The School of Computer Science offers the following majors and minors:

- B.S. in Artificial Intelligence
- B.S. in Computational Biology
- B.S. in Computer Science
- B.S. in Human-Computer Interaction
- Bachelor's in Computer Science and Art (joint with the College of Fine Arts)
- Additional major in Computational Biology
- Additional major in Computer Science
- Additional major in Human-Computer Interaction
- Additional major in Robotics
- Minor in Computer Science
- Minor in Computational Biology
- Minor in Human-Computer Interaction
- Minor in Language Technologies
- Minor in Machine Learning
- Minor in Neural Computation
- Minor in Robotics
- Minor in Software Engineering

Information for these majors and minors can be found through the navigation menu or through the links below:

- Artificial Intelligence (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/artificialintelligence/) (B.S. degree)
- Computational Biology (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputationalbiology/) (B.S. degree, additional major, minor)
- Computer Science (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputerscience/) (B.S. degree, additional major, minor)
- Human-Computer Interaction (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/humancomputerinteractionprogram/) (B.S. degree, additional interdisciplinary major, minor)
- SCS additional majors and minors (http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/additionalmajors/minors/)

Students who apply to, and are directly admitted into, the School of Computer Science can choose between four primary majors: Artificial Intelligence, Computational Biology, Computer Science and Human-Computer Interaction. Students with artistic and computing interests may be given the option to pursue a major in Computer Science and Art. Suitable prepared students from other Carnegie Mellon colleges are eligible to apply for internal transfer to the School of Computer Science (for Computational Biology or Computer Science) and will be considered for transfer if grades in specific requirements are sufficiently high and space is available. Computation-oriented programs are also available within the Mellon College of Science, the Dietrich College of Humanities and Social Sciences, the College of Engineering and the College of Fine Arts.

Policies & Procedures

Academic Standards and Actions

Grading Practices

Grades given to record academic performance in SCS are detailed under Grading Practices at Undergraduate Academic Regulations (http://coursecatalog.web.cmu.edu/servicesandoptions/undergraduateacademicregulations/).

Dean's List WITH HIGH HONORS

SCS recognizes each semester those undergraduates who have earned outstanding academic records by naming them to the Dean's List with High Honors. The criterion for such recognition is a quality point average of at least 3.75 while completing a minimum of 36 factored units and earning no incomplete grades.

Academic Actions

In the first year, quality point averages below 1.75 in either semester invoke an academic action. For all subsequent semesters an academic action will be taken if the semester quality point average or the cumulative quality point average (excluding the first year) is below 2.00.

Probation: The action of probation will be taken in the following cases based on QPA:

1. One semester of the first year is below 1.75 QPA;
2. The semester QPA of a student in good standing beyond the first year falls below 2.00.

The term of probation is one semester as a full-time student. First year students are no longer on probation at the end of the second semester if the second semester's QPA and the cumulative QPA is 1.75 or above. Students in the third or subsequent semester of study are no longer on probation at the end of one semester if the semester QPA and cumulative QPA (excluding the first year) are 2.00 or above.

Probation Continued: A student who has had one semester on probation and is not yet meeting minimum requirements but whose record indicates that the standards are likely to be met at the end of the next semester of study is occasionally continued on probation, based on advisor recommendation. This action is normally taken only when a student's semester QPA is above 2.0 but their cumulative QPA is not yet above 2.0.

Suspension: A student who does not meet minimum standards based on QPA at the end of one semester of probation will be suspended:

1. A first year student will be suspended if the QPA from each semester is below 1.75;
2. A student on probation in the third or subsequent semester of study will be suspended if the semester QPA is below 2.00.

The minimum period of suspension is one academic year (two non-summer semesters). At the end of that period a student may return to campus (on probation) by:

1. completing a Return from Leave form from the HUB, and
2. submitting an additional written statement to the SCS Associate Dean for Undergraduate Programs, minimum one page, that outlines what the student did while on leave to address the issues that led to the suspension and that would indicate future success on return, and
3. (optional) submitting up to two letters of support from individuals supporting the student's return, and
4. written approval from the student's academic advisor and the Associate Dean for Undergraduate Programs, in consultation with the Office of Student Affairs and the Office of International Education as appropriate.

Students who have been suspended or have withdrawn are required to absent themselves from the campus (including residence halls and Greek houses) within a maximum of two days after the action and to remain off the campus for the duration of the time specified. This action includes debarment from part-time or summer courses at the university for the duration of the period of the action. Although suspended students may not hold student jobs, students on academic suspension may, under certain
circumstances, have a non-student job with the university. Students on
disciplinary or administrative suspension may not.

Drop: This is a permanent severance. Students who have been suspended
and who fail to meet minimum standards in the semester that they return to
school will be dropped.

Students who have been dropped are required to absent themselves from
the campus (including residence halls and Greek houses) within a maximum
of two days after the action.

Other Actions: In addition to academic actions based on QPA, the
Associate Dean for Undergraduate Programs may place students on
probation, or subsequent suspension, if they do not demonstrate
reasonable progress through the core curriculum of their major (e.g., not
completing a core class after 3 attempts, not completing the required 100-
level core courses by the end of the sophomore year, etc.). Students are
encouraged to consult with their academic advisor about any concerns with
regard to lack of progress in their chosen SCS major.

The relation indicated above between probation, suspension and drop is
nominal. In unusual circumstances, SCS College Council may suspend or
drop a student without prior probation.

**Leave of Absence and Return from Leave of Absence**

SCS undergraduate students may elect to take a leave of absence for a
variety of reasons, after consultation with their academic advisor. Students
who wish to take a leave of absence must do so by the last day of classes
before final exams begin and before final grades are posted (in case this is
earlier). Students requesting a leave of absence must complete a form from
the HUB and have this signed by their academic advisor and SCS Associate
Dean for Undergraduate Programs. Students who take a leave of absence
up to the last day to drop classes will have all of their classes dropped.
Students who take a leave of absence after the last day to drop classes will
be assigned a grade of W (withdrawal) for all of their classes.

Students returning from a leave of absence are required to submit a Return
from Leave of Absence form to their academic advisor for approval by the
student’s academic advisor and the SCS Associate Dean for Undergraduate
Programs. In addition, the student must also supply a letter that explains
the reason for the leave, the actions that were performed during the leave
to prepare the student for a successful return, and a description of the
on-campus resources, if required, that would be used by the student in
order to increase the likelihood of success. Students returning from a
leave are also encouraged to provide up to two letters of support from
people close to the student (e.g. family, friends, clergy, teachers, coaches,
others as appropriate). Requests to return are reviewed by the student’s
academic advisor, the Associate Dean and the Student Affairs liaison to
determine eligibility and any resources that need to be put into place to
assist the student upon return. Contact the CS Undergraduate Office for
more information.

**Internal Transfer within SCS**

First year students admitted to SCS are considered undeclared during their
first year. These students declare their SCS major in the second semester
of their freshman year. SCS students who wish to transfer from one SCS
major to another SCS major may do so by applying for transfer by mid-
semester break during the semester the transfer is desired. These students
should consult with their academic advisor and the program director of the
intended major for more information about specific course requirements and
academic plans. Internal SCS transfers do not have any grade requirements.
Transfers are approved based on demonstrated interest, ability, and
available space in the intended major.

**Transfer into SCS / Dual-Degree**

Undergraduate students admitted to colleges at CMU other than SCS
and wishing to transfer to Computer Science or pursue a dual degree
in Computer Science should consult with the Director of the Computer
Science major during their first year. Students wishing to transfer
to Computational Biology or pursue a dual degree in Computational
Biology should consult with the Assistant Department Head for
Education in the Computational Biology Department during their first
year. See the individual program pages for Computer Science (http://
coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/
undergraduatecomputationalbiology/) and Computational Biology (http://
coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/
undergraduatecomputationalbiology/) for locations.

- For the Computer Science major, students must complete 21-127 (or
equivalent), 15-122, 15-150, 15-210, 15-212, 15-251 with an overall
QPA over these six courses of 3.6 or higher and an overall QPA of at
least 3.0 in order to be considered for transfer or dual degree.
- For the Computational Biology major, students must complete 21-127
(or equivalent), 15-122, 15-251, 15-351 (or 15-210*), 03-121 and
02-250 with an overall QPA over these six courses of 3.6 or higher
and an overall QPA of at least 3.0 in order to be considered for transfer
or dual degree. (*Students who take 15-210 will need to also take 15-150;
this course is not required for the B.S. in Computational Biology but can
count as an elective.)
- At this time, no transfers will be allowed into the Human-Computer
Interaction program or Artificial Intelligence program for non-SCS
students. Non-SCS students are able to apply for the interdisciplinary
additional major in Human-Computer Interaction. Consult with the
program director of the Artificial Intelligence major for any changes to
this policy at the start of each academic year.

Students may apply for transfer by the mid-semester break in the semester
when the last of the six required courses will be completed. In the case
of courses in progress, the mid-semester grades will be used in the QPA
calculation. The decision to allow transfer or dual degree will be made by
committee based on the student’s academic performance (in the specified
courses and in their courses overall if necessary), additional involvement in
SCS and other computing-related activities, and availability of space in the
student's class level. Students should consult the SCS Undergraduate Office
for complete information concerning minimum requirements, instructions and
deadlines.

**External Transfer**

A student currently enrolled at another university or college who wishes
to transfer to SCS should first apply through the Office of Admission. If the
Office of Admission believes the applicant meets admission guidelines,
the student’s record is sent to SCS for evaluation. Admission is based on
seat availability, overall academic performance and course rigor from the
student’s current institution, ability to complete the rigorous SCS program
on time, and the application material including recommendations and
reflection essay. It is important to note that external transfers are admitted to the SCS program at Carnegie Mellon University. At this
time, no transfers will be allowed into the Artificial Intelligence or Human-
Computer Interaction program for non-CMU students. External transfers
who are admitted for Computer Science or Computational Biology may not
subsequently transfer into the Artificial Intelligence or Human-Computer
Interaction programs at this time.

**Graduation Requirements**

1. A requirement for graduation is the completion of the program specified
for a degree with a cumulative quality point average of 2.00 or higher
for all courses taken after the first year.
2. Students must be recommended for a degree by the faculty of SCS.
3. A candidate for the bachelor's degree must complete at the University a
minimum of four semesters of full-time study, or the equivalent of part-
time study, comprising at least 180 units of course work.
4. Students will be required to have met all financial obligations to the
university before being awarded a degree.

A student who does not meet the QPA requirement above must petition SCS
College Council for a waiver of the first requirement.

**General Education Requirements**

All undergraduate degrees in the School of Computer Science include
depth in their particular field of study but also breadth through the general
education requirements. General education requirements are part of SCS
degrees to give students an opportunity to learn more about the world from
scientific and humanistic points of view. These additional skills are useful
for graduates since computing is often embedded in domains that are not
entirely within the bounds of computing. SCS students will need to use
their computing skills to solve problems alongside scientists and engineers,
artists, social and cognitive scientists, historians, linguists, economists and
business experts, and SCS students will need to communicate effectively
and understand the ethical implications of their work. The general education
requirements help SCS students gain this broad perspective so they can
work well in a wide variety of domains.
Science and Engineering

All candidates for a B.S. degree in the School of Computer Science must complete a minimum of 36 units offered by the Mellon College of Science and/or the College of Engineering (CIT).

Computational Biology majors

For Computational Biology majors, consult the Computational Biology program page for specific science and engineering requirements. The required science and engineering courses for the Computational Biology major also satisfy the General Education requirement for SCS by default.

Artificial Intelligence, Computer Science and Human-Computer Interaction majors

For Artificial Intelligence, Computer Science and Human-Computer Interaction majors, four courses in science and engineering are required, 9 units or more for each course, at least one course must have a laboratory component and at least two courses must be from the same department.

Non-lab courses that are usually taken by AI, CS and HCI majors to satisfy the General Education requirement for SCS by default. The following MCS and CIT courses cannot be used to satisfy the Science and Engineering requirement:

02-223 Personalized Medicine: Understanding Your Own Genome (can be paired with a course in Biology 03-xxx for two courses in one department) 9
03-121 Modern Biology 9
03-125 Evolution 9
03-132 Basic Science to Modern Medicine 9
03-133 Neurobiology of Disease 9
06-100 Introduction to Chemical Engineering 12
06-221 Thermodynamics 9
09-105 Introduction to Modern Chemistry I 10
09-106 Modern Chemistry II 10
09-217 Organic Chemistry I 9
09-216 Organic Chemistry II 9
09-225 Climate Change: Chemistry, Physics and Planetary Science 9
12-100 Exploring CEE: Infrastructure and Environment in a Changing World 12
12-201 Geology 9
18-100 Introduction to Electrical and Computer Engineering 12
18-220 Electronic Devices and Analog Circuits 12
18-240 Structure and Design of Digital Systems 12
24-101 Fundamentals of Mechanical Engineering 12
24-231 Fluid Mechanics 10
24-261 Statics 10
24-351 Dynamics 10
27-215 Thermodynamics of Materials 12
27-324 Introduction to Polymer Science and Engineering 9
33-114 Physics of Musical Sound 9
33-120 Science and Science Fiction 9
33-121 Physics I for Science Students or 33-141 Physics I for Engineering Students of 33-151 Matter and Interactions I 12
33-142 Physics II for Engineering and Physics Students or 33-152 Matter and Interactions II 12
33-224 Stars, Galaxies and the Universe 9
42-101 Introduction to Biomedical Engineering 12
42-202 Physiology 9
85-219 Biological Foundations of Behavior (can be paired with a course in Biology 03-xxx for two courses in one department) 9

At present, courses meeting the lab requirement include:

02-261 Quantitative Cell and Molecular Biology Laboratory (can be paired with a course in Biology 03-xxx for two courses in one department) 9
03-124 Modern Biology Laboratory 9
09-101 Introduction to Experimental Chemistry (This 3 unit lab together with 09-105 satisfies the lab requirement.)
09-221 Laboratory I: Introduction to Chemical Analysis 12
27-100 Engineering the Materials of the Future 12
33-104 Experimental Physics 9
33-228 Electronics I 10
42-203 Biomedical Engineering Laboratory 9
85-310 Research Methods in Cognitive Psychology 9
85-314 Cognitive Neuroscience Research Methods 9

The following MCS and CIT courses cannot be used to satisfy the Science and Engineering requirement:

03-511 Computational Molecular Biology and Genomics 9
03-512 Computational Methods for Biological Modeling and Simulation 9
06-262 Mathematical Methods of Chemical Engineering 12
09-103 Atoms, Molecules and Chemical Change 9
09-108 The Illusion and Magic of Food 6
09-109 Kitchen Chemistry Sessions 9
09-110 The Design and Making of Skin and Hair Products 3
09-114 Basics of Food Science 3
09-204 Professional Communication Skills in Chemistry 3
09-231 Mathematical Methods for Chemists 9
12-215 Introduction to Professional Writing in CEE 9
12-271 Introduction to Computer Application in Civil & Environmental Engineering 9
18-090 Twisted Signals: Multimedia Processing for the Arts 10
18-200 ECE Sophomore Seminar 1
18-202 Mathematical Foundations of Electrical Engineering 12
18-213 Introduction to Computer Systems 12
18-330 Introduction to Computer Security 12
18-334 Network Security 12
18-335 Secure Software Systems 12
18-345 Introduction to Telecommunication Networks 12
18-411 Computational Techniques in Engineering 12
18-441 Computer Networks 12
18-461 Introduction to Machine Learning for Engineers 12
18-462 Principles and Engineering Applications of AI 12
18-465 Advanced Probability & Statistics for Engineers 12
18-482 Telecommunications Technology and Policy for the Internet Age 12
18-487 Introduction to Computer Security 12
18-540 Rapid Prototyping of Computer Systems 12
19-101 Introduction to Engineering and Public Policy 12
19-211 Ethics and Policy Issues in Computing (or 17-200) 9
19-303 Cryptocurrencies, Blockchains and Applications Var.
19-351 Applied Methods for Technology-Policy Analysis 9
19-402 Telecommunications Technology and Policy for the Internet Age 12
19-403 Policies of Wireless Systems 12
19-411 Science and Innovation Leadership for the 21st Century: Firms, Nations, and Tech 9
27-410 Computational Techniques in Engineering 12
33-100 Basic Experimental Physics 6
33-115 Physics for Future Presidents 9
33-124 Introduction to Astronomy 9
33-232 Mathematical Methods of Physics 10
42-201 Professional Issues in Biomedical Engineering 3

All Electrical and Computer Engineering graduate courses [18-6xx, 18-7xx, 18-8xx, 18-9xx] cannot be used for this requirement. Students interested in Engineering & Public Policy (19-xxx) courses that are not excluded above must consult with the CS Program Director to determine suitability for this requirement. In general, any MCS or CIT courses that are cross-listed with SCS courses or have significant mathematical or computational content cannot be used for this requirement. Students must consult with an SCS undergraduate advisor about any course to be used for the Science and Engineering requirement before registration.
Humanities and Arts

All candidates for a B.S. degree in the School of Computer Science must complete a minimum of 63 units offered by the College of Humanities & Social Sciences and/or the College of Fine Arts as prescribed below. Students pursuing a Bachelor's in Computer Science and Art (http://coursecatalog.web.cmu.edu/servicesandoptions/intercollegeprograms/bxaintercollege/#bcsacurriculumtext) should consult the general education requirements for that program.

A. Freshman Writing Requirement (9 units)

Complete one of the following writing options for 9 units:

- 76-101 Interpretation and Argument
- 76-102 Advanced First Year Writing: Special Topics
- 76-106 Writing about Literature, Art and Culture
- 76-107 Writing about Data
- 76-108 Writing about Public Problems

B. Breadth Requirement (minimum 27 units: 9 units each)

Complete three courses, one each from Category 1, Category 2, and Category 3. Students may use two minis totaling 9 units or more to satisfy one of the categories, with permission of the Assistant Dean for Undergraduate Education, if the minis meet the goals of the desired category. NOTE: Artificial Intelligence majors replace Category 1 with Category 1A: Cognitive Studies which is a subset of Category 1.

Category 1 (for all SCS majors except Artificial Intelligence):
Cognition, Choice and Behavior - this requirement explores the process of thinking, decision making, and behavior in the context of the individual.

70-311 Organizational Behavior 9
80-130 Introduction to Ethics 9
80-150 Nature of Reason 9
80-180 Nature of Language 9
80-221 Philosophy of Social Science 9
80-241 Ethical Judgments in Professional Life 9
80-242 Conflict and Dispute Resolution 9
80-270 Problems of Mind and Body: Meaning and Doing 9
80-271 Philosophy and Psychology 9
80-275 Metaphysics 9
80-281 Language and Thought 9
80-330 Ethical Theory 9
85-102 Introduction to Psychology 9
85-211 Cognitive Psychology 9
85-213 Human Information Processing and Artificial Intelligence 9
85-221 Principles of Child Development 9
85-241 Social Psychology 9
85-251 Personality 9
85-261 Psychopathology 9
85-370 Perception 9
85-390 Human Memory 9
85-408 Visual Cognition 9
85-421 Language and Thought 9
88-120 Reason, Passion and Cognition 9

Category 1A (for Artificial Intelligence majors): Cognitive Studies - this requirement explores how the brain and the mind work.

85-211 Cognitive Psychology 9
85-213 Human Information Processing and Artificial Intelligence 9
85-370 Perception 9
85-390 Human Memory 9
85-408 Visual Cognition 9
85-421 Language and Thought 9

Category 2 (all SCS majors): Economic, Political and Social Institutions - this requirement explores the processes by which institutions organize individual preferences and actions into collective outcomes.

19-101 Introduction to Engineering and Public Policy 12

36-303 Sampling, Survey and Society 9
70-332 Business, Society and Ethics 9
73-102 Principles of Microeconomics 9
73-103 Principles of Macroeconomics 9
79-245 Capitalism and Individualism in American Culture 9
79-299 From Newton to the Nuclear Bomb: History of Science, 1750-1950 9
79-300 History of American Public Policy 9
79-310 U. S. Business History: 1870 to the Present 9
79-320 Women, Politics, and Protest 9
79-331 Body Politics: Women and Health in America 9
79-341 The Cold War in Documents and Film 9
79-383 The History of Capitalism 9
80-135 Introduction to Political Philosophy 9
80-136 Social Structure, Public Policy & Ethics 9
80-243 Ethics of Leadership 9
80-244 Environmental Ethics 9
80-245 Medical Ethics 9
80-324 Philosophy of Economics 9
80-335 Social and Political Philosophy 9
80-341 Computers, Society and Ethics 9
84-104 Decision Processes in American Political Institutions 9
84-275 Comparative Politics 9
84-310 International Political Economy 9
84-322 Nonviolent Conflict and Revolution 9
84-324 The Future of Democracy 9
84-326 Theories of International Relations 9
84-362 Diplomacy and Statecraft 9
84-380 Grand Strategy in the United States 9
84-386 The Privatization of Force 9
84-389 Terrorism and Insurgency 9
84-402 Judicial Politics and Behavior 9
84-414 International and Subnational Security 9
88-257 Experimental Economics 9

Category 3 (all SCS majors): Cultural Analysis - this requirement seeks to recognize cultures that have shaped and continue to shape the human experience; courses in this category are usually either broad in place, time, or cultural diversity.

57-173 Survey of Western Music History 9
60-205 Critical Theory in Art III 9
62-301 Music-Cinema-Culture 9
62-371 Photography, The First 100 Years, 1839-1939 9
70-342 Managing Across Cultures 9
76-221 Books You Should Have Read By Now 9
76-232 Introduction to Black Literature 9
76-239 Introduction to Film Studies 9
76-241 Introduction to Gender Studies 9
79-104 Global Histories 9
79-201 Introduction to Anthropology 9
79-202 Flesh and Spirit: Early Modern Europe, 1400-1750 9
79-223 Mexico: From the Aztec Empire to the Drug War 9
79-226 African History: Earliest Times to 1780 9
79-229 The Origins of the Palestinian-Israeli Conflict, 1880-1948 9
79-230 Arab-Israeli Conflict Since 1948 9
79-240 Development of American Culture 9
79-241 African American History: Africa to the Civil War 9
79-242 African American History: Reconstruction to the Present 9
79-261 The Last Emperors: Chinese History and Society, 1600-1900 9
79-262 Modern China: From the Birth of Mao ... to Now 9
79-265 Russian History: Tsar, Power, and Rebellion 9
79-281 Introduction to Religion 9
79-282 Europe and the World Since 1800 9
79-311 PaleoKitchen: Food and Cooking in the Ancient World 6
79-316 Photography, the First 100 Years, 1839-1939 9
79-333 Sex, Gender & Anthropology 9
79-345 Roots of Rock & Roll 9
79-350 Early Christianity 9
79-395 The Arts in Pittsburgh & Beyond: Experiencing Music & Art in a Time of Pandemic 9
79-396 Music and Society in 19th and 20th Century Europe and the U.S. 9
80-100 Introduction to Philosophy 9
80-250 Ancient Philosophy 9
80-251 Modern Philosophy 9
80-253 Continental Philosophy 9
80-254 Analytic Philosophy 9
80-255 Pragmatism 9
80-261 Experience, Reason, and Truth 9
80-276 Philosophy of Religion 9
82-267 Topics in Italian Language & Culture 9
82-273 Introduction to Japanese Language and Culture 9
82-293 Russian Cinema: From the Bolshevik Revolution to Putin's Russia 9
82-294 19th Century Russian Masterpieces 9
82-303 French & Francophone Cultures 9
82-304 French & Francophone Sociolinguistics 9
82-314 Literature of the Arabic-speaking World 9
82-327 The Emergence of the German Speaking World 9
82-333 Introduction to Chinese Language and Culture 9
82-342 Spain: Language and Culture 9
82-343 Latin America: Language and Culture 9
82-344 U.S. Latinos: Language and Culture 9
82-345 Introduction to Hispanic Literary and Cultural Studies 9

C. Humanities and Arts Electives (minimum 27 units)

Complete 3 non-technical courses of at least 9 units each from any of the departments in the Dietrich College of Humanities & Social Sciences or the College of Fine Arts. Some of the courses taught in these units are considered technical courses and may not be used to satisfy this requirement (see Deletions below). Additionally, a select set of courses from Business Administration and from Environmental and Public Policy can also count for this requirement (see Additions below). Students may combine humanities/arts courses with lower units together to form a single course of 9 units or more. Students are encouraged, but not required, to take courses from different departments to gain additional breadth and to create new opportunities for engagement with the university community.

Deletions

Some courses from the Dietrich College or the College of Fine Arts may not count toward the unconstrained electives in Humanities and Arts in SCS due to the technical (computing and/or mathematical) nature of the courses. Courses from the following departments do not count toward the unconstrained Humanities and Arts electives:

- Statistics and Data Science (36), except 36-303 Sampling, Survey and Society
- Information Systems (67)
- Economics (73), except 73-102 Principles of Microeconomics and 73-103 Principles of Macroeconomics

Additionally, the following courses do not count toward the unconstrained Humanities and Arts electives:

51-257 Introduction to Computing for Creative Practices 10
51-327 Design Center: Introduction to Web Design 9
51-328 Design Center: UX for Digital Systems 9
76-348 Coding for Humanists 9
76-481 Introduction to Multimedia Design 12
76-487 Web Design 12
80-110 Nature of Mathematical Reasoning 9
80-210 Logic and Proofs 9
80-211 Logic and Mathematical Inquiry 9
80-222 Measurement and Methodology 9
80-223 Causality and Probability 9
80-305 Decision Theory 9
80-310 Formal Logic 9
80-311 Undecidability and Incompleteness 9
80-314 Causal Discovery, Statistics, and Machine Learning 9
80-315 Modal Logic 9
80-405 Game Theory 9
80-411 Proof Theory 9
80-413 Category Theory 9
80-419 Interactive Theorem Proving 9
80-521 Seminar on Formal Epistemology: Network Epistemology 9
85-219 Biological Foundations of Behavior 9
85-310 Research Methods in Cognitive Psychology 9
85-314 Cognitive Neuroscience Research Methods 9
85-414 Cognitive Neuropsychology 9
88-251 Empirical Research Methods 9
88-372 Social and Emotional Brain 9

Additions

The following courses outside of Dietrich College and the College of Fine Arts may count toward the unconstrained Humanities and Arts electives:

16-161 ROB Freshman Seminar: Artificial Intelligence and Humanity 9
16-397 Art, Conflict and Technology 12
17-333 Privacy Policy, Law, and Technology 9
17-562 Law of Computer Technology 9
19-101 Introduction to Engineering and Public Policy 12
19-351 Applied Methods for Technology-Policy Analysis 9
19-402 Telecommunications Technology and Policy for the Internet Age 12
19-403 Policies of Wireless Systems 12
19-411 Science and Innovation Leadership for the 21st Century: Firms, Nations, and Tech 9
32-201 Leadership & Management 9
32-402 Leadership and Ethics 9
70-100 Global Business 9
70-311 Organizational Behavior 9
70-321 Negotiation and Conflict Resolution 9
70-332 Business, Society and Ethics 9
70-340 Business Communications 9
70-341 Team Dynamics and Leadership 9
70-342 Managing Across Cultures 9
70-345 Business Presentations 9
70-350 Acting for Business 9
70-364 Business Law 9
70-465 International Trade and International Law 9
70-381 Marketing I 9
70-430 International Management 9

Honors Research Thesis

Students considering going on to graduate school in Computer Science or related disciplines should take a wide variety of Computer Science and Mathematics courses, as well as consider getting involved in independent research as early as possible. This would be no later than the junior year and can begin even earlier. Students interested in graduate school in computer science or its related areas are strongly encouraged to participate in the SCS Honors Undergraduate Research Thesis program. Additionally, graduate CS courses can be taken with permission of the instructor and in consultation with an academic advisor.

The goal of the SCS Honors Undergraduate Research Thesis Program is to introduce students to the breadth of tasks involved in independent research, including library work, problem formulation, experimentation, analysis, technical writing and public speaking. In particular, students write a paper summarizing prior results and current progress in their desired area of research, present a public poster session in December of their senior year describing their current progress, present their final results with a poster and an oral presentation in the year-end university-wide Undergraduate Research Symposium (Meeting of the Minds) and submit a written thesis at the end of their senior year. Students work closely with faculty research advisors to plan and carry out their research. The SCS Honors Undergraduate Research Thesis (07-599) typically starts in the fall semester of the senior year, and spans the entire senior year. Students
receive a total of 36 units of academic credit for the thesis work, 18 units per semester. Students should prepare their research prospectus (i.e., proposal of work) during the spring semester of their junior year, and students in this program are advised to plan their schedules carefully to ensure there is ample time to perform the required research for the thesis during the senior year.

Students interested in research are urged to consult with their undergraduate advisor and the SCS Assistant Dean no later than the end of their sophomore year in order to plan their workload effectively. Although there is no specific GPA requirement to participate, students are expected to have at least a 3.5 GPA in the core SCS topics relevant to their proposed research to be successful in their work. For those students with no background in research, they may consider using Research and Innovation in Computer Science (15-300, 9 units) as an introduction to the research process in their junior year since this course will introduce students to various research projects going on in the School of Computer Science and important skills that are needed to be an effective researcher. This course leads to a subsequent Research Practicum in Computer Science (15-400, 12 units) that allows students to complete a small-scale research study or experiment and present a research poster. Students who use 15-400 to start their senior thesis can use these units toward the required 36 units. Students should consult with their academic advisor concerning how the units earned toward the senior thesis can be used toward elective requirements for their major.

Interested juniors should submit a project prospectus of no more than three pages by the end of their junior year, although submissions over the summer prior to the senior year will also be considered for review. A prospectus must include:

- The name of the research advisor (an SCS faculty member)
- A short abstract (two paragraphs, max)
- A description of the problem to be worked on and its significance
- A tactical description of the proposed research plan, including:
  - a description of the background reading to be carried out,
  - a description of the research contribution,
  - a description of the expected results of the research, and
  - a reasonably detailed timeline for the thesis work
- A bibliography of related work (all references belong here)
- The signature of the research advisor, signifying endorsement of the project and willingness to supervise and evaluate it (or an email confirmation from the research advisor)

Students who need help finding potential advisors should get in touch with their academic advisor or the Associate Dean for Undergraduate Education. Applications to the program are due by the start of the senior year, although submission of applications in the junior year is encouraged.

Students completing an outstanding senior thesis will earn SCS College Honors and can compete for various SCS research awards given out during commencement.

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