

COMPUTER SCIENCE AND COMPUTATIONAL THINKING (BA)

The B.A. in Computer Science and Computational Thinking (BACSCT) serves those students with an interest in computing who would also like to study broadly in the humanities, the social sciences, or the natural sciences. For example, students interested in language and literature could explore questions that arise in computational linguistics or in computational approaches to the study of literature. Students interested in the social sciences could investigate sociological and economic questions through the increasing availability of large data repositories. Students interested in the life sciences could investigate the growing field of bioinformatics. The potential to combine computing with other disciplines makes the BACSCT an attractive option for students with diverse interests. In addition, the BACSCT degree provides background sufficient for entry level employment in many parts of the computer industry, as well as a base for further training in computer science.

The process of majoring in BACSCT begins by selecting a Discipline for Computational Thinking (DCT), chosen from Art, Biology, Communications Studies, Economics, English, Environmental Studies, Philosophy, Sociology, or Theatre Arts. Students choose at least twelve credits from their DCT. The foundation in computing is built upon twenty-five credits in mathematics and computer science. In consultation with their advisors, students also choose an additional eighteen credits in computer science courses. These could include courses relevant to the DCT. For instance, the Department of Computer Science offers courses in human language processing and big data analytics which could complement courses in English or Sociology.

BACSCT students can also pursue optional concentrations in Data Science, Software Application Development, or Software Security.

Cautionary Notes

- Students may take no more than fifteen 200-level CPSC credits over the entire degree. Of these fifteen, no more than nine may be taken to satisfy the eighteen elective credits (See "II. Computer Science Electives," below. Computer science courses are usually, but not always, three credits.
- Many upper division computer science courses require CPSC 260 Computer Organization as a prerequisite (see Courses offered by the Department of Computer Science for details).

Program Requirements

Code	Title	Hours
Lower Division		
CPSC 121	Computer Science I	3
CPSC 122	Computer Science II	3
CPSC 223	Algorithm and Abstract Data Structures	3
CPSC 224	Software Development	3
MATH 148	Survey of Calculus	3-4
or MATH 157	Calculus and Analytic Geometry I	
MATH 231	Discrete Structures	3
Upper Division		
Computer Science Electives ¹		18

CPSC 491	Software Engineering	2
CPSC 491L	Senior Design Project Lab I	1
CPSC 492L	Senior Design Project Lab II	3
CPSC 499	Computers and Society	1

Required Concentration (DCT Specific Courses)

Select one of the following concentrations: 12-15

Art
Biology
Communication Studies
Economics
English
Environmental Studies
Philosophy
Sociology
Theatre Arts

Additional Elective Concentration Options in Computer Science

Select an optional concentration: ²

Computer Science: Data Science
Computer Science: Software Application Development
Computer Science: Software Security

Total Hours 55-59

- ¹
- Any CPSC 200, 300, or 400-level course.
 - At most three elective courses (9 credits) may be taken at the 200-level.
 - 9 of the 18 elective credits will be determined by the DCT Committee to best coincide with the chosen concentration.
 - Courses used to fulfill a computer science concentration may also fulfill these elective credits.

- ² Courses used to fulfill computer science concentration requirements may also fulfill the computer science elective requirements above

***No more than five computer science courses in the entire degree are to be at the 200 level. Many upper division computer science courses require CPSC 260 Computer Organization as a prerequisite (see the list of course in the University Catalog for details).**

Required Concentrations

Art Concentration

Code	Title	Hours
VART 101	Drawing I	3
VART 112	Digital Art Foundations	3
or VART 230	3-D Design	
Select one of the following:		3
VART 393	Special Topics Study Abroad (Modern Italian Art (taught in Florence))	
VART 394	Special Topics in Art History	
VART 395	Modern Art	
VART 396	Contemporary Art	
VART 397	Renaissance Art	
VART 398		
VART 401	Renaissance Architecture	
VART 402	The Image of God	

VART 403/ HIST 302	The Ancient City	
VART 404/ HIST 307	Archaeology of Ancient Greece	
VART 405/ HIST 308	Archaeology of Ancient Rome	
VART 406/ HIST 366	American Cultures and Ideas	
VART 407/ WGST 350	Women Artists	
VART 408	History of Photography	
Select one of the following: ¹		3
VART 141	Ceramics I	
VART 201	Drawing II	
VART 221	Oil Painting	
VART 350	Beginning Printmaking	
VART 351	Beginning Screen Printing	
Total Hours		12

¹ Some of the courses below have a prerequisite. Check the undergraduate catalog.

Biology Concentration

Code	Title	Hours
BIOL 105 & 105L	Information Flow in Biological Systems and Information Flow in Biological Systems Lab	4
BIOL 106	Energy Flow in Biological Systems ¹	3
Select one of the following options:		8
Option A:		
Select two of the following:		
BIOL 205 & BIOL 250L	Physiology and Biodiversity and	
BIOL 206 & 206L	Ecology and Ecology Lab	
BIOL 207 & 207L	Genetics and Genetics Lab	
Option B:		
BIOL 205 & 205L	Physiology and Biodiversity and Physiology and Biodiversity Lab	
BIOL 451 & 451L	Comparative Endocrinology and Comparative Endocrinology Lab (when offered)	
Option C:		
BIOL 206 & 206L	Ecology and Ecology Lab	
Select one of the following:		
BIOL 303 & 303L	Population Ecology and (when offered)	
BIOL 305	Biological Data Analysis	
BIOL 333	Community Ecology	
BIOL 340 & 340L	Field Botany and Field Botany Lab	
BIOL 344 & 344L	Introduction to GIS in Biology and	

BIOL 360 & 360L	Plant Biology and (when offered)	
Option D:		
BIOL 207 & 207L	Genetics and Genetics Lab	
Select one of the following:		
BIOL 305	Biological Data Analysis	
BIOL 335	Advanced Genetics:	
BIOL 337 & 337L	Developmental Biology and (when offered)	
BIOL 351 & 351L	Advanced Cell Biology and Advanced Cell Biology Lab (when offered) ²	
Total Hours		15

¹ CHEM 101 General Chemistry I/CHEM 101L General Chemistry I Lab is a prerequisite

² CHEM 230 Organic Chemistry I is a prerequisite

Communication Studies Concentration

Code	Title	Hours
COMM 210	Understanding Meaning-making	3
COMM 230	Understanding Identity	3
COMM 370	Digital Culture/Networked Self	3
Select one of the following:		3
COMM 340	Encounters in Public Spheres	
COMM 350	Politics of Social Memory	
COMM 360	Media Aesthetics	
COMM 450	Justice and Arts of Civic Life	
Total Hours		12

Economics Concentration

Code	Title	Hours
ECON 201	Microeconomics	3
ECON 202	Macroeconomics	3
Select one of the following:		3
ECON 355	Regression Analysis ¹	
ECON 451	Econometrics ¹	
Select one of the following:		
ECON 303	Game Theory and Economic Applications	
ECON 351	Managerial Economics ¹	
ECON elective ²		3
Total Hours		12

¹ ECON 351 Managerial Economics, ECON 355 Regression Analysis, ECON 451 Econometrics pre-requisites: ECON 201 Microeconomics & ECON 202 Macroeconomics, (BUSN 230 Business Statistics, or MATH 121 Introductory Statistics, or MATH 321 Statistics for Experimentalist)

² ECON course have pre-requisites

English Concentration

12 credits

Any combination of four 300- or 400-level English courses

Environmental Studies Concentration

Code	Title	Hours
ENVS 101	Introduction to Environmental Studies	3
ENVS 103 & 103L	Environmental Biology and Environmental Biology Lab	4
ENVS 104 & 104L	Environmental Chemistry and Environmental Chemistry Lab	4
ENVS 200	Case Studies in Environmental Science	4
Total Hours		15

Philosophy Concentration

12 credits

Four 400-level Philosophy courses chosen by the DCT Committee.

Sociology Concentration

12 credits

Any four Sociology courses at the 100-, 200, and 300-levels.

Theatre Arts Concentration

Code	Title	Hours
THEA 100	Introduction to Theatre Arts	3
THEA 132 or THEA 332	Stagecraft Scenic Design	3-4
THEA 235	Design Process	3
THEA 239	Lighting Design	3
THEA 260	Production Lab	1
Total Hours		13-14

Optional Concentrations

In addition to their required DCT concentration, BSCT students may choose from the following optional concentrations.

Computer Science: Software Security Optional Concentration

Code	Title	Hours
CPSC 260	Computer Organization	3
CPSC 348	Computer Security	3
CPSC 353	Applied Cryptography	3
Select one of the following:		3
CPSC 341	Internet of Things	
CPSC 346	Operating Systems	
CPSC 447		
EENG 410	Information Theory and Coding	
Total Hours		12

Computer Science: Data Science Optional Concentration

Code	Title	Hours
CPSC 222	Introduction to Data Science	3
CPSC 322	Data Science Algorithms	3
Select one of the following:		3
MATH 121	Introductory Statistics	
MATH 221	Applied Statistics	
MATH 321	Statistics for Experimentalist	
CPSC 321	Database Management Systems	3
Select two of the following:		6
CPSC 323	Machine Learning and Intelligent Systems	

CPSC 324	
CPSC 325	Data Science Project Lab
CPSC 475	Speech and Natural Language Processing
Total Hours	18

Computer Science: Software Application Development Optional Concentration

Code	Title	Hours
CPSC 331	UI/UX Design	3
CPSC 332	Web Development	3
CPSC 333	Mobile App Development	3
CPSC 334	Linux and DevOps	3
Total Hours		12

University Core

In addition to their major and minor areas of study, all undergraduate students follow a common program designed to complete their education in those areas that the University considers essential for a Catholic, Jesuit, liberal, and humanistic education. The University Core Curriculum consists of forty-five credits of course work, with additional designation requirements that can be met through core, major, or elective courses.

The University Core Curriculum is a four-year program, organized around one overarching question, which is progressively addressed through yearly themes and questions. Hence, core courses are best taken within the year for which they are designated. First year core courses encourage intellectual engagement and provide a broad foundation of fundamental skills. Second and third year courses examine central issues and questions in philosophy and religious studies. The fourth year course, the Core Integration Seminar, offers a culminating core experience. Taken at any time throughout the four years, broadening courses intersect with the core themes and extend students' appreciation for the humanities, arts, and social and behavioral sciences. Finally, the designation requirements (writing enriched, global studies, and social justice) reflect important values and reinforce students' knowledge and competencies.

Overarching Core Question: As students of a Catholic, Jesuit, and Humanistic University, how do we educate ourselves to become women and men for a more just and humane global community?

Year 1 Theme and Question: Understanding and Creating: How do we pursue knowledge and cultivate understanding?

- The First-Year Seminar (DEPT 193, 3 credits): The First-Year Seminar (FYS), taken in the fall or spring of the first year, is designed to promote an intellectual shift in students as they transition to college academic life. Each small seminar is organized around an engaging topic, which students explore from multiple perspectives. The FYS is offered by many departments across the University (click here [PDF] (<https://www.gonzaga.edu/catalogs/current/undergraduate/school-of-engineering-and-applied-science/course-detail/?code=PHIL+101>) for list of FYS courses).
- Writing (ENGL 101 Writing, 3 credits) and Reasoning (PHIL 101 Reasoning, 3 credits): The Writing and Reasoning courses are designed to help students develop the foundational skills of critical reading, thinking, analysis, and writing. They may be taken as linked sections. Writing (ENGL 101 Writing) carries one of the three required writing-enriched designations (see below).
- Communication & Speech (COMM 100 Communication and Speech, 3 credits): This course introduces students to interpersonal and

small group communication and requires the application of critical thinking, reasoning, and research skills necessary to organize, write, and present several speeches.

- Scientific Inquiry (BIOL 104 Scientific Inquiry/BIOL 104L Scientific Inquiry Lab, CHEM 104 Scientific Inquiry/CHEM 104L Scientific Inquiry Lab, or PHYS 104 Scientific Inquiry/, 3 credits): This course explores the scientific process in the natural world through evidence-based logic and includes significant laboratory experience. Students pursuing majors that require science courses will satisfy this requirement through their major.
- Mathematics (above Math 100, 3 credits): Mathematics courses promote thinking according to the modes of the discipline—abstractly, symbolically, logically, and computationally. One course in mathematics, above Math 100, excluding MATH 193 FYS: and including any math course required for a major or minor, will fulfill this requirement. MATH 100 College Algebra (College Algebra) and courses without the MATH prefix do not fulfill this requirement.

Year 2 Theme and Question: Being and Becoming: Who are we and what does it mean to be human?

- Philosophy of Human Nature (PHIL 201 Philosophy of Human Nature, 3 credits): This course provides students with a philosophical study of key figures, theories, and intellectual traditions that contribute to understanding the human condition; the meaning and dignity of human life; and the human relationship to ultimate reality.
- Christianity and Catholic Traditions (RELI, 3 credits). Religious Studies core courses approved for this requirement explore diverse topics including Christian scriptures, history, theology, and practices as well as major contributions from the Catholic intellectual and theological traditions (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).

Year 3 Theme and Question: Caring and Doing: What principles characterize a well lived life?

- Ethics (PHIL 301 Ethics or RELI, 3 credits): The Ethics courses are designed to help students develop their moral imagination by exploring and explaining the reasons humans should care about the needs and interests of others. This requirement is satisfied by an approved ethics course in either Philosophy (PHIL 301 Ethics) or Religious Studies (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).
- World/Comparative Religion (RELI, 3 credits): Religious Studies courses approved for this core requirement draw attention to the diversity that exists within and among traditions and encourage students to bring critical, analytical thinking to bear on the traditions and questions considered. These courses carries one of the required two global-studies designations (see below) (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).

Year 4 Theme and Question: Imagining the Possible: What is our role in the world?"

- Core Integration Seminar (DEPT 432, 3 credits). The Core Integration Seminar (CIS) offers students a culminating core experience in which they integrate the principles of Jesuit education, prior components of the core, and their disciplinary expertise. Some CIS courses may also count toward a student's major or minor. The CIS is offered by several departments across the University (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of CIS courses).

The Broadening Courses

- Fine Arts & Design (VART, MUSC, THEA, 3 credits): Arts courses explore multiple ways the human experience can be expressed through creativity, including across different cultures and societies. One approved course in fine arts, music, theatre, or dance will fulfill this requirement (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).
- History (HIST, 3 credits): History courses are intended to develop students' awareness of the historical context of both the individual and the collective human experience. One course in History (HIST 101 Foundations of the West, HIST 102 The West and the World, HIST 112 World History, HIST 103 United States History I, HIST 104 United States History II) will fulfill this requirement.
- Literature (3 credits): Literature courses foster reflection on how literature engages with a range of human experience. One approved course in Literature (offered by English, Classics, or Modern Languages) will fulfill this requirement (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).
- Social & Behavioral Sciences (3 credits): Courses in the social and behavioral sciences engage students in studying human behavior, social systems, and social issues. One approved course offered by Criminal Justice, Economics, Political Science, Psychology, Sociology, or Women and Gender Studies will fulfill this requirement (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).

The Designations

Designations are embedded within already existing core, major, minor, and elective courses. Students are encouraged to meet designation requirements within elective courses as their schedule allows; however, with careful planning students should be able to complete most of the designation requirements within other core, major, or minor courses.

- Writing Enriched (WE; 3 courses meeting this designation): Courses carrying the WE designation are designed to promote the humanistic and Jesuit pedagogical ideal of clear, effective communication. In addition to the required core course, Writing (ENGL 101 Writing), which carries one of the WE designations, students must take two other WE-designated courses (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3A04EAD74>) for a list of approved courses).

rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3404EAD740f0a list of approved courses).

- Global-Studies (GS; 2 courses meeting this designation): Courses carrying the GS designation are designed to challenge students to perceive and understand human diversity by exploring diversity within a context of constantly changing global systems. In addition to the required core course, World/Comparative Religion (RELI 300-level), which carries one of the GS designations, students must take one other GS-designated course (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3404EAD740f0>) a list of approved courses).
- Social-Justice (SJ; 1 course meeting this designation): Courses carrying the SJ designation are designed to introduce students to one or more social justice concerns. Students must take one course that meets the SJ designation (click here [PDF] (<https://gonzaga.azureedge.net/-/media/Website/Documents/Academics/University-Core/university-core-registration-guide.ashx?rev=42dd64be974d42c49aac56d4d16b7963&hash=7264D841F25D646771C8A9E3404EAD740f0>) a list of approved courses).

Courses that may be repeated for credit.

In order to remain an Honors student in good standing, a student must:

1. Complete the Honors First Year Block (HONS 193 FYS., HONS 100 Multi-modal Communications, and PHIL 101H Reasoning: Honors) or the transfer equivalent within one academic year of joining the program.
2. Must either complete 6 credit hours of HONS courses (or courses with the Honors Designation) per academic year, or be within 12 credit hours of completing the Honors requirements. Exceptions will be made for students studying abroad during the academic year.
3. Must achieve a cumulative GPA of 3.3 at the time of graduation and good academic standing throughout their tenure at Gonzaga (as defined by the undergraduate catalogue). Students who drop below a 3.0 for two consecutive semesters will be removed from the program (subject to Director review).

Students who fail to meet these requirements will be removed from the program and will no longer qualify for the Honors scholarship.

Major-specific adaptations to the University Core Curriculum

All Gonzaga students, regardless of their major, will complete the University Core Curriculum requirements. However some Gonzaga students will satisfy certain core requirements through major-specific programs or courses. Any major-specific adaptations to the core are described with the requirements for the majors to which they apply.

Honors Program Requirements

Students must take the following courses to complete their Honors degree

Code	Title	Hours
HONS 100	Multi-modal Communications	3
PHIL 101	Reasoning	3
HONS 193	FYS:	3
HONS 432	CIS	3
HONS 499	Honors Senior Project	3
Select five of the following: ¹		15-16
HONS 104 & 104L	Science Inquiry and Science Inquiry Lab	
HONS 201	Honors Human Nature	
HONS 217	Honors Special Topics: Mathematics	
HONS 220	Honors Christian Catholic Traditions	
HONS 221	Honor World or Global Religion	
HONS 241	Foundations of the West	
HONS 243	Asian&PacificIslanderAmerHist	
HONS 247	Honors Special Topics in History	
HONS 267	Honors Special Topics in Art	
HONS 287	Honors Special Topics in Literature	
HONS 301	Honors Ethics	
HONS 290	Honors Colloquium ²	3
HONS 390	Honors Colloquium ²	3

¹ These courses are cross-listed with regular University courses, and can fulfill core or major requirements.