflect on its merits as a valuable part of their education.

College Catalog Curriculum Requirements 1978-79

Basic Curriculum Outline

A. Core Curriculum

Part 1- General Studies Courses (GST) required of every student:

Course Title	# of Courses	Taken
GST 001-The Arts of Literary Interpretation and Expression	1	Freshman
GST 002-The Arts of Literary Interpretation and Expression	1	Freshman
GST 004-Dimensions of Religious Phenomena	1	
GST 005-An Introduction to Philosophical Thought	1	

Part 2-Area Studies (AS) Courses: (a) Each student must select two courses from each of six of the seven areas (excluding the area related to the major field)* (b) These courses should be spread out over the freshman, sophomore, junior, and senior years; (c) The total number of courses required in Area Studies is 12, or 36 credit hours.

	Area Title		Majors
I.	Natural Sciences Medical		(Biology, Biochemistry, Chemistry, Technology, Pre-Engineering, Physics)
II.	Social Studies		(Business, Communication, Economics, Education, International Relations, Political Science, Psychology, Sociology/Anthropology, Urban Studies)
III.	Art and Literature		(Art History, English, French, German)
IV.	Temporal Processes of Mankind		(History)
V.	Philosophical Interpretations of Existence		(Philosophy)
VI.	Religious Dimensions of Human Life		(Religious Studies)
VII.	Mathematics and Languages		(French, German, Mathematics)
	TOTAL		12 Courses
B.	Major and Ancillary Courses	not more than	18 Courses
C.	Elective Courses		6 Courses
			<hr/> 40 Courses

Two credits in physical education are also required.

Any alterations or revisions in this core may be made by individual students by petitioning the appropriate dean.

Rationale for Liberal Arts Core Curriculum

A rationale for this core curriculum was written by J. Bieron, a member of the Chemistry Department was serving as dean of the College of Arts and Sciences from 1971 to 1980 and presented in the Buffalo News, July 3, 1978. The article outlines the core curriculum and compares it to one implemented by Harvard University. It is reprinted below and helps explain that a chemistry major not only receives the necessary education to be a chemist but also develops a broad understanding of the liberal arts, social sciences and religious values.

Canisius 'Core' is in Mainstream

By. Dr. Joseph F. Bieron

It is not often that the outcome of a college faculty meeting is reported in Newsweek or the New York Times. But then, Harvard University is not just any college, so when the Harvard faculty voted to accept a new core curriculum this past May, its actions became national news.

The Harvard core curriculum, which is a set of basic educational requirements applicable to every undergraduate student, was accepted after four years of study in a move which has been characterized as a "back to basics" approach to education.

Harvard had been operating under a general studies program for the past 30 years in which students were required to select courses from the broad areas of humanities, social sciences and natural sciences. Courses proliferated during the

academic permissive period of the late 1960's so that little, if any, cohesiveness or adherence to educational objectives was evident in the Harvard undergraduate's full course of study.

The new core curriculum at Harvard addresses the problem of cohesiveness and academic rigor by defining educational objectives and then mandating areas of study to achieve those objectives.

THE OBJECTIVES define the rationale for liberal arts in today's world and are, thus, worth enumerating. Briefly stated, an educated person:

- 1-Must be able to think and write clearly and effectively.
- 2-Should have a critical appreciation of the ways in which we gain knowledge and understanding of the universe, of society and of ourselves.
- 3-Cannot be provincial in the sense of being ignorant of other cultures.
- 4-is expected to have some understanding of, and experience in thinking about, moral and ethical problems.
- 5-Should have achieved depth in some field of knowledge...to develop a student's power of reasoning and analysis.

AFTER MUCH debate, the Harvard faculty met these objectives by defining specific subject areas which every student must encounter: one literature course, one music or fine arts course and one interdisciplinary course related to both of the areas, one course each in history, social sciences, philosophical analysis, foreign culture, physical sciences or mathematics and biological or behavioral sciences.

In addition to these courses, competencies must be demonstrated in writing, mathematics (algebra level) and foreign language, although courses are not required.

It is interesting to point out, however, the Harvard core, adopted in 1977, is strikingly similar to the Canisius College core which was adopted in 1971.

The Canisius core mandates four general studies courses: two in English with an emphasis on writing, and one each in religious studies and philosophy.

IN ADDITION to the general studies section, the Canisius core also requires that a student take two courses in each of six of the seven areas of study: natural sciences, social sciences, literature and art, history, philosophy, religious studies and mathematics and foreign language.

In the defined areas of study, the Canisius core and the Harvard core exhibit definite similarities. The great concern for writing and literacy is expressed in both curricula.

There also are differences between the two cores which have been the subject of much healthy debate among faculty at the college. The Harvard core constitutes 20% of a student's course requirements for graduation; Canisius' core constitutes a larger 40% of the student's requirements.

CANISIUS HAS also placed a larger emphasis on religious studies and philosophy in its core, reflecting the impact and importance of the strong Jesuit tradition in these disciplines.

Harvard's core features a "Future's" prospective in which students take courses directed at a more enlightened and philosophical approach to future world problems. Our core does not address this point and, in this sense, may be considered deficient. On the other hand, the intense vocationalism of today's student often forces the student to be very "present-minded" when it comes to choosing and evaluating courses. This conflict must be reconciled so that student needs are met more directly by core courses without sacrificing higher ideals of a liberal education.

Yet, the important point is that Canisius has had its core since 1971! The curriculum erosion and academic permissiveness which forced so many colleges in the United States to abandon requirements in the late 1960's was dealt with effectively by the Canisius faculty, a point which they can look on with some justifiable pride.

Nevertheless, a college's core curriculum demands constant critical re-examination if it is to service students and remain viable. This mission presents a constant challenge to the Canisius faculty because of the multitude of problems that confront liberal arts education today.

BECAUSE OF poor preparation of students in the traditional disciplines at the high school level, students enter college equipped with inadequate skills.

Higher education also faces an anticipated no-growth economy in the near future because of declining numbers of traditional students, which will lead to a climate of possible retrenchment fostering faculty-centered concerns rather than student-centered concerns. The core curriculum is likely to be trapped in such a climate, making it further unresponsive to student needs.

Finally, college faculty, perhaps, more so than any other organization, displays a greater resistance to change. As Harvard President Derek Bok said, "Changing undergraduate education is like trying to move a graveyard."

Despite these pressures, we at Canisius strive to maintain a viable core. The General Studies Committee, a faculty committee chaired by the dean, maintains the integrity of the core by annually reviewing all core courses as well as approving or disapproving new courses for the core.

The Harvard core is not the final word on education. We've learned that much at Canisius after six years of experience. Yet, also, we believe we're adequately equipped to handle the types of problems that Harvard undoubtedly will face also in the coming years.

For me, it's refreshing to know that Canisius is in the mainstream of liberal arts in higher education today, even if Harvard does get all the publicity.

The Buffalo News, Sunday, July 9, 1978, Page E-3

Chemistry Major Course Requirements

As stated previously, the chemistry course requirements in the early days were minimal with an emphasis on analytical methods and wet (solution) chemistry.

Over the years, basic courses in each of the four sub-disciplines were required as stated in the 1939-40 Catalog.

As more instrumentation was introduced in chemistry, courses were also introduced to address these methods. An organic course in instrumental analysis and two analytical courses covering analytical methods became part of the curriculum.

The American Chemical Society provides a service of evaluating Chemistry programs at colleges based on guidelines it has defined. Canisius applied for certification and the Chemistry Department was approved in April 1960. The guidelines for ACS Certification are reprinted here. The Department must make annual reports to ACS and every five years, based on a 5-year summary report, the program certification is renewed. Both the Chemistry and the Biochemistry programs are certified.

In summary, the undergraduate programs in chemistry and biochemistry, both accredited by the ACS constitute the principle academic activity of the Department. The Masters Degree program peaked in the 1950's and was discontinued in 1982. The Evening Division program provided needed opportunities for working students but slowly faded away in the 1990's. The pre-med program was popular in the 1920's-40's by gave way to merging with the degree programs.

Undergraduate Professional Education in Chemistry – ACS Certification Guidelines

The American Chemical Society, the professional organization for chemists, publishes guidelines and evaluation procedures for Bachelor's Degree Programs in Chemistry and Biochemistry.

The Chemistry Department at Canisius College was evaluated by the ACS in the 1950's and its academic program received certification.

Reprinted below are excerpts of the guidelines and criteria for an ACS-approved program that were published by the American Chemical Society's Committee on Professional Training in Spring 2008.

ACS Criteria for Program Certification

“The American Chemical Society (ACS) promotes excellence in chemistry education for undergraduate students through approval of baccalaureate chemistry programs. ACS, through CPT, approves chemistry programs meeting the ACS guidelines. ACS authorizes the chair of the ACS-approved program to certify graduating students who complete a bachelor's degree meeting the ACS guidelines. A certified degree signifies that a student has completed an integrated, rigorous program which includes introductory and foundational course work in chemistry and in-depth course work in chemistry or chemistry-related fields. The certified degree also emphasizes laboratory experience and the development of professional skills needed to be an effective chemist.”

“Faculty. The faculty of an approved program should have the range of educational backgrounds and expertise to provide a sustainable, robust, and engaging

environment in which they educate students. The faculty of an approved program has the following attributes:

- There must be at least four full-time, permanent faculty members wholly committed to the chemistry program.
- At least three-fourths of the chemistry faculty must hold the Ph.D. or an equivalent research degree.
- The collective expertise of the faculty should reflect the breadth of the major areas of modern chemistry.”

“Teaching Contact Hours. The number of contact hours in classroom and in laboratory instruction for faculty and instructional staff must not exceed 15 total hours per week.

“Support Staff. A sustainable and robust program requires an adequate number of administrative personnel, stockroom staff, and technical staff.”

“Student Teaching Assistants. The participation of upper-class chemistry undergraduates and graduate students in the instructional program as teaching assistants both helps them reinforce their knowledge of chemistry and provides a greater level of educational support to students in classes.”

“Physical Plant. An approved program should have classroom, teaching laboratory, research, office, and common space that is safe, well-equipped, modern and properly maintained.”

“Instrumentation. The characterization and analysis of chemical systems requires an appropriate suite of modern chemical instrumentation and specialized laboratory apparatus to support undergraduate instructional and research missions.

- Instrumentation should be modern, high quality, and properly maintained.
- Approved programs must have a functioning NMR spectrometer.
- Throughout their curriculum, undergraduates must use additional instrumentation and specialized laboratory apparatus from most of the broad categories listed below, chosen as appropriate to the teaching and research needs of the program:

-Optical spectroscopy (e.g., UV-vis, FT-ir, fluorescence, atomic absorption and emission, Raman, laser)

-Mass spectrometry (e.g., MS, GC-MS)

-Structure determination methods (e.g. NMR, X-ray diffraction)

-Chromatography and separations (e.g., HPLC, GC, electrophoresis)

-Electrochemistry (e.g., potentiometry, voltammetry)

-Vacuum and inert-atmosphere systems (e.g., Schlenk line, dry box)

-Thermal analysis (e.g., DSC, TGA)

-Imaging and microscopy methods (e.g., electron microscopy, scanning probe microscopy)

- The program should have resources for maintenance and upkeep of this instrumentation including knowledgeable support staff.”

“Computational Capabilities and Software. Students should use computing facilities and computational chemistry software in their course work and research.”

“Chemical Information Resources.

- An approved program must provide access to no fewer than 14 current journals chosen from the CPT recommended journal list (available from the CPT Website) in either print or electronic form.
- Students must have print or electronic access to *Chemical Abstracts*, including the ability to search and access full abstracts.”

“Curriculum. The curriculum of an approved program provides both a broad background in chemical principles and in-depth study of chemistry. These guidelines divide the chemistry curriculum for the certified major into three categories: the introductory chemistry experience, foundation course work that provides breadth and rigorous in-depth course work that builds on the foundation.”

“Pedagogy. Faculty should incorporate pedagogies that have been shown to be effective in undergraduate chemistry education. Examples include problem- or inquiry-based learning, peer-led instruction, group learning, learning communities or networks, writing throughout the curriculum, and technology-aided instruction.”

“Introductory or General Chemistry. The introductory or general chemistry experience plays a vital role in educating all students. An introductory course provides a common background for students with a wide range of high school experiences.”

“Foundation Course Work. Foundation course work provides breadth and lays the groundwork for the in-depth course work. Certified majors must have instruction equivalent to a one-semester course of at least three semester credit hours in each of the five major areas of chemistry: analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry.”

“In-Depth Course Work. The curriculum for the certified major must also include at a minimum the equivalent of four one-semester courses. An in-depth course builds on prerequisite foundation course work.”

“Laboratory Experience. The certified major must have 400 hours of laboratory experience beyond the introductory chemistry laboratory. Undergraduate research can serve as part of the laboratory hours and the in-depth course work if accompanied by a comprehensive written report.”

“Cognate Courses. Certified graduates must complete course work equivalent to two semesters of calculus and two semesters of physics with laboratory.”

“Frequency and Location of Course Offerings. The program must teach at least four semester-long or six quarter-long in-depth courses annually, exclusive of research.”

“Undergraduate Research. Undergraduate research allows students to integrate and reinforce chemistry knowledge from their formal course work, develop their scientific and professional skills, and create new scientific knowledge. The research project should be envisioned as a component of a publication in a peer-reviewed journal.”

2015 Liberal Arts Core Requirements

The faculty at the College implemented a new core curriculum in 2010 after two years of deliberations. The liberal arts course requirements of every student are presented below.

Foundations; Four Courses

Students are recommended to complete these courses in the first year, as long as the major schedule permits.

FYS 101 First Year Experience is for most students in the fall semester.

ENG 101 English is recommended for most students in the spring semester.

PHI 101 Philosophy or RST 101 Religion in the fall semester; complete the second course in the spring semester.

Breadth of Knowledge: Seven Courses

Students are required to take at least seven courses, with at least one from each of the following Fields:

Field 1 Religious Studies and Theology

Field 2 Philosophy

Field 3 Arts

Field 4 History

Field 5 Social Sciences

Field 6 Natural Sciences

Field 7 Mathematical Sciences

Only those courses designated count as fulfillment of a Field requirement. Courses designated as satisfying Field requirement may also satisfy major requirements.

Cross-disciplinary Knowledge and Skills Requirement

Students are required to take courses designated for each of the following cross-disciplinary knowledge and skills:

Diversity (at least one designated course)

Ethics (at least one designated course)

Global Awareness (at least one designated course)

Justice (at least one designated course)

Advanced Writing-intensive (at least one designated course at the 200-level or above)

Oral Communications (at least one designated course)

Courses designated for Field or courses that satisfy major or elective credit may carry these designations. Some courses may carry more than one designation. Students must take as many courses as necessary to achieve all six requirements.

Core Capstone:

Students must take a Core Capstone following completion of all other core requirements.

Typically, students will take a Core Capstone in the junior or senior year. Some Core Capstones may also be designated capstones in a major