BXA Intercollege Degree Programs

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Location: Hall of the Arts 211
www.cmu.edu/interdisciplinary (http://www.cmu.edu/interdisciplinary/)

Mission Statement
The BXA Intercollege Degree Programs are designed for students who want to turn talent and passion into viable professions for the future through a challenging academic curriculum. BXA students pursue their goals with the help of multifaceted advising, innovative pedagogical strategies and a focus on the impact arts have on technology and vice versa.

The goal of the Bachelor of Computer Science and Arts (BCSA), the Bachelor of Engineering Studies and Arts (BESA), the Bachelor of Humanities and Arts (BHA), the Bachelor of Science and Arts (BSA) and the additional major in Engineering and Arts (EA), housed under the BXA Intercollege Degree Programs, is to allow a select group of students who demonstrate interest and accomplishment in the fine arts and computer science, engineering, humanities, social sciences or natural sciences to explore beyond the traditional academic major, or integrate more than one field of study across disciplines. These programs foster the creativity of students who explore innovative approaches to the academic environments of two colleges. By merging the components in the arts and computer science, engineering, natural sciences or humanities into an interdisciplinary/multidisciplinary study, a unique, complex product is born. BXA students produce new object-based project that integrates both areas of concentration

Program Objectives
The skills developed by BXA students span the creative, the technical, the academic and the practical. The objective of the BXA Intercollege Degree Programs is to prepare graduates for careers in which they will draw on their creative and academic skills to create, educate, communicate and innovate across disciplines.

Students who complete the BXA curriculum will graduate with the following skills:
• Foundational knowledge and technical expertise in the CFA concentration area and the DC/ENG/MCS/SCS concentration area
• Ability to describe the connections between these concentrations and how the student integrates them
• Ability to communicate ideas textually, visually and orally
• Knowledge of how the concentration disciplines intersect with history, society and culture from local and global perspectives
• Ability to use cognitive, behavioral and ethical dimensions within the concentration disciplines to make decisions on individual and social levels
• Experience in engaging in art research to produce new knowledge both within the CFA concentration and the DC/ENG/MCS/SCS concentration
• Experience in designing, researching and completing a large-scale, object-based project that integrates both areas of concentration

Bachelor of Computer Science and Arts Degree Program
The Bachelor of Computer Science and Arts (BCSA) intercollege degree program combines the strengths of the College of Fine Arts (CFA) and the School of Computer Science (SCS). This degree provides an ideal technical, critical and conceptual foundation for students interested in pursuing fields that comprehensively meld technology and the arts, such as game design, computer animation, computer music, recording technologies, interactive stagecraft, robotic art and other emerging media. Students choose their arts concentration from the following schools in CFA: Architecture, Art, Design, Drama or Music. Students choose their computer science concentration established by the School of Computer Science.

The BCSA curriculum has three main components: general education requirements, fine arts concentration requirements and computer science concentration requirements. Each student’s course of study is structured so they can complete this rigorous program in four years.

Students receive extensive advising support. The academic advisors in the BXA Intercollege Degree Programs are the primary advisors and liaisons between CFA and SCS. Each student has two additional academic advisors: an advisor in the admitting school of CFA to guide their focus in the arts and an advisor in SCS to guide their focus in computer science.

BCSA Curriculum

<table>
<thead>
<tr>
<th>I. BCSA General Education</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing (1 course, 9 units, 76-101 required)</td>
<td>122</td>
</tr>
<tr>
<td>Mathematics (2 courses, 20 units minimum, 21-122 and either 21-259, 21-266 or 21-241 required), Probability (1 course, 9 units minimum)</td>
<td>117</td>
</tr>
<tr>
<td>Science &amp; Engineering (2 courses, 18 units minimum)</td>
<td>108-114</td>
</tr>
<tr>
<td>Economic, Political, &amp; Social Institutions OR Cognition, Choice &amp; Behavior (1 course, 9 units minimum)</td>
<td>27-33</td>
</tr>
<tr>
<td>University Requirement (1 course, 3 units, 99-101 required)</td>
<td></td>
</tr>
<tr>
<td>BCSA Required Courses (5 courses, 36 units, 52-190, 52-291, 52-392, 52-401, 52-402)</td>
<td></td>
</tr>
</tbody>
</table>

Total BCSA Degree Requirements 380

BCSA General Education
(15 courses, 122 units minimum)

Writing (1 course, 9 units)

Broader considerations: language is a tool used to communicate, as well as a way to organize non-visual and non-mathematical thinking. This requirement focuses on the social nature of language and the ways in which writing constitutes thinking.

76-101 Interpretation and Argument 9
or 76-102 Advanced First Year Writing: Special Topics
or 76-106 Writing about Literature, Art and Culture
& 76-107 and Writing about Data
& 76-108 and Writing about Public Problems

All undergraduate students must complete the First-Year Writing requirement—the Department of English does not accept any Advanced Placement exemptions. This requirement can be completed in two different ways. Enroll in one of two full-semester courses 101 or 102 (by invitation only), 9 units, or enroll in two of three half-semester mini courses (back-to-back within a single semester) 106/107/108, 4.5 + 4.5 units.

Course options and topics: www.cmu.edu/hss/english/first_year/index.html
Mathematics & Probability (3 courses, 29 units minimum)
Choose two mathematics courses (20 units minimum):
21-122 Integration and Approximation 10
21-259 Calculus in Three Dimensions 10
or 21-266 Vector Calculus for Computer Scientists
or 21-241 Matrices and Linear Transformations
Choose one probability course(s) (9 units minimum):
15-259 Probability and Computing 12
21-325 Probability 9
36-218 Probability Theory for Computer Scientists 9
36-225-36-226 Introduction to Probability Theory - Introduction to Statistical Inference 18

Science & Engineering (2 courses, 18 units minimum)
Choose two science courses from differing departments or one science and one engineering course from the following list:
02-223 Personalized Medicine: Understanding Your Own Genome 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
09-105 Introduction to Modern Chemistry I 10
12-100 Exploring CEE: Infrastructure and Environment in a Changing World 12
12-201 Geology 9
18-095 Getting Started in Electronics: An Experiential Approach 9
18-100 Introduction to Electrical and Computer Engineering 12
24-101 Fundamentals of Mechanical Engineering 12
24-231 Fluid Mechanics 10
24-291-24-381 Environmental Systems on a Changing Planet - Environmental Systems on a Changing Planet: Science Engineering Addendum 12
24-358 Culinary Mechanics 9
27-215 Thermodynamics of Materials 12
33-114 Physics of Musical Sound 9
33-120 Science and Science Fiction 9
33-121 Physics I for Science Students 9
33-141 Physics I for Engineering Students 12
33-151 Matter and Interactions I 12
42-101 Introduction to Biomedical Engineering 12
42-202 Physiology 9
85-219 Foundations of Brain and Behavior 9
Labs:
02-261 Quantitative Cell and Molecular Biology Laboratory Var.
02-262 Computation and Biology Integrated Research Lab Var.
27-100 Engineering the Materials of the Future 12
33-104 Experimental Physics 9

Economic, Political & Social Institutions OR Cognition, Choice & Behavior (1 course from either category, 9 units minimum)

Economic, Political & 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
66-221 Topics of Law: Introduction to Intellectual Property Law 9
70-332 Business, Society and Ethics 9
73-102 Principles of Microeconomics 9
76-425 Rhetoric, Science, and the Public Sphere 9
79-101 Making History: How to Think about the Past (and Present) 9
79-189 Democracy and History: Thinking Beyond the Self 9
79-237 Comparative Slavery 9
79-244 Women in American History 9
79-253 Imperialism and Decolonization in South Asia 9
79-300 History of American Public Policy 9
79-320 Women, Politics, and Protest 9
79-321 Documenting Human Rights 9
79-331 Body Politics: Women and Health in America 9
79-370 Technology in the United States 9
79-383 The History of Capitalism 9
79-391 Nations and Nationalisms in South Asia 9
79-392 Europe and the Islamic World 9
80-135 Introduction to Political Philosophy 9
80-136 Social Structure, Public Policy & Ethics 9
80-244 Environmental Ethics 9
80-245 Medical Ethics 9
80-324 Philosophy of Economics 9
80-334/335 Social and Political Philosophy 9
80-348 Health, Human Rights, and International Development 9
84-104 Decision Processes in American Political Institutions 9
84-110 Foundations of Political Economy 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
84-352 Representation and Voting Rights 9
84-362 Diplomacy and Statecraft 9
84-365 The Politics of Fake News and Misinformation 9
84-380 US Grand Strategy 9
84-386 The Privatization of Force 9
84-387 Remote Systems and the Cyber Domain in Conflict 9
84-389 Terrorism and Insurgency 9
84-390 Social Media, Technology, and Conflict 9
84-393 Legislative Decision Making: US Congress 9
84-402 Judicial Politics and Behavior 9
84-405 The Future of Warfare 9
88-281 Topics in Law: 1st Amendment 9
88-284 Topics in Law: The Bill of Rights 9

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
80-101 Dangerous Ideas in Science and Society 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
80-270 Problems of Mind and Body: Meaning and Doing 9
80-271 Mind and Body: The Objective and the Subjective 9
80-275 Metaphysics 9
80-330 Ethical Theory 9
85-102 Introduction to Psychology 9
85-104 Psychopathology 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
88-120 Reason, Passion and Cognition 9
88-230 Human Intelligence and Human Stupidity 9
* Indicates co-requisites and/or prerequisites required.

Additional Dietrich College Courses (2 courses, 18 units minimum)
Complete two non-technical courses. Consult with your BXA advisor to determine the best courses to fulfill this requirement.

University Requirement (1 course, 3 units)
This is a mini-course, pass/no pass, to be completed in the first semester or online in the summer prior to the first semester.

BXA Required Courses (5 courses, 36 units)
BXA-specific courses give students the opportunity to integrate their areas of concentration by focusing on interdisciplinary approaches and arts-based research techniques.

52-190 BXA Seminar I: Building the Wunderkammer - Spring, Freshman (mini-4) 4.5
52-291 BXA Seminar II: Transferring Knowledge -Spring, Sophomore (mini-3) 4.5
52-392 BXA Seminar III: Deconstructing Disciplines 9
52-401 BXA Seminar IV: Capstone Project Research 9
52-402 BXA Seminar V: Capstone Project Production 9

School of Computer Science Concentration
Computer Science Concentration
(11 courses, 117 units minimum)

Prerequisite
15-112 Fundamentals of Programming and Computer 12
Science

Computer Science Core Requirements (5 courses, 60 units)
15-122 Principles of Imperative Computation 12
15-150 Principles of Functional Programming 12
15-210 Parallel and Sequential Data Structures and 12
Algorithms
15-213 Introduction to Computer Systems 12
15-251 Great Ideas in Theoretical Computer Science 12

Concepts of Mathematics (1 course, 12 units)

Note: First-year BCSA students may opt for 15-151 if offered, in place of 21-127.

Applications Courses or CS Electives (5 courses, 45 units minimum)
Choose a minimum of five courses from SCS beyond the core requirements, 200-level or higher, not including 02-201, 02-223, 02-250, 02-261, 15-351, 16-223, 17-200, 17-333, 17-562. Listed below are suggested choices for these electives. Consult with the CS advisor if interested in courses not listed.

05-391 Designing Human Centered Software 12
05-418 Design Educational Games 12
10-335 Art and Machine Learning 12
11-291 Applied Computational Intelligence Lab 9
11-344 Machine Learning in Practice 12
11-411 Natural Language Processing 12
15-281 Artificial Intelligence: Representation and 12
Problem Solving
15-322 Introduction to Computer Music 9
15-323 Computer Music Systems and Information 9
Processing
15-365 Experimental Animation 12
15-388 Practical Data Science 9
15-415 Database Applications 12
15-451 Algorithm Design and Analysis 12
15-458 Discrete Differential Geometry 12
15-462 Computer Graphics 12
15-463 Computational Photography 12
15-464 Technical Animation 12
15-465 Animation Art and Technology 12
15-466 Computer Game Programming 12
15-494 Cognitive Robotics: The Future of Robot Toys 12
16-264 Humanoids 12
16-362 Mobile Robot Algorithms Laboratory 12
16-374 IDeaTe: Art of Robotic Special Effects 12
16-384 Robot Kinematics and Dynamics 12
16-385 Computer Vision 12
16-423 Designing Computer Vision Apps 12
16-455 IDeaTe: Human-Machine Virtuosity 12
16-465 Game Engine Programming 10
16-467 Human Robot Interaction 12
17-214 Principles of Software Construction: Objects, 12
Design, and Concurrency
17-313 Foundations of Software Engineering 12
17-356 Software Engineering for Startups 12
17-437 Web Application Development 12

COLLEGE OF FINE ARTS CONCENTRATION
(number of courses vary, 108-114 units minimum)

BCSA students choose one of the following concentrations:
• Architecture (108 units)
• Art (114 units)
• Design (108 units)
• Drama (108 units)
• Music (108 units)

Architecture Concentration
(108 units minimum)

Architecture Required Courses (7 courses, 52 units minimum)
48-100 Architecture Design Studio: POIESIS STUDIO 1 - Fall, Freshman or Sophomore year 10-15
48-095 Spatial Concepts for Non-Architecture Majors

62-122 Digital Media I -Fall, Freshman year 6
62-125 Drawing I -Fall, Freshman year 6
62-123 Digital Media II -Spring, Freshman year 6
62-126 Drawing II -Spring, Freshman year 6
48-240 History of World Architecture, I -Spring, 9
Freshman year
48-241 History of Modern Architecture -Fall, Sophomore 9
year

Architecture Electives (56 units minimum)
A minimum of 56 additional Architecture units must be approved by the Architecture advisor. A list of these selected courses must be filed in the BXA office.

Art Concentration
(114 units minimum)

First-Year Seminar (1 course, 6 units)
60-104 Foundations: Art First-Year Seminar 6

Foundation Studios (3 courses, 30 units)
Complete three courses:
60-110 Foundations: Time-Based Media 10
60-120 Foundations: Digital Media 10
60-131 Foundations: Sculpture 10
60-135 Foundations: Sculpture II 10
60-150 Foundations: Drawing 10
60-170 Foundations: Paint/Print 10

Intermediate Studios (3 courses, 30 units)
Complete three courses:
60-2xx Intermediate Studio Elective 10
60-2xx Intermediate Studio Elective 10
60-2xx Intermediate Studio Elective 10

**Advanced Studios (3 courses, 30 units)**

Students may take courses in any media area (ETB, SIS, CP or DP3). They may take all courses in one media area if a focus is desired. With approval from the Art advisor, BXA students can take an additional intermediate studio in lieu of an advanced studio to increase breadth.

Complete three courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>51-101</td>
<td>Studio: Survey of Design - Fall, First-year</td>
<td>10</td>
</tr>
<tr>
<td>51-121</td>
<td>Visualizing - Fall, First-year</td>
<td>10</td>
</tr>
<tr>
<td>51-277</td>
<td>Design Studies - Systems - Fall, Sophomore year</td>
<td>5</td>
</tr>
<tr>
<td>51-279</td>
<td>Design Studies - Cultures - Fall, Sophomore year</td>
<td>5</td>
</tr>
<tr>
<td>51-282</td>
<td>Design Studies - Persuasion - Spring, Sophomore year</td>
<td>5</td>
</tr>
<tr>
<td>51-284</td>
<td>Design Studies - Power - Spring, Sophomore year</td>
<td>5</td>
</tr>
<tr>
<td>Choose Two</td>
<td>Studios - Fall, Sophomore year</td>
<td>4.5+4.5</td>
</tr>
<tr>
<td>51-225</td>
<td>Communications Studio I: Understanding Form &amp; Context</td>
<td>4.5</td>
</tr>
<tr>
<td>or 51-245</td>
<td>Products Studio I: Understanding Form &amp; Context</td>
<td>4.5</td>
</tr>
<tr>
<td>or 51-265</td>
<td>Environments Studio I: Understanding Form &amp; Context</td>
<td>4.5</td>
</tr>
<tr>
<td>Choose Two</td>
<td>Corresponding Labs - Fall, Sophomore year</td>
<td>4.5+4.5</td>
</tr>
<tr>
<td>51-227</td>
<td>Prototyping Lab I: Communications</td>
<td>4.5</td>
</tr>
<tr>
<td>or 51-247</td>
<td>Prototyping Lab I: Products</td>
<td>4.5</td>
</tr>
<tr>
<td>or 51-267</td>
<td>Prototyping Lab I: Environments</td>
<td>4.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Electives (10 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minimum of 10 additional Design units must be approved by the Design advisor. A list of these selected courses must be filed in the BXA office.</td>
</tr>
</tbody>
</table>

**Design Concentration (108 units minimum)**

**Design Required Courses (16 courses, 98 units)**

<table>
<thead>
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</tr>
</thead>
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<td>Studio: Survey of Design - Fall, First-year</td>
<td>10</td>
</tr>
<tr>
<td>51-121</td>
<td>Visualizing - Fall, First-year</td>
<td>10</td>
</tr>
<tr>
<td>51-175</td>
<td>Design Studies - Place - Fall, First-year (mini-1)</td>
<td>5</td>
</tr>
<tr>
<td>51-177</td>
<td>Design Studies - Histories - Fall, First-year (mini-2)</td>
<td>5</td>
</tr>
<tr>
<td>51-102</td>
<td>Design Lab - Spring, First-year</td>
<td>5</td>
</tr>
<tr>
<td>51-122</td>
<td>Collaborative Visualizing - Spring, First-year</td>
<td>10</td>
</tr>
<tr>
<td>51-176</td>
<td>Design Studies - Futures - Spring, First-year (mini-3)</td>
<td>5</td>
</tr>
<tr>
<td>51-178</td>
<td>Design Studies - Experience - Spring, First-year (mini-4)</td>
<td>5</td>
</tr>
<tr>
<td>51-277</td>
<td>Design Studies - Systems - Fall, Sophomore year</td>
<td>5</td>
</tr>
<tr>
<td>51-279</td>
<td>Design Studies - Cultures - Fall, Sophomore year</td>
<td>5</td>
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<tr>
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<td>Design Studies - Persuasion - Spring, Sophomore year</td>
<td>5</td>
</tr>
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<td>5</td>
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<tr>
<td>51-225</td>
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<td>4.5</td>
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</tr>
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<td>Environments Studio I: Understanding Form &amp; Context</td>
<td>4.5</td>
</tr>
<tr>
<td>Choose Two</td>
<td>Corresponding Labs - Fall, Sophomore year</td>
<td>4.5+4.5</td>
</tr>
<tr>
<td>51-227</td>
<td>Prototyping Lab I: Communications</td>
<td>4.5</td>
</tr>
<tr>
<td>or 51-247</td>
<td>Prototyping Lab I: Products</td>
<td>4.5</td>
</tr>
<tr>
<td>or 51-267</td>
<td>Prototyping Lab I: Environments</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Design Electives (10 units)**

A minimum of 10 additional Design units must be approved by the Design advisor. A list of these selected courses must be filed in the BXA office.

**Dramaturgy Required Courses (9 courses, 59 units minimum)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>54-109</td>
<td>Dramaturgy 1: Approaches to Text</td>
<td>9</td>
</tr>
<tr>
<td>54-184</td>
<td>Dramaturgy 2: Introduction to Production</td>
<td>9</td>
</tr>
<tr>
<td>54-121</td>
<td>Directing I: A Director's Mindset</td>
<td>9</td>
</tr>
<tr>
<td>54-159-54-159</td>
<td>Production Practicum-Production Practicum</td>
<td>12</td>
</tr>
<tr>
<td>54-200-54-200</td>
<td>Dramaturgy Forum-Dramaturgy Forum - Fall</td>
<td>2</td>
</tr>
<tr>
<td>54-xxx</td>
<td>Dramaturgy 3, 4, 5 or 6 (minimum of two; all four if enrolled as BXA for six semesters or more)</td>
<td>18</td>
</tr>
</tbody>
</table>

A minimum of 30 additional Dramaturgy units must be approved by the Dramaturgy faculty area chair. A list of these selected courses must be filed in the BXA office.

**Production Technology and Management Required Courses (2 courses, 26 units)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>54-151-54-152</td>
<td>Stagecraft-Stagecraft - Fall</td>
<td>26</td>
</tr>
</tbody>
</table>

A minimum of 63 additional Design units must be approved by the BXA faculty area chair. A list of these selected courses must be filed in the BXA office.
### Audio Recording & Production Required Courses (7 courses, 40 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-101</td>
<td>Introduction to Music Technology</td>
<td>6</td>
</tr>
<tr>
<td>or 57-171</td>
<td>Introduction to Music Technology (self-paced)</td>
<td>6</td>
</tr>
<tr>
<td>57-181</td>
<td>Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-180</td>
<td>Basic Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>57-173</td>
<td>Survey of Western Music History</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(co-requisite: 57-188)</td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-337</td>
<td>Sound Recording</td>
<td>6</td>
</tr>
<tr>
<td>57-338</td>
<td>Sound Editing and Mastering</td>
<td>6</td>
</tr>
<tr>
<td>57-438</td>
<td>Multitrack Recording</td>
<td>9</td>
</tr>
</tbody>
</table>

Choose 59 units from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-153</td>
<td>Harmony II</td>
<td>9</td>
</tr>
<tr>
<td>or 57-150</td>
<td>Basic Harmony II</td>
<td>9</td>
</tr>
<tr>
<td>57-182</td>
<td>Solfege II</td>
<td>3</td>
</tr>
<tr>
<td>or 57-186</td>
<td>Advanced Solfege II</td>
<td>3</td>
</tr>
<tr>
<td>10-301</td>
<td>Introduction to Machine Learning (Undergrad)</td>
<td>12</td>
</tr>
<tr>
<td>15-104</td>
<td>Introduction to Computing for Practice</td>
<td>10</td>
</tr>
<tr>
<td>15-213</td>
<td>Introduction to Computer Systems</td>
<td>12</td>
</tr>
<tr>
<td>15-322</td>
<td>Introduction to Computer Music</td>
<td>9</td>
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<tr>
<td>18-090</td>
<td>Twisted Signals: Multimedia Processing for the Arts</td>
<td>10</td>
</tr>
<tr>
<td>33-114</td>
<td>Physics of Musical Sound</td>
<td>9</td>
</tr>
<tr>
<td>54-166</td>
<td>Introduction to Sound Design for Theatre</td>
<td>6</td>
</tr>
<tr>
<td>54-275</td>
<td>History of Sound Design</td>
<td>3</td>
</tr>
<tr>
<td>54-666</td>
<td>Production Audio</td>
<td>6</td>
</tr>
<tr>
<td>57-161</td>
<td>Eurhythmics I</td>
<td>3</td>
</tr>
<tr>
<td>57-344</td>
<td>Experimental Sound Synthesis</td>
<td>9</td>
</tr>
<tr>
<td>57-347</td>
<td>Electronic and Computer Music</td>
<td>6</td>
</tr>
<tr>
<td>57-358</td>
<td>Introduction to Electronic Music</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(with instructor permission as space allows)</td>
<td></td>
</tr>
<tr>
<td>57-421</td>
<td>Exploded Ensemble</td>
<td>6</td>
</tr>
<tr>
<td>57-427</td>
<td>Advanced Seminar in Film Musicology</td>
<td>9</td>
</tr>
<tr>
<td>57-478</td>
<td>Survey of Historical Recording</td>
<td>6</td>
</tr>
<tr>
<td>57-622</td>
<td>Independent Study in Sound Recording</td>
<td>3</td>
</tr>
</tbody>
</table>

60-131 Foundations: Sculpture 10

Note: Students completing an IDEATe minor may double-count up to two of the IDEATe minor courses towards the Audio Recording & Production concentration.

### Composition Required Courses (12 courses, 76 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-161</td>
<td>Eurhythmics I (recommended co-requisite: 57-181)</td>
<td>3</td>
</tr>
<tr>
<td>57-181</td>
<td>Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-180</td>
<td>Basic Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>57-173</td>
<td>Survey of Western Music History</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(co-requisite: 57-188)</td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-49x</td>
<td>BXA Studio (4 semesters)</td>
<td>36</td>
</tr>
<tr>
<td>57-xxx</td>
<td>Major Ensemble (4 semesters)</td>
<td>24</td>
</tr>
</tbody>
</table>

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

### Music Performance Required Courses (12 courses, 76 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-161</td>
<td>Eurhythmics I (recommended co-requisite: 57-181)</td>
<td>3</td>
</tr>
<tr>
<td>57-181</td>
<td>Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-180</td>
<td>Basic Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>57-173</td>
<td>Survey of Western Music History</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(co-requisite: 57-188)</td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-49x</td>
<td>BXA Studio (4 semesters)</td>
<td>36</td>
</tr>
<tr>
<td>57-xxx</td>
<td>Major Ensemble (4 semesters)</td>
<td>24</td>
</tr>
</tbody>
</table>

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

### Sound Theory & Practice Required Courses (7 courses, 47 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-101</td>
<td>Introduction to Music Technology</td>
<td>6</td>
</tr>
<tr>
<td>or 57-171</td>
<td>Introduction to Music Technology (self-paced)</td>
<td>6</td>
</tr>
<tr>
<td>57-181</td>
<td>Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-180</td>
<td>Basic Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>57-173</td>
<td>Survey of Western Music History</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>(co-requisite: 57-188)</td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>18-090</td>
<td>Twisted Signals: Multimedia Processing for the Arts</td>
<td>10</td>
</tr>
<tr>
<td>57-911</td>
<td>Music Since 1945</td>
<td>9</td>
</tr>
<tr>
<td>57-616</td>
<td>Independent Study in Sound Studies</td>
<td>9</td>
</tr>
</tbody>
</table>

Choose 52 units from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-153</td>
<td>Harmony II</td>
<td>9</td>
</tr>
<tr>
<td>or 57-150</td>
<td>Basic Harmony II</td>
<td>9</td>
</tr>
<tr>
<td>57-182</td>
<td>Solfege II</td>
<td>3</td>
</tr>
<tr>
<td>or 57-186</td>
<td>Advanced Solfege II</td>
<td>3</td>
</tr>
<tr>
<td>10-301</td>
<td>Introduction to Machine Learning (Undergrad)</td>
<td>12</td>
</tr>
<tr>
<td>15-104</td>
<td>Introduction to Computing for Practice</td>
<td>10</td>
</tr>
<tr>
<td>15-213</td>
<td>Introduction to Computer Systems</td>
<td>12</td>
</tr>
<tr>
<td>15-322</td>
<td>Introduction to Computer Music</td>
<td>9</td>
</tr>
<tr>
<td>18-090</td>
<td>Twisted Signals: Multimedia Processing for the Arts</td>
<td>10</td>
</tr>
<tr>
<td>33-114</td>
<td>Physics of Musical Sound</td>
<td>9</td>
</tr>
<tr>
<td>54-166</td>
<td>Introduction to Sound Design for Theatre</td>
<td>6</td>
</tr>
<tr>
<td>54-275</td>
<td>History of Sound Design</td>
<td>3</td>
</tr>
<tr>
<td>54-666</td>
<td>Production Audio</td>
<td>6</td>
</tr>
<tr>
<td>57-161</td>
<td>Eurhythmics I</td>
<td>3</td>
</tr>
<tr>
<td>57-344</td>
<td>Experimental Sound Synthesis</td>
<td>9</td>
</tr>
<tr>
<td>57-347</td>
<td>Electronic and Computer Music</td>
<td>6</td>
</tr>
<tr>
<td>57-358</td>
<td>Introduction to Electronic Music</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>(with instructor permission as space allows)</td>
<td></td>
</tr>
<tr>
<td>57-421</td>
<td>Exploded Ensemble</td>
<td>6</td>
</tr>
<tr>
<td>57-438</td>
<td>Multitrack Recording</td>
<td>9</td>
</tr>
<tr>
<td>57-478</td>
<td>Survey of Historical Recording</td>
<td>6</td>
</tr>
</tbody>
</table>

60-131 Foundations: Sculpture 10

Note: Students completing an IDEATe minor may double-count up to two of the IDEATe minor courses towards the Sound Theory & Practice concentration.

### Free Electives

(approximately 3-4 courses, 27-33 units minimum)

Take any Carnegie Mellon course. A maximum of 9 units of physical education and/or military science may be counted toward this requirement.

### Bachelor of Engineering Studies and Arts Degree Program

The Bachelor of Engineering Studies and Arts (BESA) intercollege degree program combines the strengths of the College of Fine Arts (CFA) and the College of Engineering (ENG). This degree is tailored for students seeking to apply knowledge from duel fields to advance maker culture in novel and creative ways. Students choose their arts concentration from the following schools in CFA: Architecture, Art, Design, Drama or Music. Students choose their engineering studies concentration established by the College of Engineering. Options within the concentration include: biomedical engineering, chemical engineering, civil & environmental engineering, electrical & computer engineering, materials science & engineering or mechanical engineering.

The BESA curriculum has three main components: general education requirements, fine arts concentration requirements and engineering studies concentration requirements. Each student’s course of study is structured so they can complete this rigorous program in four years.

Students receive extensive advising support. The academic advisors in the BXA Intercollege Degree Programs are the primary advisors and liaisons between CFA and ENG. Each student has two additional academic advisors: an advisor in the admitting school of CFA to guide their focus in the arts and an advisor in ENG to guide their focus in engineering studies.
BESA Curriculum

<table>
<thead>
<tr>
<th>BESA General Education</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. BESA General Education</td>
<td>92</td>
</tr>
<tr>
<td>II. ENG Concentration</td>
<td>93-120</td>
</tr>
<tr>
<td>III. CFA Concentration</td>
<td>108-114</td>
</tr>
<tr>
<td>IV. Free Electives</td>
<td>54-87</td>
</tr>
<tr>
<td><strong>Total BESA Degree Requirements</strong></td>
<td><strong>380</strong></td>
</tr>
</tbody>
</table>

**BESA GENERAL EDUCATION**

(11 courses, 92 units minimum)

- Writing (1 course, 9 units, 76-101 required)
- Mathematics (2 courses, 20 units, 21-120 and 21-122 required)
- Science and Technology (2 courses, 24 units, 15-112 and 33-141 required)
- University Requirement (1 course, 3 units, 99-101 required)
- BXA Required Courses (5 courses, 36 units, 52-190, 52-291, 52-392, 52-401, 52-402)

- Writing (1 course, 9 units)
  
  76-101 Interpretation and Argument 9
  or 76-102 Advanced First Year Writing: Special Topics 9
  or 76-106 Writing about Literature, Art and Culture 9 & 76-107 and Writing about Data 9 & 76-108 and Writing about Public Problems 9

All undergraduate students must complete the First-Year Writing requirement—the Department of English does not accept any Advanced Placement exemptions. This requirement can be completed in two different ways. Enroll in one of two full-semester courses 101 or 102 (by invitation only), 9 units, or enroll in two of three half-semester mini courses (back-to-back within a single semester) 106/107/108, 4.5 + 4.5 units. Course options and topics: www.cmu.edu/hss/english/first_year/index.html

- Mathematics (2 courses, 20 units)
  
  21-120 Differential and Integral Calculus 10
  21-122 Integration and Approximation 10

- Science and Technology (2 courses, 24 units)
  
  15-112 Fundamentals of Programming and Computer Science 12
  33-141 Physics I for Engineering Students 12

- BXA Required Courses (5 courses, 36 units)
  
  BXA-specific courses give students the opportunity to integrate their areas of concentration by focusing on interdisciplinary approaches and arts-based research techniques.

  52-190 BXA Seminar I: Building the Wunderkammer - Spring, Freshman (mini-4) 4.5
  52-291 BXA Seminar II: Transferring Knowledge -Spring, Sophomore (mini-3) 4.5
  52-392 BXA Seminar III: Deconstructing Disciplines 9
  52-401 BXA Seminar IV: Capstone Project Research 9
  52-402 BXA Seminar V: Capstone Project Production 9

**College of Engineering Concentration**

(number of courses vary, 93-120 units)

BESA students declare one of the following concentrations, through consultation with their BXA advisor and the ENG concentration advisors. A completed ENG Concentration Declaration form must be approved by the concentration advisor and submitted to the BXA office, by spring mid-semester break of the student’s first year.

- Biomedical Engineering (93 units)
- Chemical Engineering (102 units)
- Civil Engineering (99 units)
- Electrical & Computer Engineering (120 units)
- Mechanical Engineering (105 units)

BESA students who are admitted as freshmen are undeclared until they have met with a concentration advisor and have submitted their signed Declaration form. BESA students who are admitted through internal transfer must have chosen an ENG concentration at the time of their application (which serves as declaration). All BESA students wishing to change their ENG concentration at any time following the initial declaration must meet with the advisor of their intended concentration area to complete a new Declaration form.

**Biomedical Engineering Concentration**

(93 units minimum)

**Mathematics & Science Prerequisites**

- 21-120 Differential and Integral Calculus -(Gen Ed) 10
- 21-122 Integration and Approximation -(Gen Ed) 10
- 21-254 Linear Algebra and Vector Calculus for Engineers 11
- 21-260 Differential Equations 9
- 15-110 Principles of Computing 10
- 33-141 Physics I for Engineering Students -(Gen Ed) 12
- 33-142 Physics II for Engineering and Physics Students 12
- 03-121 Modern Biology 9

**Biomedical Engineering Courses (7 courses, 66 units)**

- 42-101 Introduction to Biomedical Engineering - Freshman year 12
- 42-102 Physiology -Sophomore year; prereq: 03-121/03-151 9
- 42-203 Biomedical Engineering Laboratory -Sophomore year; prereq: 42-101, 03-121/03-151 9
- 42-401 Foundation of BME Design -Fall, Senior year; prereq: 42-101 6
- 42-402 BME Design Project -Spring, Senior year 9

**Electives (3 courses, 27 units minimum)**

Choose 3 elective courses in BME tracks and/or ENG with prerequisites in consultation with the concentration advisor.

**Chemical Engineering**

(102 units minimum)

**Mathematics & Science Prerequisites**

- 21-120 Differential and Integral Calculus -(Gen Ed) 10
- 21-122 Integration and Approximation -(Gen Ed) 10
- 21-254 Linear Algebra and Vector Calculus for Engineers -Fall, Sophomore year 11
- 21-110 Principles of Computing 10
- 33-141 Physics I for Engineering Students -(Gen Ed) 12
- 33-142 Physics II for Engineering and Physics Students 12
- 09-105 Introduction to Modern Chemistry I 10
- 09-106 Modern Chemistry II 10

**Chemical Engineering Courses (7 courses, 75 units)**

- 06-100 Introduction to Chemical Engineering -Freshman year; co-req: 09-105, 21-120 12
- 06-223 Chemical Engineering Thermodynamics -Fall, Sophomore year; prereq: 06-100, 33-121/33-141/33-151 12
- 06-261 Fluid Mechanics -Spring, Sophomore year; prereq: 06-223, 21-254 9
- 06-262 Mathematical Methods of Chemical Engineering - Spring, Sophomore year; prereq: 06-223, 21-254 12
- 06-323 Heat and Mass Transfer -Fall, Junior year; prereq: 06-261, 06-262/21-260, 33-122/33-142/33-152 9
Consultation with the concentration advisor:

Mathematics & Science Prerequisites
(99 units minimum)

Choose 27 units from the following ChemE and/or ENG courses with prerequisites in consultation with the concentration advisor:

- 06-363 Transport Process Laboratory -Spring, Junior year; prereq: 06-261, 06-323
- 06-310 Molecular Foundations of Chemical Engineering -Fall, Junior year; prereq: 06-223, 09-106
- 06-325 Numerical Methods and Machine Learning for Chemical Engineering -Fall, Junior year; prereq: 06-262, 15-110/15-112
- 06-326 Optimization Modeling and Algorithms -Fall, Junior year; prereq: 06-262
- 06-364 Chemical Reaction Engineering -Spring, Junior year; prereq: 06-310, 06-323
- 06-607 Physical Chemistry of Colloids and Surfaces - Senior year
- 06-609 Physical Chemistry of Macromolecules -Fall, Senior year
- 27-xxx Materials Science course

Note: With advisor approval, electives can instead be other ChemE/ENG courses as long as they are taken in proper order to follow the required prerequisites, not allowing 06-421.

Civil Engineering
(99 units minimum)

Mathematics & Science Prerequisites

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-120</td>
<td>Differential and Integral Calculus -(Gen Ed)</td>
</tr>
<tr>
<td>21-122</td>
<td>Integration and Approximation -(Gen Ed)</td>
</tr>
<tr>
<td>21-254</td>
<td>Linear Algebra and Vector Calculus for Engineers</td>
</tr>
<tr>
<td>21-260</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>15-110</td>
<td>Principles of Computing</td>
</tr>
<tr>
<td>33-141</td>
<td>Physics I for Engineering Students -(Gen Ed)</td>
</tr>
<tr>
<td>33-142</td>
<td>Physics II for Engineering and Physics Students</td>
</tr>
<tr>
<td>12-212</td>
<td>Statics -Fall, Sophomore year</td>
</tr>
<tr>
<td>12-233</td>
<td>CEE Infrastructure Systems in Action -Fall, Sophomore year; prereq: 12-212, 33-141</td>
</tr>
<tr>
<td>12-231</td>
<td>Solid Mechanics -Spring, Sophomore year; prereq: 12-212</td>
</tr>
<tr>
<td>12-234</td>
<td>Sensing and Data Acquisition for Engineering Systems -Spring, Sophomore year</td>
</tr>
<tr>
<td>12-271</td>
<td>Computation and Data Science for Civil &amp; Environmental Engineering -Spring, Sophomore year; prereq: 15-110/15-112, 21-120, 21-122, 33-141</td>
</tr>
<tr>
<td>27-357</td>
<td>Introduction to Materials Selection -Spring, Junior year</td>
</tr>
</tbody>
</table>

Electives (3 courses, 27 units minimum)

Choose 27 units from the following Civil Engineering courses with prerequisites in consultation with the concentration advisor:

- 12-210 Geology - Sophomore year
- 12-301 CEE Projects: Integrating the Built, Natural and Information Environments - Fall, Junior year; prereq: 12-200, 12-271
- 12-335 Soil Mechanics -Fall, Junior year; prereq: 12-231, 33-142; co-req: 12-355
- 12-355 Fluid Mechanics -Fall, Junior year; prereq: 21-260
- 12-356 Fluid Mechanics Lab -Fall, Junior year; co-req: 12-355

Electrical & Computer Engineering

Mathematics & Science Prerequisites

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-120</td>
<td>Differential and Integral Calculus -(Gen Ed)</td>
</tr>
<tr>
<td>21-122</td>
<td>Integration and Approximation -(Gen Ed)</td>
</tr>
<tr>
<td>21-127</td>
<td>Concepts of Mathematics</td>
</tr>
<tr>
<td>15-112</td>
<td>Fundamentals of Programming and Computer Science</td>
</tr>
<tr>
<td>15-122</td>
<td>Principles of Imperative Computation</td>
</tr>
<tr>
<td>33-141</td>
<td>Physics I for Engineering Students -(Gen Ed)</td>
</tr>
<tr>
<td>33-142</td>
<td>Physics II for Engineering and Physics Students</td>
</tr>
</tbody>
</table>

Electrical & Computer Engineering Courses (7 courses, 84 units)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-100</td>
<td>Introduction to Electrical and Computer Engineering -Freshman year; co-req: 21-120</td>
</tr>
<tr>
<td>xx-xxx</td>
<td>2nd Introduction to Engineering course, student's choice</td>
</tr>
<tr>
<td>18-213</td>
<td>Introduction to Computer Systems -Sophomore year; prereq: 15-122</td>
</tr>
<tr>
<td>18-220</td>
<td>Electronic Devices and Analog Circuits -Sophomore year; prereq: 18-100; co-req: 33-142</td>
</tr>
<tr>
<td>18-240</td>
<td>Structure and Design of Digital Systems -Sophomore year; prereq: 18-100</td>
</tr>
<tr>
<td>18-290</td>
<td>Signals and Systems -Sophomore year; prereq: 18-100</td>
</tr>
</tbody>
</table>

Electives (3 courses, 36 units minimum)

Choose 3 elective courses 18-3xx and above. At least 2 courses should be Area Courses from 1 of the 5 Areas within ECE and 1 course may be an additional Area Course from a second Area, a Coverage Course or ENG with prerequisites in consultation with the concentration advisor.

Environmental Engineering

(95 units minimum)

Mathematics & Science Prerequisites

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-120</td>
<td>Differential and Integral Calculus -(Gen Ed)</td>
</tr>
<tr>
<td>21-122</td>
<td>Integration and Approximation -(Gen Ed)</td>
</tr>
<tr>
<td>21-254</td>
<td>Linear Algebra and Vector Calculus for Engineers</td>
</tr>
<tr>
<td>21-260</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>15-110</td>
<td>Principles of Computing</td>
</tr>
<tr>
<td>33-141</td>
<td>Physics I for Engineering Students -(Gen Ed)</td>
</tr>
<tr>
<td>33-142</td>
<td>Physics II for Engineering and Physics Students</td>
</tr>
<tr>
<td>09-105</td>
<td>Introduction to Modern Chemistry I</td>
</tr>
</tbody>
</table>

Electives (3 courses, 7 units minimum)

Choose 3 elective courses 12-3xx and above. At least 2 courses should be Area Courses from 1 of the 5 Areas within ECE and 1 course may be an additional Area Course from a second Area, a Coverage Course or ENG with prerequisites in consultation with the concentration advisor.

Environmental Engineering Courses (10 courses, 77 units)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-100</td>
<td>Exploring CEE: Infrastructure and Environment in a Changing World -Freshman year; co-req: 21-120, 33-141</td>
</tr>
<tr>
<td>xx-xxx</td>
<td>2nd Introduction to Engineering course, student's choice</td>
</tr>
<tr>
<td>12-200</td>
<td>CEE Challenges: Design in a Changing World - Fall, Sophomore year; prereq: 12-210</td>
</tr>
<tr>
<td>12-212</td>
<td>Statics -Fall, Sophomore year; co-req: 12-100, 21-122, 33-141</td>
</tr>
<tr>
<td>12-297</td>
<td>Computation and Data Science for Civil &amp; Environmental Engineering -Spring, Sophomore year; prereq: 15-110/15-112, 21-120, 21-122, 33-141</td>
</tr>
</tbody>
</table>

Electives (3 courses, 27 units minimum)

Choose 27 units from the following Civil Engineering courses with prerequisites in consultation with the concentration advisor:

- 12-201 Geology - Sophomore year
- 12-301 CEE Projects: Integrating the Built, Natural and Information Environments - Fall, Junior year; prereq: 12-200, 12-271
- 12-335 Soil Mechanics -Fall, Junior year; prereq: 12-231, 33-142; co-req: 12-355
- 12-355 Fluid Mechanics -Fall, Junior year; prereq: 21-260
- 12-356 Fluid Mechanics Lab -Fall, Junior year; co-req: 12-355

Environmental Engineering Courses - Spring, Sophomore year; prereq: 15-110/15-112, 21-120, 21-122, 33-141
Electives (2 courses, 18 units minimum)
Choose 18 units from the following EE courses with prerequisites in consultation with the concentration advisor:

- 12-201 Geology - Sophomore year
- 12-301 CEE Projects: Integrating the Built, Natural and Information Environments - Fall, Junior year; co-req: 12-200 and 12-271
- 12-353 Environmental Biology and Ecology - Spring, Junior year
- 12-612 Intro to Sustainable Engineering - Fall, Senior year
- 12-657 Water Resource Systems Engineering - Fall, Senior year; co-req: 12-355; co-req: 12-351
- 03-121 Modern Biology

Materials Science & Engineering
(99 units minimum)

Mathematics & Science Prerequisites
21-120 Differential and Integral Calculus -(Gen Ed) 10
21-212 Integration and Approximation -(Gen Ed) 10
21-254 Linear Algebra and Vector Calculus for Engineers 11
21-260 Differential Equations 9
15-110 Principles of Computing 10
33-141 Physics I for Engineering Students -(Gen Ed) 12
33-142 Physics II for Engineering and Physics Students 12
09-105 Introduction to Modern Chemistry I 10

Materials Science & Engineering Courses (8 courses, 72 units)
27-100 Engineering the Materials of the Future - Freshman year; co-req: 21-120, 33-141 12
xx-xxx 2nd Introduction to Engineering course, student’s choice 12
27-211 Structure of Materials (Minor Option) - Fall, Sophomore year 6
27-212 Defects in Materials (Minor Option) - Spring, Sophomore year 6
27-215 Thermodynamics of Materials - Fall, Sophomore year; co-req: 27-100, 21-259 12
27-216 Transport in Materials - Spring, Sophomore year; co-req: 27-100, 21-259 9
27-227 Phase Relations and Diagrams (Minor Option) - Spring, Sophomore year 9
27-357 Introduction to Materials Selection - Spring, Sophomore year 6

* In consultation with the concentrations advisor, students may choose to complete the version of the course with lab component.

Electives (3 courses, 27 units minimum)
Choose 3 elective courses in MSE and/or ENG with prerequisites in consultation with the concentration advisor.

Mechanical Engineering
(105 units minimum)

Mathematics & Science Prerequisites
21-120 Differential and Integral Calculus -Freshman year (Gen Ed) 10
21-212 Integration and Approximation - Freshman year (Gen Ed) 10
21-254 Linear Algebra and Vector Calculus for Engineers 11
21-260 Differential Equations 9
15-110 Principles of Computing -(Gen Ed) 10
33-141 Physics I for Engineering Students -Freshman year (Gen Ed) 12
33-142 Physics II for Engineering and Physics Students - Freshman year 12

Note: The BESA Gen Ed Science and Technology requirement can be fulfilled with either 15-110 or 15-112. Students may start taking MechE Courses upon completion of Calculus I, Calculus II and Physics I.

Mechanical Engineering Courses (7 courses, 60 units)
24-101 Fundamentals of Mechanical Engineering - Freshman year; co-req: 21-120, 33-141 12
xx-xxx 2nd Introduction to Engineering course, student’s choice 12
24-200 Maker Series: Intro to Manual Machining - Sophomore year 1
24-251 Electronics for Sensing and Actuation - Sophomore year 3
24-261 Mechanics I: 2D Design - Fall, Sophomore year; prerequisites: 21-122, 33-151/33-121/33-121/33-106 10
24-262 Mechanics II: 3D Design - Spring, Sophomore year; prerequisites: 33-106/33-141/33-151, 24-261 10
24-370 Mechanical Design: Methods and Application - Fall, Junior year; prerequisites: 24-200, 24-202, 24-262 12

Electives (45 units minimum)
Choose 5 elective courses. Each course should be a minimum of 9 units. At least 3 courses should be from the following MechE courses and 2 of the courses may be ENG with prerequisites in consultation with the concentration advisor.

24-221 Thermodynamics - Fall, prerequisites: 21-122, 24-101, 33-106/33-121/33-141/33-151 10
24-231 Fluid Mechanics - Spring; prerequisites: 21-122, 33-106/33-141/33-151 10
24-291 Environmental Systems on a Changing Planet - Fall 9
24-300 or above

COLLEGE OF FINE ARTS CONCENTRATION
(number of courses vary, 108-114 units minimum)
BESA students choose one of the following concentrations:
- Architecture (108 units)
- Art (114 units)
- Design (108 units)
- Drama (108 units)
- Music (108 units)

Architecture Concentration
(108 units minimum)

Architecture Required Courses (7 courses, 52 units minimum)
48-100 Architecture Design Studio: POIESIS STUDIO 1 - Fall, Freshman or Sophomore year 10
or 48-095 Spatial Concepts for Non-Architecture Majors 15
62-122 Digital Media I - Fall, Freshman year 6
62-125 Drawing I - Fall, Freshman year 6
62-123 Digital Media II - Spring, Freshman year 6
62-126 Drawing II - Spring, Freshman year 6
48-240 History of World Architecture, I - Spring, Freshman year 9
48-241 History of Modern Architecture - Fall, Sophomore year 9

Architecture Electives (56 units minimum)
A minimum of 56 additional Architecture units must be approved by the Architecture advisor. A list of these selected courses must be filed in the BXA office.

Art Concentration
(114 units minimum)
Design Required Courses (16 courses, 98 units)

Foundation Studios (3 courses, 30 units)
Complete three courses:
- 60-110 Foundations: Time-Based Media 10
- 60-120 Foundations: Digital Media 10
- 60-131 Foundations: Sculpture 10
- 60-135 Foundations: Sculpture II 10
- 60-150 Foundations: Drawing 10
- 60-170 Foundations: Paint/Print 10

Intermediate Studios (3 courses, 30 units)
Complete three courses:
- 60-2xx Intermediate Studio Elective 10
- 60-2xx Intermediate Studio Elective 10
- 60-2xx Intermediate Studio Elective 10

Advanced Studios (3 courses, 30 units)
Students may take courses in any media area (ETB, SIS, CP or DP3). They may take all courses in one media area if a focus is desired. With approval from the Art advisor, BXA students can take an additional intermediate studio in lieu of an advanced studio to increase breadth. Complete three courses:
- 60-401/402 Senior Studio 10
- 60-403 Senior Critique Seminar 10
- Advanced Electronic and Time-Based Work (ETB) (course numbers 60-410 through 60-429) 10
- Advanced Sculpture, Installation and Site-Work (SIS) (course numbers 60-430 through 60-447) 10
- Advanced Contextual Practice (CP) (course numbers 60-448 through 60-449) 10
- Advanced Drawing, Painting, Print Media and Photography (DP3) (course numbers 60-450 through 60-498) 10
- 60-499 Studio Independent Study (one only) 10

* Courses offered intermittently; speak with a BXA advisor to determine course availability.

Critical Studies (2 courses, 18 units)
- 60-107 Foundations: Critical Studies -Spring 9
- 60-3xx Critical Studies Elective 9

Review Requirement (1 required review, 0 units)
Complete required review:
- 60-200 Sophomore Review -Spring (pass/no pass) 0

Design Concentration (108 units minimum)

Design Required Courses (16 courses, 98 units)
- 51-101 Studio: Survey of Design -Fall, First-year 10
- 51-121 Visualizing -Fall, First-year 10
- 51-175 Design Studies: Place -Fall, First-year (mini-1) 5
- 51-177 Design Studies: Histories -Fall, First-year (mini-2) 5
- 51-102 Design Lab -Spring, First-year 10
- 51-122 Collaborative Visualizing -Spring, First-year 10
- 51-176 Design Studies: Futures -Spring, First-year (mini-3) 5
- 51-178 Design Studies: Experience -Spring, First-year (mini-4) 5
- 51-277 Design Studies: Systems -Fall, Sophomore year (mini-1) 5
- 51-279 Design Studies: Cultures -Fall, Sophomore year (mini-2) 5
- 51-282 Design Studies: Persuasion -Spring, Sophomore year (mini-3) 5
- 51-284 Design Studies: Power -Spring, Sophomore year (mini-4) 5

Choose Two Studios -Fall, Sophomore year: 4.5+4.5

- 51-225 Communications Studio I: Understanding Form & Context 4.5
- 51-245 Products Studio I: Understanding Form & Context 4.5
- 51-265 Environments Studio I: Understanding Form & Context 4.5

Choose Two Corresponding Labs -Fall, Sophomore year: 4.5+4.5

- 51-227 Prototyping Lab I: Communications 4.5
- 51-247 Prototyping Lab I: Products 4.5
- 51-267 Prototyping Lab I: Environments 4.5

Design Electives (10 units)
A minimum of 10 additional Design units must be approved by the Design advisor. A list of these selected courses must be filed in the BXA office.

Drama Concentration (108 units minimum)
Options available in the following areas: 1) Design, 2) Directing, 3) Dramaturgy, 4) Production Technology and Management

Required Courses for All Concentration Options (4 courses, 19 units)
- 54-175 Conservatory Hour 1
- 54-177 Foundations of Drama I 6
- 54-281 Foundations of Drama II (prerequisite: 54-177) 6
- 54-381 Special Topics in Drama: History, Literature and Criticism 6
- 54-362 Anti-Racist & Equitable Practices in Theater (optional) 6

Work with Drama Faculty Area Chair to Approve Concentration Option (89 units minimum).

Design Required Courses (2 courses, 26 units)
- 54-151-54-152 Stagecraft-Stagecraft (13 units + 13 units) 26

A minimum of 63 additional Design units must be approved by the Design faculty area chair. A list of these selected courses must be filed in the BXA office.

Directing Required Courses (10 courses, 64 units)
- 54-121-54-122 Directing I: A Director’s Mindset - Directing I: A Director’s Preparation 18
- 54-221-54-222 Directing II: In the Studio - Directing II: In The Room 18
- 54-159-54-159 Production Practicum-Production Practicum (two times) 12
- 54-517 Directors Common Hour (four times) 16

A minimum of 25 additional Directing units must be approved by the Directing faculty area chair. A list of these selected courses must be filed in the BXA office.

Dramaturgy Required Courses (9 courses, 59 units minimum)
- 54-109 Dramaturgy 1: Approaches to Text 9
- 54-184 Dramaturgy 2: Introduction to Production 9
- 54-121 Directing I: A Director’s Mindset 9
- 54-159-54-159 Production Practicum-Production Practicum (two times) 12
- 54-200-54-200 Dramaturgy Forum-Dramaturgy Forum -Fall (minimum of two; every semester it is offered while enrolled) 2

- 54-xxx Dramaturgy 3, 4, 5 or 6 (minimum of two; all four if enrolled as BXA for six semesters or more) 18

A minimum of 30 additional Dramaturgy units must be approved by the Dramaturgy faculty area chair. A list of these selected courses must be filed in the BXA office.

Production Technology and Management Required Courses (2 courses, 26 units)
- 54-151-54-152 Stagecraft-Stagecraft (13 units + 13 units) 26

A minimum of 63 additional PTM units must be approved by the PTM faculty area chair. A list of these selected courses must be filed in the BXA office.
Music Concentration
(108 units minimum)

Options available in the following areas: 1) Audio Recording & Production, 2) Composition, 2) Music Performance (instrumental, organ, piano, voice), 4) Sound Theory & Practice

Required Course for All Concentration Options (1 course, 9 units)

- 57-152 Harmony I 9
- or 57-149 Basic Harmony I

Work with Music Advisor to Approve Concentration Option (9 units minimum).

Audio Recording & Production Required Courses (7 courses, 40 units)

- 57-101 Introduction to Music Technology 6
- or 57-171 Introduction to Music Technology (self-paced)
- 57-181 Solfege I 3
- or 57-180 Basic Solfege I
- or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 57-337 Sound Recording 6
- 57-338 Sound Editing and Mastering 6
- 57-438 Multitrack Recording 9

Choose 59 units from:

- 57-153 Harmony II 9
- or 57-150 Basic Harmony II
- 57-182 Solfege II 3
- or 57-186 Advanced Solfege II
- 10-301 Introduction to Machine Learning (Undergrad) 12
- 15-104 Introduction to Computing for Creative Practice 10
- 15-213 Introduction to Computer Systems 12
- 15-322 Introduction to Computer Music 9
- 18-090 Twisted Signals: Multimedia Processing for the Arts 10
- 33-114 Physics of Musical Sound 9
- 54-166 Introduction to Sound Design for Theatre 6
- 54-275 History of Sound Design 3
- 54-666 Production Audio 6
- 57-161 Eurhythmics I 3
- 57-344 Experimental Sound Synthesis 9
- 57-347 Electronic and Computer Music 6
- 57-358 Introduction to Electronic Music (with instructor permission as space allows) 9
- 57-421 Exploded Ensemble 6
- 57-427 Advanced Seminar in Film Musicology 6
- 57-478 Survey of Historical Recording 6
- 57-622 Independent Study in Sound Recording Production 3
- 60-131 Foundations: Sculpture 10

Note: Students completing an IDEATE minor may double-count up to two of the IDEATE minor courses towards the Audio Recording & Production concentration.

Composition Required Courses (12 courses, 76 units)

- 57-161 Eurhythmics I (recommended co-requisite: 57-181) 3
- 57-181 Solfege I 3
- or 57-180 Basic Solfege I
- or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 57-49x BXA Studio (4 semesters) 36
- 57-xxx Major Ensemble (4 semesters) 24

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

Music Performance Required Courses (12 courses, 76 units)

- 57-161 Eurhythmics I (recommended co-requisite: 57-181) 3
- 57-181 Solfege I 3
- or 57-180 Basic Solfege I
- or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 57-49x BXA Studio (4 semesters) 36
- 57-xxx Major Ensemble (4 semesters) 24

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

Sound Theory & Practice Required Courses (7 courses, 47 units)

- 57-101 Introduction to Music Technology 6
- or 57-171 Introduction to Music Technology (self-paced)
- 57-181 Solfege I 3
- or 57-180 Basic Solfege I
- or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 18-090 Twisted Signals: Multimedia Processing for the Arts 10
- 57-111 Music Since 1945 9
- 57-616 Independent Study in Sound Studies 9

Choose 52 units from:

- 57-153 Harmony II 9
- or 57-150 Basic Harmony II
- 57-182 Solfege II 3
- or 57-186 Advanced Solfege II
- 15-104 Introduction to Computing for Creative Practice 10
- 15-322 Introduction to Computer Music (prerequisite: 15-112) 9
- 33-114 Physics of Musical Sound 9
- 57-337 Sound Recording 6
- 57-338 Sound Editing and Mastering 6
- 57-343 Music, Technology, and Culture 9
- 57-344 Experimental Sound Synthesis 9
- 57-347 Electronic and Computer Music (prerequisite: 57-101 or 57-171) 6
- 57-358 Introduction to Electronic Music (with instructor permission as space allows) 9
- 57-421 Exploded Ensemble 6
- 57-438 Multitrack Recording 9
- 57-478 Survey of Historical Recording 6
- 60-131 Foundations: Sculpture 10

Note: Students completing an IDEATE minor may double-count up to two of the IDEATE minor courses towards the Sound Theory & Practice concentration.

FREE ELECTIVES
(approximately 6-10 courses, 54-87 units minimum)

Take any Carnegie Mellon course. A maximum of 9 units of physical education and/or military science may be counted toward this requirement.

Bachelor of Humanities and Arts Degree Program

The Bachelor of Humanities and Arts (BHA) intercollege degree program combines the strengths of the College of Fine Arts (CFA) and the Dietrich College of Humanities and Social Sciences (DC). This degree is designed for academically and artistically talented students who want to develop their interest in the fine arts, while also pursuing studies in the humanities and social/behavioral sciences. Students choose their fine arts concentration from the following schools in CFA: Architecture, Art, Design, Drama or Music. Students choose their humanities and social sciences concentration from the subject areas offered by DC. The most important aspect of the
BHA program is for students to blend their interests and to explore the connections between their chosen disciplines. The program also provides enough flexibility for students to broaden or deepen their concentrations and to explore other areas in which they may be interested.

The BHA curriculum has three main components: general education requirements, fine arts concentration requirements and humanities/social sciences concentration requirements. Students must complete an array of courses defined by their chosen concentrations. Each student’s course of study is unique, based on their background and interests, and course availability in the respective colleges.

Students receive extensive advising support. The academic advisors in the BHA Intercollege Degree Programs are the primary advisors and liaisons between CFA and DC. Each student has two additional academic advisors: an advisor in the admitting school of CFA to guide their focus in the arts and an advisor in DC to guide their focus in the humanities or social/behavioral sciences.

BHA Curriculum

<table>
<thead>
<tr>
<th>Units</th>
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<tbody>
<tr>
<td>I. BHA General Education</td>
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<tr>
<td>II. DC Concentration</td>
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<tr>
<td>III. CFA Concentration</td>
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<tr>
<td>IV. Free Electives</td>
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<tr>
<td><strong>Total BHA Degree Requirements</strong></td>
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**BHA General Education**

*(16 courses, 126 units minimum)*

- Communication (1 course, 9 units, 76-101 required)
- Contextual Thinking (1 course, 9 units)
- Intercultural and Global Inquiry (1 course, 9 units)
- Humanities (1 course, 9 units)
- Data Analysis (1 course, 9 units, 36-200 required)
- Social Sciences (1 course, 9 units)
- Equity and Justice (1 course, 9 units)
- Math, Science, and Computation (2 courses, 18 units)
- Disciplinary Perspectives within CMU (1 course, 6 units)
- University Requirement (1 course, 3 units, 99-101 required)
- BXA Required Courses (5 courses, 36 units, 52-190, 52-291, 52-392, 52-401, 52-402)

**Communication (1 courses, 9 units)**

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<td>76-101</td>
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<td>or 76-102</td>
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<td>&amp; 76-108</td>
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<td>or 76-102</td>
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All undergraduate students must complete the First-Year Writing requirement—the Department of English does not accept any Advanced Placement exemptions. This requirement can be completed in two different ways. Enroll in one of two full-semester courses 101 or 102 (by invitation only), 9 units, or enroll in two of three half-semester mini courses (back-to-back within a single semester) 106/107/108, 4.5 + 4.5 units. Course options and topics: www.cmu.edu/hss/english/first-year/index.html

**Contextual Thinking (1 course, 9 units)**

A list of courses for this requirement can be found on the DC GenEd website (https://www.cmu.edu/dietrich/gened/fall-2021-and-beyond/course-options/).

**Intercultural and Global Inquiry (1 course, 9 units minimum)**

A list of courses for this requirement can be found on the DC GenEd website (https://www.cmu.edu/dietrich/gened/fall-2021-and-beyond/course-options/).

**Humanities (1 course, 9 units minimum)**

A list of courses for this requirement can be found on the DC GenEd website (https://www.cmu.edu/dietrich/gened/fall-2021-and-beyond/course-options/).

**Data Analysis (1 course, 9 units minimum)**

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<td>36-200</td>
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Reasoning with Data

**Social Sciences (1 course, 9 units minimum)**

A list of courses for this requirement can be found on the DC GenEd website (https://www.cmu.edu/dietrich/gened/fall-2021-and-beyond/course-options/).

**Equity and Justice (1 course, 9 units minimum)**

A list of courses for this requirement can be found on the DC GenEd website (https://www.cmu.edu/dietrich/gened/fall-2021-and-beyond/course-options/).

**Math, Science, and Computation (2 courses, 18 units minimum)**

Choose two of three categories: Computational Thinking, Scientific Inquiry, Logic/Mathematical Reasoning. A list of courses for this requirement can be found on the DC GenEd website (https://www.cmu.edu/dietrich/gened/fall-2021-and-beyond/course-options/).

**Disciplinary Perspectives within CMU (1 course, 6 units)**

Choose one non-DC or CFA course; DC Arts courses excluded.

**University Requirement (1 course, 3 units)**

This is a mini-course, pass/no pass, to be completed in the first semester or online prior to the first semester.

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Computing @ Carnegie Mellon

**BXA Required Courses (5 courses, 36 units)**

BXA-specific courses give students the opportunity to integrate their areas of concentration by focusing on interdisciplinary approaches and arts-based research techniques.

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<th>Units</th>
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<tr>
<td>52-190</td>
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<td>52-291</td>
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<td>52-392</td>
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<td>52-401</td>
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<td>52-402</td>
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**Dietrich College of Humanities and Social Sciences Concentrations**

*(number of courses vary, 81-93 units)*

BHA students declare a DC concentration based on existing DC programs, through consultation with their BXA advisor and the DC concentration advisors. A completed DC Concentration Declaration form must be approved by the concentration advisor and submitted to the BXA office, by spring mid-semester break of the student’s sophomore year.

Curriculum for approved BHA DC concentration options are outlined below, though this list is not exhaustive of all concentrations possible in DC.

BHA students who are admitted as freshmen are undeclared until they have met with a concentration advisor and have submitted their signed Declaration form. BHA students who are admitted through internal transfer must have chosen a DC concentration at the time of their initial declaration. All BHA students wishing to change their DC concentration at any time following the initial declaration must meet with the advisor of their intended concentration area to complete a new Declaration form.

**Behavioral Economics Concentration**

*(81 units minimum)*

Students in BE—the first and only major of its kind—will be uniquely trained in the integration of Economics and Psychology and will have a solid grounding in quantitative methods. The core includes courses in economics, psychology, behavioral economics, and quantitative methods. SDS offers the largest selection of behavioral economics courses anywhere in the world. Applied projects in courses will teach students how to collect original data, design field and laboratory experiments, analyze data, and develop interventions to improve economic outcomes and decisions. Students will be well equipped to enter a wide range of professions and graduate degree programs.

**Quantitative Methods (3 courses, 27 units)**

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<th>Units</th>
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<td>36-202</td>
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<td>88-251</td>
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</tbody>
</table>

Methods for Statistics & Data Science

Empirical Research Methods

Cause and Effect or 73-274

Econometrics I
Economics Courses (2 courses, 18 units)
73-102 Principles of Microeconomics 9
or 73-104 Principles of Microeconomics Accelerated
88-221 Markets, Democracy, and Public Policy 9
or 73-103 Principles of Macroeconomics
or 73-150 Markets, Models, and Math
or 73-230 Intermediate Microeconomics
or 73-328 Health Economics
or 73-347 Game Theory Applications for Economics and Business
or 73-359 Benefit-Cost Analysis
or 73-408 Law and Economics
or 73-421 Emerging Markets
or 73-427 Sustainability, Energy, and Environmental Economics

Psychology Courses (2 courses, 18 units)
88-120 Reason, Passion and Cognition (freshman or sophomore year) 9
88-302 Behavioral Decision Making 9

Behavioral Economics Courses (2 courses, 18 units)
88-360 Behavioral Economics (prerequisite: 21-111) 9
88-367 Behavioral Economics & Field Experiments in Organizations 9
or 88-365 Behavioral Economics and Public Policy 9

Chinese Studies Concentration
(81 units minimum)
A BHA concentration in Chinese Studies promotes not just language proficiency but also an understanding of Chinese culture. Students who arrive at Carnegie Mellon with previous language study and/or who have high Advanced Placement, an International Baccalaureate, a Cambridge GCE Advanced level or internal placement exam scores will be able to begin taking courses in the concentration earlier in their undergraduate program. In all cases, progress in the concentration will be accelerated by study abroad, which is recommended for all students.

Prerequisites
Intermediate level proficiency in Chinese. This is equivalent to the completion of three courses (two at the 100-level and one at the 200-level) or exemption based on Advanced Placement, International Baccalaureate, Cambridge GCE Advanced level or Carnegie Mellon internal placement test scores.

Core Courses in Chinese Studies (4 courses, 36 units minimum)
82-232 Intermediate Chinese II 9
or 82-235 Fables, Legends and Stories from Ancient Chinese Civilization
82-331 Reading Into a New China I: Population, Youth, Marriage, & Housing 9
82-332 Reading Into a New China II: Transportation, Education, Pop Culture, & Health 9
82-333 Chinese Language and Culture 9
*Students who place out of 82-232/82-235 must take a minimum of 9 additional units chosen from Chinese Studies Electives at the 400-level.

Core Courses in Modern Languages (1 course, 9 units)
Complete one course.
82-239 Crazy Linguistically Rich Asian Languages 9
82-280 Bilingual & Bicultural Experiences in the US 9
82-281 Contextual Thinking 9
82-282 Interpreting Global Texts & Culture 9
82-283 Language Diversity & Cultural Identity 9
82-284 Multicultural Pittsburgh: VR Storytelling 9
82-285 Podcasting: Language and Culture Through Storytelling 9
82-286 Cultural Complexities 9
82-287 Multicultural Immersion - Relating Your World in Virtual Reality 6
82-383 Second Language Acquisition: Theories and Research 9
82-388 Topics in Second Language Acquisition 9
82-480 Translation Technologies 9

Note: In consultation with the concentration advisor, students may substitute a Modern Languages course elective with one related to language analysis, language learning, or acquisition of language and culture from the listings in Chinese Studies or from another department. Examples: 80-180 Nature of Language, 85-421 Language and Thought. In addition, students may choose to take 82-580 Senior Seminar in Modern Languages (9 units). The selected course may not double count in the Electives category.

Core Courses in Chinese History & Society (1 course, 9 units)
Complete one course in consultation with the concentration advisor.
79-261 The Last Emperors: Chinese History and Society, 1600-1900 9
79-262 Modern China: From the Birth of Mao ... to Now 9
79-309 The Chinese Revolution Through Film (1949-2000) 9
82-138 Comparative China: Perceptions Through Youtube & TikTok 9
82-230 Cultural Topics in Chinese Studies 9
82-234 Topics in Chinese History 9
82-238 Topics in Chinese Culture 9
82-333 Chinese Language and Culture (must be a different section than the one used for the core requirements) 9

Chinese Studies and Interdisciplinary Electives (3 courses, 27 units minimum)
Complete two courses from Chinese Studies Electives and one course from Interdisciplinary Electives in consultation with the concentration advisor.

Chinese Studies Electives:
82-235 Fables, Legends and Stories from Ancient Chinese Civilization 9
82-334 Structure of Chinese 9
82-335 Chinese Culture Through Legends and Folktales 9
82-337 Mandarin Chinese for Oral Communication I 9
82-338 Mandarin Chinese for Oral Communication II 9
82-339 Business Language & Culture in China I 9
82-340 Business Language & Culture in China II 9
82-431 China and the West 9
82-432 Chinese Popular Culture: A Game of Learning 9
82-433 Topics in Contemporary Culture of China 9
82-434 Studies in Chinese Traditions 9
82-436 Introduction to Classical Chinese 9
82-439 Modern China Through Literature Var.
82-440 Studies in Chinese Literature & Culture * 9
82-505 Modern Languages Undergraduate Internship Var.
82-533/532 Special Topics in Chinese Studies (independent studies) Var.
82-533 Cultural Topics in Chinese Studies 6
* Students may repeat these courses with new topics.

Interdisciplinary Electives:
This list is compiled from possibilities such as but not limited to the following. Students should consult SIO and the concentration advisor for approval as a substitute. Note that not all courses are offered each semester.

Business
70-342 Managing Across Cultures 9
70-365 International Trade and International Law 9
70-430 International Management 9
English
76-318 Communicating in the Global Marketplace 9
76-386 Language & Culture 9
History
79-261 The Last Emperors: Chinese History and Society, 1600-1900 9
79-262 Modern China: From the Birth of Mao ... to Now 9
79-309 The Chinese Revolution Through Film (1949-2000) 9
Research Methods Training (2 course, 18 units)

84-226 International Relations 9
84-310 International Political Economy 9
84-362 Diplomacy and Statecraft 9
84-369 Decision Science for International Relations 9
84-370 Nuclear Security & Arms Control 9
84-380 US Grand Strategy 9
84-388 Concepts of War and Cyber War 6
84-405 The Future of Warfare 9

Modern Languages
82-137 Chinese Calligraphy: Culture and Skills 9
82-138 Comparative China: Perceptions Through Youtube & TikTok 9
82-139 Topics in Chinese Language, Culture and Society 9
82-198 Research Training: Modern Languages Var.
82-230 Cultural Topics in Chinese Studies 9
82-234 Topics in Chinese History 9
82-238 Topics in Chinese Culture 9
82-280 Bilingual & Bicultural Experiences in the US 9
82-281 Contextual Thinking 9
82-282 Interpreting Global Texts & Cultures 9
82-283 Language Diversity & Cultural Identity 9
82-284 Multicultural Pittsburgh: VR Storytelling 9
82-285 Podcasting: Language and Culture Through Storytelling 9
82-286 Cultural Complexities 9
82-287 Multicultural Immersion - Relating Your World in Virtual Reality 6
82-383 Second Language Acquisition: Theories and Research 9
82-388 Topics in Second Language Acquisition 9
82-480 Translation Technologies 9

Philosophy
80-180 Nature of Language 9
80-276 Philosophy of Religion 9
80-280 Linguistic Analysis 9
80-380 Philosophy of Language 9

Psychology
85-375 Crosscultural Psychology 9
85-421 Language and Thought 9

Cognitive Neuroscience Concentration
(81 units minimum)

Cognitive neuroscience is a science concerned with discovering biological bases of psychological functions. It addresses questions of how behavior is produced by neural circuits of the brain and also how those neural circuits are in turn influenced by behavioral experiences. Students with a concentration in Cognitive Neuroscience are expected to understand cognition at a deep level. Because this concentration is administered by the Psychology Department, it focuses on human cognition and the experimental study of the human mind as illuminated by the techniques of the above disciplines.

Introductory and Survey Coursework (4 courses, 36 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-121</td>
<td>Modern Biology 9</td>
</tr>
<tr>
<td>03-363</td>
<td>Systems Neuroscience 9</td>
</tr>
<tr>
<td>85-219</td>
<td>Foundations of Brain and Behavior 9</td>
</tr>
<tr>
<td>85-211</td>
<td>Cognitive Psychology 9</td>
</tr>
<tr>
<td>or 85-213</td>
<td>Human Information Processing and Artificial Intelligence 9</td>
</tr>
</tbody>
</table>

Research Methods Training (2 course, 18 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-309</td>
<td>Experimental Design for Behavioral &amp; Social Sciences 9</td>
</tr>
<tr>
<td>or 85-309</td>
<td>Statistical Concepts and Methods for Behavioral and Social Science</td>
</tr>
<tr>
<td>85-314</td>
<td>Cognitive Neuroscience Research Methods 9</td>
</tr>
</tbody>
</table>

* 85-310 Research Methods in Cognitive Psychology may be substituted if necessary.

Distribution Requirements (3 courses, 27 units)

Complete three courses with at least one from each category below.

Approaches to Cognitive Neuroscience:

15-386 | Neural Computation 9 |
85-345 | Meaning in Mind and Brain 9 |
85-407 | How the Brain Makes Meaning 9 |
85-412 | Cognitive Modeling 9 |
85-414 | Cognitive Neuropsychology 9 |
85-419 | Introduction to Parallel Distributed Processing 9 |

Cognitive Neuroscience Electives:

03-133 | Neurobiology of Disease 9 |
03-362 | Cellular Neuroscience 9 |
85-370 | Perception 9 |
85-385 | Auditory Perception: Sense of Sound 9 |
85-408 | Visual Cognition 9 |
85-435 | Biologically Intelligent Exploration 9 |
85-442 | Health Psychology 9 |
85-443 | Social Factors and Well-Being 9 |

Cognitive Science Concentration
(87 units minimum)

The field of cognitive science has grown out of increasingly active interaction among psychology, linguistics, artificial intelligence, philosophy, and neuroscience. All of these fields share the goal of understanding intelligence. By combining these diverse perspectives, students of cognitive science are able to understand cognition at a deep level. Because this concentration is administered by the Psychology Department, it focuses on human cognition and the experimental study of the human mind as illuminated by the techniques of the above disciplines.

Prerequisite Courses

15-112 | Fundamentals of Programming and Computer Science 12 |
21-120 | Differential and Integral Calculus 10-20 |
or 21-111 & 21-112 | Calculus I and Calculus II |
21-127 | Concepts of Mathematics 12 |

Statistics Course (1 course, 9 units)

36-309 | Experimental Design for Behavioral & Social Sciences 9 |
or 85-309 | Statistical Concepts and Methods for Behavioral and Social Science |

Computational/Cognitive Modeling Core (3 courses, 33 units)

Complete two of the following courses:

15-122 | Principles of Imperative Computation 12 |
15-150 | Principles of Functional Programming 12 |
15-251 | Great Ideas in Theoretical Computer Science 12 |

Plus one of the following courses:

85-412 | Cognitive Modeling 9 |
85-419 | Introduction to Parallel Distributed Processing 9 |
85-435 | Biologically Intelligent Exploration 9 |

Cognitive Psychology Core (4 courses, 36 units minimum)

85-211 | Cognitive Psychology 9 |
or 85-213 | Human Information Processing and Artificial Intelligence 9 |
85-310 | Research Methods in Cognitive Psychology 9 |
or 85-311 | Modern Research Methods: Cumulative Science, Big Data, and Meta-Analysis 9 |
or 85-314 | Cognitive Neuroscience Research Methods |

Plus two of the following (one of which must be 85-3xx or 85-4xx):

85-219 | Foundations of Brain and Behavior 9 |
or 85-106 | Animal Minds 9 |
85-359 | Introduction to Music Cognition Research 9 |
85-360 | Origins of Intelligence 9 |
85-370 | Perception 9 |
85-395 | Applications of Cognitive Science 9 |
The complexity and policy challenges of cyber-engagements is immense. This minor addresses the role of deterrence, dissuasion, and attribution in cyber conflict, while also studying the nuances of key components of modern warfare—from the security dilemma to escalation management.

Courses in this minor focus on the existing gaps in our understanding of cybersecurity and international conflict, such as whether cyberspace is offense or defense dominant (or over time fluid between the two), and which factors are important in determining the answer to this. Other relevant questions include how nation-states, their primary adversaries, and a bevy of nonstate actors engage online and in the virtual and information environments. Accordingly, the minor exposes students to basic technology concepts, methods of attack and defense, potential strategy and goals for cyber-engagement, and response and forensics for cyber-engagements.

Alongside conventional methods of warfare, cybersecurity has rapidly developed into a centerpiece of a state’s ability to project power. As the United States and other emerging cyber powers craft and implement doctrine in this domain, there is likely to be a rapid increase in activity, from efforts to disrupt the online activities of global terrorist networks, to cybersecurity offense and defense in the Russia-Ukraine war, to near daily raids on foreign networks designed to cripple states’ cyberweapons before they can be deployed. In addition, the impact of cyberattacks on critical infrastructure, theft of intellectual property, pervasive identity theft, and hacking of sensitive databases have accumulated, gradually wearing down civil networks and achieving strategic effects over time.

In the shifting landscape of cyber capabilities, how will laws, authorities, and policies keep pace? What are the implications and consequences of actions that may be considered “short of war” by some countries but “above the threshold” of conflict by others? Will a more aggressive defensive posture with respect to cybersecurity inadvertently increase the risk of conflict with states that sponsor malicious hacking groups? What is the proper balance between offense and defense in cybersecurity and how are cyber operations best integrated into a country’s overall military strategy?

Unlike other kinds of conflicts, attribution of attacks presents significant challenges. Indeed, in many cases, it can be difficult to determine whether the attacker is a nation-state, a nonstate actor, a criminal gang, or a lone hacktivist. Investigators must combine technical and traditional methods to identify potentially responsible parties and to understand their intent. If the aggressor’s identity cannot be confirmed, how can a counterattack be launched? Some attackers may seek to mount “false flag” attacks and deception, for example, that misdirect defenders to counter-attack in the wrong direction.

Additionally, what are appropriate responses to attacks made on civil infrastructure and private business operations, such as in the areas of financial services, transportation, energy, entertainment, and health care? In other words, what are the appropriate rules of engagement for national systems, infrastructural systems, businesses, and individuals? When, for example, is a counterattack or a “kinetic” response permissible?

These questions have major implications for the study of war and peace. Those who seek to start a war may be harder to find and their motives more difficult to discern. The cybersecurity and international conflict minor tackles the social-scientific dimensions of cybersecurity with a focus on the implications of the cyber age for modern statecraft, warfare, elections, (local, state, and national), and domestic and international politics.

**Foundational Courses (2 courses, 18 units)**

Students must complete two of the following courses:

- 84-104 Decision Processes in American Political Institutions 9
- 84-226 International Relations 9
- 84-275 Comparative Politics 9

**Core Courses (3 courses, 24 units)**

- 84-387 Remote Systems and the Cyber Domain in Conflict 9
- 84-388 Concepts of War and Cyber War 6
- 84-405 The Future of Warfare 9

**Electives (4-5 courses, 39 units minimum)**

At least two courses (18 units) must be taken from the CMIST and have an 84-number.

- 84-200 Security War Game Simulation 6
- 84-312 Terrorism in Sub-Saharan Africa 6
- 84-319 Civil-Military Relations 9
- 84-323 War and Peace in the Contemporary Middle East 9
- 84-325 Contemporary American Foreign Policy 9
- 84-327 Repression and Control in Dictatorships 9
Decision Science Concentration
(84 units minimum)

Decision Science is grounded in theories and methods drawn from psychology, economics, philosophy, statistics, and management science. Courses in the BHA concentration in Decision Science cover the three aspects of decision science: (a) normative analysis, creating formal models of rational choice; (b) descriptive research, studying how cognitive, emotional, social, and institutional factors affect judgment and choice, and (c) prescriptive interventions, seeking to improve judgment and decision making. In addition to gaining a broad education in the principles of judgment and decision making, students with a concentration in Decision Science gain broadly applicable skills in research design and analysis. They also have the chance to think about and discuss decision making in many different areas.

Disciplinary Perspectives (5 courses, 48 units)

- 73-102 Principles of Microeconomics 9
- 73-104 Principles of Microeconomics Accelerated 9
- 85-102 Introduction to Psychology 9
- 88-120 Reason, Passion and Cognition (freshman or sophomore year) 9
- 88-223 Decision Analysis 12
- 88-302 Behavioral Decision Making 9

Research Methods (2 courses, 18 units)

- 36-202 Methods for Statistics & Data Science 9
- 36-309 Experimental Design for Behavioral & Social Sciences 9
- 85-309 Statistical Concepts and Methods for Behavioral and Social Science 9
- 88-251 Empirical Research Methods 9

Capstone (1 course, 9 units)

- 88-454 Decision Science Capstone 9

Electives (1 course, 9 units minimum)

Complete one course (at least 9 units) from the following category of courses. Note that not all elective courses are offered every year.

Biological and Behavioral Aspects of Decision Making:

- 88-150 Managing Decisions 9
- 88-221 Markets, Democracy, and Public Policy 9
- 88-230 Human Intelligence and Human Stupidity 9
- 88-231 Thinking in Person vs. Thinking Online 9
- 88-252 Cause and Effect 9
- 88-255 Strategic Decision Making 9
- 88-275 Bubbles: Data Science for Human Minds 9

- 88-300 Programming and Data Analysis for Social Scientists 9
- 88-312 Decision Models and Games 9
- 88-342 The Neuroscience of Decision Making 9
- 88-344 Systems Analysis: Environmental Policy 9
- 88-360 Behavioral Economics 9
- 88-365 Behavioral Economics and Public Policy 9
- 88-366 Behavioral Economics of Poverty and Development 9
- 88-367 Behavioral Economics & Field Experiments in Organizations 9
- 88-372 Social and Emotional Brain 9
- 88-380 Dynamic Decisions 9
- 88-388 Psychological Models of Decision Making 9
- 88-405 Risk Perception and Communication 9
- 88-406 Behavioral Economics @ Work 9
- 88-418 Negotiation: Strategies and Behavioral Insights 9
- 88-419 International Negotiation 9
- 88-435 Decision Science and Policy 9
- 88-444 Public Policy and Regulations 9
- 88-451/452 Policy Analysis Senior Project 12

Economics Concentration
(81 units minimum)

The BHA concentration in Economics provides a solid understanding of economic theory and quantitative economic analysis. The core disciplinary sequences in economic theory and quantitative analysis are combined with calculus and data analysis to provide students with knowledge and skills that allow for creative problem-solving. Students pursuing the BHA concentration in Economics will hold a Dietrich College affiliation.

Mathematics Prerequisites

These courses are not counted as part of your DC Concentration. It may be used to satisfy general education or free elective requirements.

- 21-120 Differential and Integral Calculus 10
- 21-256 Multivariate Analysis 9

Economic Theory Requirements (4 courses, 36 units)

- 73-102 Principles of Microeconomics 9
- 73-104 Principles of Microeconomics Accelerated 9
- 73-103 Principles of Macroeconomics 9
- 73-230 Intermediate Microeconomics 9
- 73-240 Intermediate Macroeconomics 9

* Students who place out of 73-102 based on the economics placement exam will receive a prereq waiver for 73-102 and are waived from taking 73-102.

Quantitative Analysis Requirements (2 courses, 18 units)

These courses require 36-200 Reasoning with Data as a prerequisite. 36-200 also fulfills a general education Data Analysis requirement.

- 73-265 Economics and Data Science 9
- 73-274 Econometrics I 9

Advanced Economics Electives (2 courses, 18 units)

Students must take two advanced elective courses. Advanced elective courses are those numbered 73-300 through 73-495, as well as courses designated by the program offered by other departments/programs. Additionally, students may work with their economics advisor to structure alternative sets of courses to meet these requirements based on their particular interests, subject to course availability.

Senior Work (1 course, 9 units)

- 73-497 Senior Project 9

Environmental & Sustainability Studies Concentration
(93 units minimum)

The BHA concentration in Environmental & Sustainability Studies (ESS) focuses on human-environment interactions from a multitude of disciplinary perspectives. The curriculum draws on the expertise of faculty across several Carnegie Mellon colleges in order to provide students with the interdisciplinary background and skills necessary to understand
environmental problems and the means to mitigate them. The curriculum is designed to help students apply social and scientific perspectives to environmental problems; to distinguish among scientific methods for evaluating environmental data; and to identify and assess sources of environmental problems; to identify environmental justice issues within the context of proposed policy solutions.

**Core Courses (3 course, 27 units)**

24/09-291 Environmental Systems on a Changing Planet 9
66-236 Introduction to Environmental Ideas 9
66-506 Senior Capstone (Interdisciplinary Research: Capstone in ESS) 9

**Earth and Environmental Science (1 course, 9 units)**

Choose one course from the list below.

03-128 Biology for Life Special Topics (Section S, Tropical Ecology) 9
03-140 Ecology and Environmental Science 9
33-115 Physics for Future Presidents 9

**Global Course (1 course, 3 units)**

99-xxx Each semester, a new course is offered on Global themes, in partnership with University of Pittsburgh’s Global Studies Center. 3

**Political Economy (1 course, 9 units minimum)**

Choose one course from the list below.

19-101 Introduction to Engineering and Public Policy 12
79-300 History of American Public Policy 9
84-110 Foundations of Political Economy 9
84-226 International Relations 9
84-325 Contemporary American Foreign Policy 9
88-344 Systems Analysis: Environmental Policy 9

**Electives (5 courses, 45 units minimum)**

Choose three DC Electives and two MCS/ENG Electives in consultation with the concentration advisor.

**DC Electives:**

76-241 Introduction to Gender Studies 9
76-291 Getting Heard/Making a Difference 9
76-354 Watchdog Journalism 9
76-395 Science Writing *(Additional prerequisite)* 9
76-450 Law, Culture, and the Humanities 9
79-201 Introduction to Anthropology 9
79-275 Introduction to Global Studies 9
79-278 How (Not) to Change the World 9
79-288 Bananas, Baseball, and Borders: Latin America and the United States 9
79-297 Technology and Work 9
79-331 Body Politics: Women and Health in America 9
79-372 The Rise and Fall of Pittsburgh Steel 6
79-377 Food, Culture, and Power: A History of Eating 9
79-379 Extreme Ethnography 9
79-383 The History of Capitalism 9
80-135 Introduction to Political Philosophy 9
80-244 Environmental Ethics 9
84-110 Foundations of Political Economy 9
84-275 Comparative Politics 9
84-325 Contemporary American Foreign Policy 9
85-241 Social Psychology 9

**MCS/ENG Electives:**

12-201 Geology 9
19-101 Introduction to Engineering and Public Policy 12
19-425 Sustainable Energy for the Developing World 9
27-505 Exploration of Everyday Materials 9
03-140 Ecology and Environmental Science 9

**Ethics, History, & Public Policy Concentration (81 units minimum)**

The BHA concentration in Ethics, History, & Public Policy (EHPP) prepares students to be leaders in a vital goal of colleges and universities in every democratic society. The intellectual challenges facing public and private sector leaders have expanded dramatically since the pioneering EHPP program began in 1996, but the need remains as great as ever for broadly educated, ethically sensitive, and technically skilled leaders.

EHPP prepares students to demonstrate sophistication and flexibility in their command of interdisciplinary knowledge; deep historical understanding of how modern-day policy problems have emerged and evolved; and clear, rational criteria for ethical and socially just decision making. The curriculum provides students with a strong humanistic foundation for developing such high-level, historically grounded, and ethically attuned leadership capacities. It also offers ample room for specialization in a wide range of policy areas in which the History and Philosophy departments have special expertise, e.g., medicine and public health, criminal justice, environment, technology, artificial intelligence (AI), gender, civil rights, immigration, and education.

**Foundation Courses in History and Philosophy (2 courses, 18 units)**

Choose one of the following two courses:

79-189 Democracy and History: Thinking Beyond the Self 9
79-248 U.S. Constitution & the Presidency 9

Choose one of the following two courses:

80-130 Introduction to Ethics 9
80-330 Ethical Theory 9

**Ethics and Policy Core (3 courses, 27 units)**

Choose three of the courses below:

No more than one course may be taken at the 100 level and at least one course must be taken at the 300 level or above.

80-135 Introduction to Political Philosophy 9
80-136 Social Structure, Public Policy & Ethics 9
80-208 Critical Thinking 9
80-221 Philosophy of Social Science 9
80-234 Race, Gender, and Justice 9
80-244 Environmental Ethics 9
80-245 Medical Ethics 9
80-249 AI, Society, and Humanity 9
80-305 Game Theory 9
80-306 Decision Theory 9
80-321 Causation, Law, and Social Policy 9
80-324 Philosophy of Economics 9
80-330 Ethical Theory 9
80-335 Social and Political Philosophy 9
80-336 Philosophy of Law 9
80-348 Health, Human Rights, and International Development 9
80-447 Global Justice 9

**History and Policy Core (3 courses, 27 units)**

Choose three of the courses below:

79-175 Moneyball Nation: Data in American Life 9
79-204 American Environmental History 9
79-212 Jim Crow America 9
79-215 Environmental Justice from Conservation to Climate Change 9
79-234 Technology and Society 9
79-242 African American History: Reconstruction to the Present 9
79-248 U.S. Constitution & the Presidency 9
79-250 Voting Rights: An Introduction 9
79-278 How (Not) to Change the World 9
79-300 History of American Public Policy 9
79-320 Women, Politics, and Protest 9
79-321 Documenting Human Rights 9
79-330 Medicine and Society: Health, Healers, and Hospitals 9
Options include but are not limited to:

Topics in Film & Visual Media Studies (2 courses, 18 units)
- 76-343 Education, Democracy, and Civil Rights
- 79-370 Technology in the United States
- 79-380 Hostile Environments: The Politics of Pollution in Global Perspective

Foundation Courses in Law and Social Science (1 course, 9 units minimum)
Choose one of the courses below:
- 17-200 Ethics and Policy Issues in Computing
- 19-101 Introduction to Engineering and Public Policy
- 70-332 Business, Society and Ethics
- 73-102 Principles of Microeconomics
- 73-103 Principles of Macroeconomics
- 84-104 Decision Processes in American Political Institutions
- 84-110 Foundations of Political Economy
- 84-352 Representation and Voting Rights
- 84-393 Legislative Decision Making: US Congress
- 84-402 Judicial Politics and Behavior
- 88-281 Topics in Law: 1st Amendment
- 88-284 Topics of Law: The Bill of Rights

Film & Visual Media Concentration (81 units minimum)
The BHA concentration in Film & Visual Media trains students through a combination of coursework in visual media, film history and analysis, screenwriting, and production of film and other visual media. This concentration offers a comprehensive education in film and visual media, from theoretical framing and historical-cultural contextualization to training skills in both creating and analyzing film, and developing a complex blend of creative, professional and technical competencies. CMU's Department of English is an ideal home for the Film & Visual Media concentration due to the department’s combination of creative writers, film and media studies scholars, film makers, digital humanities and visual communication researchers.

Introductory Courses (2 courses, 18 units)
- 76-239 Introduction to Film Studies
- 76-259 Film History

Production Course (1 course, 9 units)
- 76-292 Introduction to Film Production

Screenwriting Course (1 course, 9 units)
- 76-269 Introduction to Screenwriting

Topics in Film & Visual Media Studies (2 courses, 18 units)
Options include but are not limited to:
- 76-243 Introduction to Television
- 76-278 Japanese Film and Literature: The Art of Storytelling
- 76-312 Crime and Justice in American Film
- 76-339 Topics in Film and Media (Can be taken more than once.)
- 76-353 Transnational Feminisms: Fiction and Film
- 76-367 Fact Into Film: Translating History into Cinema
- 76-439 Seminar in Film and Media Studies
- 76-448 Shakespeare on Film
- 76-449 Race and Media
- 76-454 Rise of the Blockbuster
- 79-225 West African History in Film
- 79-306 Fact into Film: Translating History into Cinema
- 79-308 Crime and Justice in American Film
- 79-319 India Through Film
- 79-326 Shall We Dance? Culture, Politics, and Movement in the 20th Century
- 79-339 Juvenile Delinquency & Film: From Soul of Youth (1920) to West Side Story (1961)
- 82-215 Arab Culture Through Dialogues, Film, and Literature

Courses in Film Production, Screenwriting, Digital Media, Literature & Culture, and/or Film & Visual Media Studies (3 courses, 27 units)
Students may take an additional three Dietrich College courses for a minimum of 27 units of courses offered in the categories listed above. Because there are dozens of options available, including many of the courses listed above, please consult with the Department of concentration advisor for guidance. Recommended courses include 76-310 Advanced Studies in Film and Media, 76-323 Text to Screen, and 76-374 Mediated Narrative.

French & Francophone Studies Concentration (81 units minimum)
A BHA concentration in French & Francophone Studies promotes not just language proficiency but also an understanding of French and francophone cultures. Students who arrive at Carnegie Mellon with previous language study and/or who have high Advanced Placement, an International Baccalaureate, a Cambridge GCE Advanced level or internal placement exam scores will be able to begin taking courses in the concentration earlier in their undergraduate program. In all cases, progress in the concentration will be accelerated by study abroad, which is recommended for all students.

Prerequisites
Intermediate level proficiency in French. This is equivalent to the completion of four courses (two at the 100-level and two at the 200-level) or exemption based on Advanced Placement, International Baccalaureate, Cambridge GCE Advanced level or Carnegie Mellon internal placement test scores.

Core Courses in French & Francophone Studies (3 courses, 27 units)
- 82-303 French & Francophone Cultures
- 82-304 French & Francophone Sociolinguistics
- 82-415/416 Topics in French and Francophone Studies

Note: 82-303 or 82-304 can be repeated with a different topic. A 400-level course may be substituted with the concentration advisor’s approval.

Core Courses in Modern Languages (1 course, 9 units)
Complete one course.
- 82-283 Language Diversity & Cultural Identity

Note: In consultation with the concentration advisor, students may substitute a Modern Languages course elective with one related to language analysis, language learning, or acquisition of language and culture from the listings in French & Francophone Studies or from another department. Examples: 80-180 Nature of Language, 85-421 Language and Thought. In addition, students may choose to take 82-580 Senior Seminar in Modern Languages (9 units). The selected course may not double count in the Electives category.

French & Francophone Studies and Interdisciplinary Electives (5 courses, 45 units minimum)
Complete four courses from French & Francophone Electives and one course from Interdisciplinary Electives or three courses from French & Francophone Electives and two courses from Interdisciplinary Electives in consultation with the concentration advisor.

French & Francophone Studies Electives:
- 82-404 Francophone Realities *
- 82-415/416 Topics in French and Francophone Studies *
- 82-505 Modern Languages Undergraduate Internship * Var.

* Students may repeat these courses with new topics.

Interdisciplinary Electives:
This list is compiled from possibilities such as but not limited to the following. Students should consult SIO and the concentration advisor for the most up to date interdisciplinary electives appropriate for the French & Francophone Studies curriculum. Courses may be suggested to the concentration advisor for approval as a substitute. Note that not all courses are offered each semester.

- English
  - 76-239 Introduction to Film Studies
  - 76-318 Communicating in the Global Marketplace
  - 76-385 Introduction to Discourse Analysis
  - 76-386 Language & Culture
In all cases, progress in the concentration will be accelerated by study taking courses in the concentration earlier in their undergraduate program. A BHA concentration in German Studies promotes not just language proficiency but also an understanding of German culture. Students who arrive at Carnegie Mellon with previous language study and/or who have high Advanced Placement, an International Baccalaureate, a Cambridge GCE Advanced level or internal placement exam scores will be able to begin taking courses in the concentration earlier in their undergraduate program. In all cases, progress in the concentration will be accelerated by study abroad, which is recommended for all students.

Prerequisites
Intermediate level proficiency in German. This is equivalent to the completion of four courses (two at the 100-level and two at the 200-level) or exemption based on Advanced Placement, International Baccalaureate, Cambridge GCE Advanced level or Carnegie Mellon internal placement test scores.

Core Courses in German Studies (4 courses, 36 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>82-221</td>
<td>Intermediate German I</td>
<td>9</td>
</tr>
<tr>
<td>82-222</td>
<td>Intermediate German II</td>
<td>9</td>
</tr>
<tr>
<td>82-320</td>
<td>Contemporary Society in Germany, Austria and Switzerland</td>
<td>9</td>
</tr>
<tr>
<td>82-323</td>
<td>Germany, Austria and Switzerland in the 20th Century</td>
<td>9</td>
</tr>
</tbody>
</table>

Note: If students have already completed the equivalent of the 200-level courses prior to arriving at Carnegie Mellon, they may take 400-level courses with approval from the concentration advisor. 400-level courses may also be substituted for the 300-level courses with the approval of the concentration advisor.

German Studies Concentration (31 units minimum)

Core Courses in Modern Languages (1 course, 9 units)
Complete one course.

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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>82-280</td>
<td>Bilingual &amp; Bicultural Experiences in the US</td>
<td>9</td>
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<tr>
<td>82-282</td>
<td>Interpreting Global Texts &amp; Cultures</td>
<td>9</td>
</tr>
<tr>
<td>82-283</td>
<td>Language Diversity &amp; Cultural Identity</td>
<td>9</td>
</tr>
<tr>
<td>82-284</td>
<td>Multicultural Pittsburgh: VR Storytelling</td>
<td>9</td>
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<tr>
<td>82-285</td>
<td>Podcasting: Language and Culture Through Storytelling</td>
<td>9</td>
</tr>
<tr>
<td>82-286</td>
<td>Cultural Complexities</td>
<td>9</td>
</tr>
<tr>
<td>82-383</td>
<td>Second Language Acquisition: Theories and Research</td>
<td>9</td>
</tr>
<tr>
<td>82-388</td>
<td>Topics in Second Language Acquisition</td>
<td>9</td>
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<tr>
<td>82-480</td>
<td>Translation Technologies</td>
<td>9</td>
</tr>
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Note: In consultation with the concentration advisor, students may substitute a Modern Languages course elective with one related to language analysis, language learning, or acquisition of language and culture from the listings in German Studies or from another department. Examples: 80-180 Nature of Language, 85-421 Language and Thought. In addition, students may choose to take 82-580 Senior Seminar in Modern Languages (9 units). The selected course may not double count in the Electives category.

German Studies and Interdisciplinary Electives (4 courses, 36 units minimum)
Complete three courses from German Studies Electives and one course from Interdisciplinary Electives in consultation with the concentration advisor.

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>82-420</td>
<td>The Crucible of Modernity: Vienna 1900</td>
<td>9</td>
</tr>
<tr>
<td>82-425/426</td>
<td>Topics in German Literature and Culture</td>
<td>9</td>
</tr>
<tr>
<td>82-427</td>
<td>Nazi and Resistance Culture</td>
<td>9</td>
</tr>
<tr>
<td>82-428</td>
<td>History of German Film</td>
<td>9</td>
</tr>
<tr>
<td>82-429</td>
<td>German Reading and Translation Workshop: Germany in Today's World</td>
<td>9</td>
</tr>
<tr>
<td>82-505</td>
<td>Modern Languages Undergraduate Internship</td>
<td>Var.</td>
</tr>
<tr>
<td>82-521/522</td>
<td>Special Topics in German Studies</td>
<td>Var.</td>
</tr>
</tbody>
</table>

* Students may repeat these courses with new topics.

Interdisciplinary Electives:
This list is compiled from possibilities such as but not limited to the following. Students should consult SIO and the concentration advisor for the most up to date interdisciplinary electives appropriate for the German Studies curriculum. Courses may be suggested to the concentration advisor for approval as a substitute. Note that not all courses are offered each semester.

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<tr>
<td>76-386</td>
<td>Language &amp; Culture</td>
<td>9</td>
</tr>
<tr>
<td>76-387</td>
<td>Writing in the Disciplines</td>
<td>6</td>
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<tr>
<td>76-483</td>
<td>Research Methods in Technical &amp; Professional Communication</td>
<td>9</td>
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History

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>79-205</td>
<td>20th Century Europe</td>
<td>9</td>
</tr>
<tr>
<td>79-257</td>
<td>Germany and the Second World War</td>
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</tr>
</tbody>
</table>

Institute for Politics and Strategy (Choose in consultation with the concentration advisor.)

Modern Languages

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>82-227</td>
<td>Germany &amp; the European Union</td>
<td>9</td>
</tr>
<tr>
<td>82-280</td>
<td>Bilingual &amp; Bicultural Experiences in the US</td>
<td>9</td>
</tr>
<tr>
<td>82-282</td>
<td>Interpreting Global Texts &amp; Cultures</td>
<td>9</td>
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<tr>
<td>82-283</td>
<td>Language Diversity &amp; Cultural Identity</td>
<td>9</td>
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<tr>
<td>82-284</td>
<td>Multicultural Pittsburgh: VR Storytelling</td>
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<tr>
<td>82-285</td>
<td>Podcasting: Language and Culture Through Storytelling</td>
<td>9</td>
</tr>
<tr>
<td>82-286</td>
<td>Cultural Complexities</td>
<td>9</td>
</tr>
</tbody>
</table>
The BHA concentration in Global Studies is designed for students interested in humanistic approaches to understanding past and present processes of globalization. Participating faculty in the departments of History, Modern Languages and English conduct research in Africa, Asia, Europe, Latin America, the Middle East, and the Pacific. The rigorous yet flexible Global Studies curriculum combines anthropology, history, literary and cultural studies, and advanced language training in order to help students make sense of complex interactions among global processes, regional and local cultures, and societal structures. BHA concentration students in Global Studies develop a broad understanding of their prospects and responsibilities as citizens of the world confronting challenging contemporary problems.

There are two required courses for the concentration: Introduction to Global Studies (79-275) and Global Studies Research Seminar (79-400). Students also choose among several courses focused on theory, research methods, transnational histories, and regional/national histories and cultures.

In addition to coursework at Carnegie Mellon, BHA students with a concentration in Global Studies are encouraged to incorporate a semester of study abroad into their course of study in order to immerse themselves in a society different from their own with unfamiliar cultural practices, language, and history.

Students should consult frequently with the BHA advisor and the Global Studies concentration advisor who will help students to craft a coherent course of study on specific topics and/or regions that may lead to the capstone research project (79-400 Global Studies Research Seminar), the BHA capstone project (SO-401 and SO-402) or a Dietrich College senior honors thesis (https://www.cmu.edu/dietrich/students/undergraduate/programs/senior-honors/). The concentration advisor will also work with students to connect their academic interests and their participation in student organizations and/or organizations based in Pittsburgh with transnational reach.

### Global Studies Introductory and Capstone Courses (2 courses, 21 units)

- **79-275** Introduction to Global Studies
- **79-400** Global Studies Research Seminar

### Language Proficiency Requirement

Gaining skills in more languages is a crucial component of the major in Global Studies. Students will pursue at least three semesters of language study, no matter the level. That is, students could take three introductory courses in three different languages, or three different level courses in the same language, or two different level courses in Language 1 and a third course in Language 2.

If students already know a language at an advanced level, they will take a test to certify those language skills, if they pass the test, they will need to take at least two semesters of language study, focused on a language different from the one they were tested on.

Please see the Modern Languages section of the schedule of classes (https://enr-apps.as.cmu.edu/open/SOC/SOCServlet/).

### Theoretical and Topical Core Courses (2 courses, 18 units)

To gain a solid foundation in the theories, methods, and analytical topics underpinning the concentration in Global Studies, students select 18 units (typically two courses) from the core courses listed below. Students must earn a final grade of “C” or better in these courses to fulfill the theoretical and topical core course requirement.

- **79-201** Introduction to Anthropology
- **79-211** Modern Southeast Asia: Colonialism, Capitalism, and Cultural Exchange
- **79-278** How (Not) to Change the World
- **79-280** Coffee and Capitalism
- **79-289** Animal Planet: An Environmental History of People and Animals
- **79-314** How Do We Remember? The Politics and Cultures of Memory
- **79-315** Thirsty Planet: The Politics of Water in Global Perspective
- **79-317** Art, Anthropology, and Empire
- **79-318** Sustainable Social Change: History and Practice
- **79-377** Food, Culture, and Power: A History of Eating
- **79-379** Extreme Ethnography
- **79-380** Hostile Environments: The Politics of Pollution in Global Perspective
- **79-383** The History of Capitalism

### Transnational, Global, and Regional Courses (3 courses, 27 units)

To gain insight into how complex transnational and global processes shape and are affected by local, national and regional dynamics, students will select 27 units (typically three courses) from any subcategories below.

#### Transnational and Global Courses:

- **76-337** Intersectional Feminism
- **76-353** Transnational Feminisms: Fiction and Film
- **76-384** Race, Nation, and the Enemy
- **76-440** Postcolonial Theory: Diaspora and Transnationalism
- **79-149** Ancient Rome: What Have the Romans Ever Done for Us?
- **79-224** Mayan America
- **79-237** Comparative Slavery
- **79-270** Anti-Semitism Then and Now: Perspectives from the Middle Ages to the Present
- **79-273** Jews and Muslims in History
- **79-276** Beyond the Border
- **79-280** Coffee and Capitalism
- **79-282** Europe and the World Since 1800
- **79-283** Hungry World: Food and Famine in Global Perspective
- **79-288** Bananas, Baseball, and Borders: Latin America and the United States
- **79-313** “Unwanted”: Refugees, Asylum Seekers, and Patterns of Global Migration
- **79-333** African Americans, Race, and the Fight for Reparations
- **79-350** Early Christianity
- **79-368** Un-natural Disasters: Societies and Environmental Hazards in Global Perspective
- **79-385** Out of Africa: The Making of the African Diaspora
- **79-510** Global Studies Guided Reading
- **80-348** Health, Human Rights, and International Development
- **80-447** Global Justice
- **82-203** Language Diversity & Cultural Identity
- **82-304** French & Francophone Sociolinguistics
- **82-345** Introduction to Hispanic Literary and Cultural Studies
- **84-226** International Relations
- **84-322** Nonviolent Conflict and Revolution
- **84-370** Nuclear Security & Arms Control
- **84-389** Terrorism and Insurgency
Regional Courses:

Africa
79-225 West African History in Film 9
79-226 African History: Earliest Times to 1780 9
79-227 Modern Africa: The Slave Trade to the End of Apartheid 9
79-290 The Slave Passage: From West Africa to the Americas 9

Eastern and Southern Asia and the Pacific
79-207 Asian American History through the Novel 9
79-210 Identity, Ethnicity, and Place in Modern China 9
79-211 Modern Southeast Asia: Colonialism, Capitalism, and Cultural Exchange 9
79-264 Tibet and China: History and Propaganda 9
88-411 Rise of the Asian Economies 9

Europe
79-202 Flesh and Spirit: Early Modern Europe, 1400-1750 9
79-203 The Other Europe: The Habsburgs, Communism, & Central/Eastern Europe, 1740-1990 9
79-205 20th Century Europe 9
79-208 Witchcraft and Witch-Hunting 9
79-268 World War I: The Twentieth Century's First Catastrophe 9
79-270 Anti-Semitism Then and Now: Perspectives from the Middle Ages to the Present 9
79-272 Coexistence and Conflict: Muslims, Christians and Jews in Spain and Portugal 9
82-320 Contemporary Society in Germany, Austria and Switzerland 9
82-415 Topics in French and Francophone Studies 9
82-441 Studies in Peninsular Literature and Culture 9

The Middle East
79-229 The Origins of the Palestinian-Israeli Conflict, 1880-1948 9
79-230 The Arab-Israeli Conflict and Peace Process since 1948 9
82-215 Arab Culture Through Dialogues, Film, and Literature 9
84-323 War and Peace in the Contemporary Middle East 9

The Americas
79-223 Mexico: From the Aztec Empire to the Drug War 9
82-245 New Directions in Hispanic Studies 9
82-343 Latin America Language and Culture 9
82-451 Studies in Latin American Literature and Culture 9
82-455 Topics in Hispanic Studies 9
82-456 Topics in Hispanic Studies 9

Electives (2 courses, 15 units minimum)

Students are required to take an additional 15 units (typically two courses) of electives, selected from one or both of the subcategories below. "Theoretical and Topical Core Courses" and "Transnational, Global, and Regional Courses" listed above that are not used to fulfill those requirements may be counted as electives in addition to the courses listed below.

Global Studies offers students the opportunity to gain credit for a 9 unit elective while gaining first-hand experience interning with Pittsburgh-based organizations that work across borders. 79-506 Global Studies Internship is offered every semester and students should register for the course after consulting with the concentration advisor. The concentration advisor will assist students with matching their interests to local organizations and identifying an on-site supervisor available to collaborate in the ongoing and final evaluation of the student's work.

Thematic Courses:

57-306 World Music 9
70-365 International Trade and International Law 9
76-241 Introduction to Gender Studies 9
76-386 Language & Culture 9
76-449 Race and Media 9
76-450 Law, Culture, and the Humanities 9

76-468 Space and Mobilities 9
79-101 Making History: How to Think About the Past (and Present) 9
79-204 American Environmental History 9
79-281 Introduction to Religion 9
79-316 Photography, the First 100 Years, 1839-1939 9
79-324 #MeToo: Naming and Resisting Gender Violence 6
79-330 Medicine and Society: Health, Healers, and Hospitals 9
79-343 Education, Democracy, and Civil Rights 9
80-244 Environmental Ethics 9
80-335 Social and Political Philosophy 9
82-215 Arab Culture Through Dialogues, Film, and Literature 9
82-541 Special Topics in Hispanic Studies Var.
84-275 Comparative Politics 9
84-310 International Political Economy 9
84-318 Politics of Developing Nations 9
84-362 Diplomacy and Statecraft 9

Nation-based Courses:

79-216 Genghis Khan and the Mongol Empire 3
79-257 Germany and the Second World War 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
79-263 Mao and the Chinese Cultural Revolution 9
79-265 Russian History: Game of Thrones 9
79-266 Russian History and Revolutionary Socialism 9
79-267 The Soviet Union in World War II: Military, Political, and Social History 9
79-269 Russian History: From Socialism to Capitalism 9
79-309 The Chinese Revolution Through Film (1949-2000) 9
79-319 India Through Film 9
79-320 Women, Politics, and Protest 9
79-322 Stalin and the Great Terror 9
79-326 Shall We Dance? Culture, Politics, and Movement in the 20th Century 6
79-331 Body Politics: Women and Health in America 9
82-253 Korean Culture Through Film 9
82-254 World of Korea, Then and Now 9
82-273 Introduction to Japanese Language and Culture 9
82-278 Japanese Film and Literature: The Art of Storytelling 9
82-293 Russian Cinema: From the Bolshevik Revolution to Putin's Russia 9
82-294 19th Century Russian Masterpieces 9
82-295 20th Century Russian Masterpieces Var.
82-303 French & Francophone Cultures 9
82-305 French in its Social Contexts 9
82-333 Chinese Language and Culture Var.
82-342 Spanish Language and Culture 9
82-344 U.S. Latinos: Language and Culture 9
82-361 Italian Language and Culture I 9
82-420 The Crucible of Modernity: Vienna 1900 9
82-425 Topics in German Literature and Culture 9
82-427 Nazi and Resistance Culture 9
82-428 History of German Film 9
82-433 Topics in Contemporary Culture of China 9
82-440 Studies in Chinese Literature & Culture 9
82-473 Topics in Japanese Studies 9

Hispanic Studies Concentration

(81 units minimum)

A BHA concentration in Hispanic Studies promotes not just language proficiency but also an understanding of its varied cultures. Students who
arrive at Carnegie Mellon with previous language study and/or who have high Advanced Placement, an International Baccalaureate, a Cambridge GCE Advanced level or internal placement exam scores will be able to begin taking courses in the concentration earlier in their undergraduate program. In all cases, progress in the concentration will be accelerated by study abroad, which is recommended for all students.

**Prerequisites**

Intermediate level proficiency in Spanish. This is equivalent to the completion of four courses (two at the 100-level and two at the 200-level) or exemption based on Advanced Placement, International Baccalaureate, Cambridge GCE Advanced level or Carnegie Mellon internal placement test scores.

**Core Courses in Hispanic Studies (3 courses, 27 units)**

Complete two courses.

- **82-342** Spain: Language and Culture  
- **82-343** Latin America Language and Culture  
- **82-344** U.S. Latinos: Language and Culture

**Complete required course.**

- **82-345** Introduction to Hispanic Literary and Cultural Studies

**Core Courses in Modern Languages (1 course, 9 units)**

Complete one course.

- **82-280** Bilingual & Bicultural Experiences in the US  
- **82-282** Interpreting Global Texts & Cultures  
- **82-283** Language Diversity & Cultural Identity  
- **82-284** Multicultural Pittsburgh: VR Storytelling  
- **82-285** Podcasting: Language and Culture Through Storytelling

- **82-286** Cultural Complexities  
- **82-383** Second Language Acquisition: Theories and Research  
- **82-388** Topics in Second Language Acquisition  
- **82-480** Translation Technologies

**Humanities Analytics Concentration**

**81 units minimum**

The human experience that is traditionally at the core of a humanities education is being dramatically transformed by the emergence of big data, digital platforms, computational thinking, and digital connectivity. Spurred by such developments, the concentration in Humanities Analytics (HumAn), offered by the Department of English, trains students in the processes involved in analyzing, digitizing, quantifying and visualizing different types of humanities and cultural phenomena, including printed books, manuscripts, historical records, art, music and film. The HumAn concentration trains students to work with cultural objects (like texts, film, books, manuscripts, historical records, art, music and film) in the digital age using computational tools such as natural language processing, text analysis and data mining, and machine learning.

**Required Courses (5 courses, 45 units)**

- **76-275** Introduction to Critical Writing  
- **76-380** Methods in Humanities Analytics

Three core courses from the following list:

- **76-314** Data Stories  
- **76-388** Coding for Humanists  
- **76-425** Rhetoric, Science, and the Public Sphere  
- **76-429** Introduction to Digital Humanities  
- **88-275** Bubbles: Data Science for Human Minds  
- **88-300** Programming and Data Analysis for Social Scientists

**Electives (4 courses, 36 units minimum)**

Choose four courses from the following categories. One course must come from List A, two from List B, and the fourth in consultation with your Humanities Analytics advisor.

**List A: One elective course relevant to digital and analytics methods (at least 9 units):**

- 79-288 Bananas, Baseball, and Borders: Latin America and the United States  
- 82-245 New Directions in Hispanic Studies  
- 82-247 US Latinos Literature  
- 82-249 Hispanic Language & Cultures for the Professions  
- 82-280 Bilingual & Bicultural Experiences in the US  
- 82-281 Contextual Thinking  
- 82-282 Interpreting Global Texts & Cultures  
- 82-283 Language Diversity & Cultural Identity  
- 82-284 Multicultural Pittsburgh: VR Storytelling  
- 82-285 Podcasting: Language and Culture Through Storytelling  
- 82-286 Cultural Complexities  
- 82-299 Equity & Justice in Modern Languages  
- 82-388 Topics in Second Language Acquisition  
- 82-480 Translation Technologies  
- 85-375 Crosscultural Psychology  
- 85-421 Language and Thought

**List B: Electives relevant to the humanities and culture (at least 18 units):**

- 82-441 Studies in Peninsular Literature and Culture  
- 82-443 Spanish Reading and Translation Workshop  
- 82-444 The Structure of Spanish  
- 82-451 Studies in Latin American Literature and Culture  
- 82-455/456 Topics in Hispanic Studies  
- 82-506 Hispanic Studies Internship  
- 82-541/542 Special Topics in Hispanic Studies

* Students may repeat these courses with new topics.
BHA concentration in Information Systems combines aspects of computer science, information technology, and business management to provide you with an uncommonly well-rounded portfolio. You will be uniquely positioned for an impactful career in an increasingly digitized and connected world and able to adapt to rapid evolution across industries.

In addition to building a solid foundation in computing, communications, and software development, you will also study social sciences and organizational theory to develop "big picture" critical thinking and understand the human impacts of technological change. This blend prepares you to take a leading role in our digital future.

Students must earn a final grade of "C" or better for these courses to count toward the concentration.

### Technical Core (3 courses, 31 units minimum)

Information Systems requires completion of prerequisite courses in mathematics and computer science. All prerequisites must be successfully completed prior to the start of fall semester, junior year. Two Technical Core courses may double-count in the BHA General Education Math, Science, and Computation category.

<table>
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<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>15-112</td>
<td>Fundamentals of Programming and Computer Science</td>
<td>12</td>
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<tr>
<td>15-121</td>
<td>Introduction to Data Structures or 15-122</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Principles of Imperative Computation</td>
<td>10</td>
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</tbody>
</table>

### Choose one:

- 21-112 Calculus II 10
- 21-120 Differential and Integral Calculus 10
- 21-127 Concepts of Mathematics 12
- 21-240 Matrix Algebra with Applications 10
- 80-210 Logic and Proofs 9

### Information Systems Professional Core (8 courses, 76 units)

<table>
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<th>Course Number</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>67-200</td>
<td>Information Systems Research Colloquium -Fall</td>
<td>1</td>
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<td>67-250</td>
<td>The Information Systems Milieux -Spring</td>
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<tr>
<td>67-262</td>
<td>Database Design and Development -Fall</td>
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<tr>
<td>67-272</td>
<td>Application Design and Development -Spring</td>
<td>12</td>
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<tr>
<td>67-373</td>
<td>Information Systems Consulting Project -Spring</td>
<td>12</td>
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<tr>
<td>05-391</td>
<td>Designing Human Centered Software</td>
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<tr>
<td>or 05-410</td>
<td>User-Centered Research and Evaluation</td>
<td>12</td>
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<tr>
<td>or 05-452</td>
<td>Service Design</td>
<td>12</td>
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<tr>
<td>17-313</td>
<td>Foundations of Software Engineering</td>
<td>12</td>
</tr>
<tr>
<td>95-422</td>
<td>Managing Digital Transformation</td>
<td>9</td>
</tr>
</tbody>
</table>

### International Relations & Political Science Concentration (81 units minimum)

Offered through the Carnegie Mellon Institute for Security and Technology (CMIST), the International Relations and Political Science (IRPS) BHA concentration is for students who want to learn how to think systematically and develop foundational knowledge about international and domestic politics. It is an interdisciplinary major that is rooted firmly in political science and draws on strengths and insights from decision science, economics, history, modern languages, and other fields. IRPS students wrestle with a wide range of issues including the future of democracy, the relationship between technology and politics, the drivers of war and peace, domestic politics across countries, and the formulation of effective foreign policies. IRPS graduates embark on a variety of careers in government, law, public policy, intelligence, national defense, consulting, international development, and more.

Core disciplinary courses for the IRPS major establish a strong foundation in the study of political science and enable students to better understand the workings of political institutions, political behavior across countries, the decision-making of political leaders, the making national and international policy, and prevailing challenges to the international system, among other topics.

Core methodology courses train IRPS students in the social science tools and communications skills needed to analyze and write persuasively about international relations and politics. Students pursuing an IRPS major learn to use a wide range of analytic tools including statistics and data science, qualitative analysis, game theory, and behavioral decision-making models as they study politics and strategy. Students also learn how to effectively communicate their analyses to affect public policy.

A rich set of electives allows students to investigate issues in security and technology, grand strategy and national security, cybersecurity and international conflict, military strategy and doctrine, the politics of key regions of the world, international political economy and economic policy, representation and voting rights, climate change and development, repression and human rights, international law and diplomacy, political psychology and public opinion, and social change and revolution.
Recognizing the influence of language and culture on politics, students are required to complete the intermediate (200) level, or its equivalent, in a modern language other than English. Advanced-level study is strongly encouraged.

**Prerequisite**

84-110 Foundations of Political Economy 9  
or 73-102 Principles of Microeconomics 9  
or 73-103 Principles of Macroeconomics 9

**Core Courses (7 courses, 60 units)**

84-104 Decision Processes in American Political Institutions 9  
84-226 International Relations 9  
84-250 Writing for Political Science and Policy 9  
84-266 Research Design for Political Science 9  
84-267 Data Science for Political Science 9  
84-302 Methods for Statistics & Data Science 9  
84-275 Comparative Politics 9  
84-450 Policy Seminar 6

**Language Requirement**

BHA IRPS students are required to complete the intermediate (200) level or the equivalent in a modern language other than English. The language requirement may be satisfied by the BHA General Education Modern Languages requirement if the 200-level is reached. Advanced level study is strongly encouraged.

**Electives (3 courses, 21 units minimum)**

International Relations and Political Science BHA students must take 21 units (three courses) from the elective lists below. Two courses (18 units) must be taken from the Carnegie Mellon Institute for Security and Technology (CMIST) and have an 84-number.

CMIST Electives

84-200 Security War Game Simulation 6  
84-252 Briefing in the Policy World 6  
84-303 International Human Rights 6  
84-304 In the News: Analysis of Current National Security Priorities 6  
84-306 Latin American Politics 9  
84-307 Economic and Political History of Contemporary China 9  
84-310 International Political Economy 9  
84-312 Terrorism in Sub-Saharan Africa 6  
84-315 Political Economy of International Migration 9  
84-316 Political Economy of Transatlantic Partnership 9  
84-317 Defense Resourcing: From Strategy to Execution 6  
84-318 Politics of Developing Nations 9  
84-319 Civil-Military Relations 9  
84-322 Nonviolent Conflict and Revolution 9  
84-323 War and Peace in the Contemporary Middle East 9  
84-324 The Future of Democracy 9  
84-325 Contemporary American Foreign Policy 9  
84-327 Repression and Control in Dictatorships 9  
84-328 Military Strategy and Doctrine 9  
84-329 Asian Strategies 6  
84-352 Representation and Voting Rights 9  
84-354 The American Experiment: Unravelling the US Electoral System 6  
84-355 Diplomacy and Statecraft 9  
84-365 The Politics of Fake News and Misinformation 9  
84-369 Decision Science for International Relations 9  
84-370 Nuclear Security & Arms Control 9  
84-372 Space and National Security 9  
84-373 Emerging Technologies and International Law 9  
84-374 Technology, Weapons, and International Conflict 9  
84-380 US Grand Strategy 9  
84-383 Cyber Policy as National Policy 6  
84-386 The Privatization of Force 9  
84-387 Remote Systems and the Cyber Domain in Conflict 9  
84-388 Concepts of War and Cyber War 6  
84-389 Terrorism and Insurgency 9  
84-390 Social Media, Technology, and Conflict 9  
84-393 Legislative Decision Making; US Congress 9  
84-402 Judicial Politics and Behavior 9  
84-405 The Future of Warfare 9  
84-421 Advanced Topics in American Politics 9  
84-440 Collaborative Research in Political Science Var.

Additional Electives

19-452 EPP Projects II 12  
70-342 Managing Across Cultures 9  
70-365 International Trade and International Law 9  
70-430 International Management 9  
73-332 Political Economy 9  
76-318 Communicating in the Global Marketplace 9  
79-203 The Other Europe: The Habsburgs, Communism, & Central/Eastern Europe, 1740-1990 9  
79-205 20th Century Europe 9  
79-223 Mexico: From the Aztec Empire to the Drug War 9  
79-227 Modern Africa: The Slave Trade to the End of Apartheid 9  
79-229 The Origins of the Palestinian-Israeli Conflict, 1880-1948 9  
79-230 The Arab-Israeli Conflict and Peace Process since 1948 9  
79-257 Germany and the Second World War 9  
79-262 Modern China: From the Birth of Mao ... to Now 9  
79-264 Tibet and China: History and Propaganda 9  
79-265 Russian History: Game of Thrones 9  
79-266 Russian History and Revolutionary Socialism 9  
79-267 The Soviet Union in World War II: Military, Political, and Social History 9  
79-275 Introduction to Global Studies 9  
79-288 Bananas, Baseball, and Borders: Latin America and the United States 9  
79-301 History of Surveillance: From the Plantation to Data Capitalism 6  
79-313 "Unwanted": Refugees, Asylum Seekers, and Patterns of Global Migration 6  
79-314 How Do We Remember? The Politics and Cultures of Memory 9  
79-318 Sustainable Social Change: History and Practice 9  
79-320 Women, Politics, and Protest 9  
79-343 Education, Democracy, and Civil Rights 9  
79-377 Food, Culture, and Power: A History of Eating 9  
79-385 Out of Africa: The Making of the African Diaspora 9  
80-135 Introduction to Political Philosophy 9  
80-136 Social Structure, Public Policy & Ethics 9  
80-249 AI, Society, and Humanity 9  
80-321 Causation, Law, and Social Policy 9  
80-335 Social and Political Philosophy 9  
80-348 Health, Human Rights, and International Development 9  
80-447 Global Justice 9  
82-3xx or 4xx Advanced Level Modern Language Course 88-281 Topics in Law: 1st Amendment 9  
88-284 Topics of Law: The Bill of Rights 9  
88-411 Rise of the Asian Economies 9

**Japanese Studies Concentration**

**(81 units minimum)**

A BHA concentration in Japanese Studies promotes not just language proficiency but also an understanding of Japanese culture. Students who arrive at Carnegie Mellon with previous language study and/or who have high Advanced Placement, an International Baccalaureate, a Cambridge GCE Advanced level or internal placement exam scores will be able to begin taking courses in the concentration earlier in their undergraduate program. In all cases, progress in the concentration will be accelerated by study abroad, which is recommended for all students.

Japanese Studies Concentration

**Prerequisite**

84-110 Foundations of Political Economy 9  
or 73-102 Principles of Microeconomics 9  
or 73-103 Principles of Macroeconomics 9

**Core Courses (7 courses, 60 units)**

84-104 Decision Processes in American Political Institutions 9  
84-226 International Relations 9  
84-250 Writing for Political Science and Policy 9  
84-266 Research Design for Political Science 9  
84-267 Data Science for Political Science 9  
84-302 Methods for Statistics & Data Science 9  
84-275 Comparative Politics 9  
84-450 Policy Seminar 6  
84-490 Collaborative Research in Political Science Var.

**Electives (3 courses, 21 units minimum)**

International Relations and Political Science BHA students must take 21 units (three courses) from the elective lists below. Two courses (18 units) must be taken from the Carnegie Mellon Institute for Security and Technology (CMIST) and have an 84-number.

CMIST Electives

84-200 Security War Game Simulation 6  
84-252 Briefing in the Policy World 6  
84-303 International Human Rights 6  
84-304 In the News: Analysis of Current National Security Priorities 6  
84-306 Latin American Politics 9  
84-307 Economic and Political History of Contemporary China 9  
84-310 International Political Economy 9  
84-312 Terrorism in Sub-Saharan Africa 6  
84-315 Political Economy of International Migration 9  
84-316 Political Economy of Transatlantic Partnership 9  
84-317 Defense Resourcing: From Strategy to Execution 6  
84-318 Politics of Developing Nations 9  
84-319 Civil-Military Relations 9  
84-322 Nonviolent Conflict and Revolution 9  
84-323 War and Peace in the Contemporary Middle East 9  
84-324 The Future of Democracy 9  
84-325 Contemporary American Foreign Policy 9  
84-327 Repression and Control in Dictatorships 9  
84-328 Military Strategy and Doctrine 9  
84-329 Asian Strategies 6  
84-352 Representation and Voting Rights 9  
84-354 The American Experiment: Unravelling the US Electoral System 6  
84-355 Diplomacy and Statecraft 9  
84-365 The Politics of Fake News and Misinformation 9  
84-369 Decision Science for International Relations 9  
84-370 Nuclear Security & Arms Control 9  
84-372 Space and National Security 9  
84-373 Emerging Technologies and International Law 9  
84-374 Technology, Weapons, and International Conflict 9  
84-380 US Grand Strategy 9  
84-383 Cyber Policy as National Policy 6  
84-386 The Privatization of Force 9  
84-387 Remote Systems and the Cyber Domain in Conflict 9  
84-388 Concepts of War and Cyber War 6  
84-389 Terrorism and Insurgency 9  
84-390 Social Media, Technology, and Conflict 9  
84-393 Legislative Decision Making; US Congress 9  
84-402 Judicial Politics and Behavior 9  
84-405 The Future of Warfare 9  
84-421 Advanced Topics in American Politics 9  
84-440 Collaborative Research in Political Science Var.
**Prerequisites**

Low-intermediate level proficiency in Japanese. This is equivalent to the completion of three courses (two at the 100-level and one at the 200-level) or exemption based on Advanced Placement, International Baccalaureate, a Cambridge GCE Advanced level or Carnegie Mellon internal placement test scores.

**Core Courses in Japanese Studies (4 courses, 39 units)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>82-272</td>
<td>Intermediate Japanese II *</td>
<td>12</td>
</tr>
<tr>
<td>82-273</td>
<td>Introduction to Japanese Language and Culture</td>
<td>9</td>
</tr>
<tr>
<td>82-371</td>
<td>Changes in Japan 1: Food and Work Cultures</td>
<td>9</td>
</tr>
<tr>
<td>82-372</td>
<td>Advanced Japanese II -Changes in Japan II: Lifestyle/Religion and Gender</td>
<td>9</td>
</tr>
</tbody>
</table>

* Students who place out of 82-272 Intermediate Japanese II must take 12 units chosen from the Japanese Studies and Interdisciplinary Electives category below.

**Core Courses in Modern Languages (1 course, 9 units)**

Complete one course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>82-280</td>
<td>Bilingual &amp; Bicultural Experiences in the US</td>
<td>9</td>
</tr>
<tr>
<td>82-282</td>
<td>Interpreting Global Texts &amp; Cultures</td>
<td>9</td>
</tr>
<tr>
<td>82-283</td>
<td>Language Diversity &amp; Cultural Identity</td>
<td>9</td>
</tr>
<tr>
<td>82-284</td>
<td>Multicultural Pittsburgh: VR Storytelling</td>
<td>9</td>
</tr>
<tr>
<td>82-285</td>
<td>Podcasting: Language and Culture Through Storytelling</td>
<td>9</td>
</tr>
<tr>
<td>82-286</td>
<td>Cultural Complexities</td>
<td>9</td>
</tr>
<tr>
<td>82-383</td>
<td>Second Language Acquisition: Theories and Research</td>
<td>9</td>
</tr>
<tr>
<td>82-388</td>
<td>Topics in Second Language Acquisition</td>
<td>9</td>
</tr>
<tr>
<td>82-480</td>
<td>Translation Technologies</td>
<td>9</td>
</tr>
</tbody>
</table>

**Japanese Studies and Interdisciplinary Electives (4 courses, 33 units minimum)**

Complete three courses from Japanese Studies Electives and one course from Interdisciplinary Electives in consultation with the concentration advisor. With permission of the concentration advisor, students are encouraged to complete at least one Japanese history course that qualifies for Japanese Studies and Interdisciplinary Electives at the University of Pittsburgh, one in Japan when they study abroad or in a summer program at any other university.

**Japanese Studies Electives**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>82-273</td>
<td>Structure of the Japanese Language</td>
<td>9</td>
</tr>
<tr>
<td>82-274</td>
<td>Issues in Japanese Technology &amp; Society</td>
<td>9</td>
</tr>
<tr>
<td>82-473/474</td>
<td>Topics in Japanese Studies *</td>
<td>9</td>
</tr>
<tr>
<td>82-505</td>
<td>Modern Languages Undergraduate Internship</td>
<td>Var.</td>
</tr>
<tr>
<td>82-571/572</td>
<td>Special Topics in Japanese Studies *</td>
<td>Var.</td>
</tr>
</tbody>
</table>

* Students may repeat these courses with new topics.

**Interdisciplinary Electives**

This list is compiled from possibilities such as but not limited to the following. Students should consult SIO and concentration advisor for the most up to date interdisciplinary electives appropriate for the Japanese Studies curriculum. Courses may be suggested to the concentration advisor for approval as a substitute. Note that not all courses are offered each semester.

**English**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-239</td>
<td>Introduction to Film Studies</td>
<td>9</td>
</tr>
</tbody>
</table>

**History**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>79-261</td>
<td>The Last Emperors: Chinese History and Society, 1600-1900</td>
<td>9</td>
</tr>
<tr>
<td>79-262</td>
<td>Modern China: From the Birth of Mao ... to Now</td>
<td>9</td>
</tr>
<tr>
<td>79-275</td>
<td>Introduction to Global Studies</td>
<td>9</td>
</tr>
</tbody>
</table>

Institute for Politics and Strategy (Choose in consultation with the concentration advisor.)

**Modern Languages**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>82-270</td>
<td>Technology in Japanese Culture and Society</td>
<td>9</td>
</tr>
<tr>
<td>82-275</td>
<td>Queer Representations in Contemporary Literature and Culture from Japan</td>
<td>Var.</td>
</tr>
<tr>
<td>82-278</td>
<td>Japanese Film and Literature: The Art of Storytelling</td>
<td>9</td>
</tr>
<tr>
<td>82-279</td>
<td>Anime - Visual Interplay between Japan and the World</td>
<td>9</td>
</tr>
<tr>
<td>82-280</td>
<td>Bilingual &amp; Bicultural Experiences in the US</td>
<td>9</td>
</tr>
<tr>
<td>82-282</td>
<td>Interpreting Global Texts &amp; Cultures</td>
<td>9</td>
</tr>
<tr>
<td>82-283</td>
<td>Language Diversity &amp; Cultural Identity</td>
<td>9</td>
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<td>82-284</td>
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<td>82-285</td>
<td>Podcasting: Language and Culture Through Storytelling</td>
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<td>82-286</td>
<td>Cultural Complexities</td>
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<td>82-388</td>
<td>Topics in Second Language Acquisition</td>
<td>9</td>
</tr>
<tr>
<td>82-480</td>
<td>Translation Technologies</td>
<td>9</td>
</tr>
</tbody>
</table>

**Linguistics Concentration (Minimum units)**

The BHA concentration in Linguistics combines courses from the departments of English, Modern Languages, Philosophy and Psychology and the Language Technologies Institute. Linguistics is the study of human language, and it encompasses a broad spectrum of research questions, approaches and methodologies. Some linguists are concerned with the cognitive aspects of language learning, production and comprehension; some are concerned with language as a social and cultural phenomenon; others engage in the analysis of linguistic form and meaning, some from a functional and others from a formal perspective. There are also computational approaches to linguistics with both applied and theoretical goals.

**Introductory Course (1 course, 9 units)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-180</td>
<td>Nature of Language</td>
<td>9</td>
</tr>
</tbody>
</table>

**Linguistics Core (2 courses, 18 units)**

Take one course each in two of the following three areas.

**Sounds:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-282</td>
<td>Phonetics and Phonology I</td>
<td>9</td>
</tr>
</tbody>
</table>

**Structure:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-280</td>
<td>Linguistic Analysis</td>
<td>9</td>
</tr>
<tr>
<td>80-285</td>
<td>Natural Language Syntax</td>
<td>9</td>
</tr>
</tbody>
</table>

**Meaning:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-381</td>
<td>Meaning in Language</td>
<td>9</td>
</tr>
<tr>
<td>80-383</td>
<td>Language in Use</td>
<td>9</td>
</tr>
</tbody>
</table>

**Extended Core (3 courses, 27 units)**

Choose three courses from Extended Core or additional courses from the Linguistics Core above.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-283</td>
<td>It Matters How You Say It</td>
<td>9</td>
</tr>
<tr>
<td>80-284</td>
<td>Invented Languages</td>
<td>9</td>
</tr>
</tbody>
</table>
80-286 Words and Word Formation: Introduction to Morphology 9  
80-287 Language Variation and Change 9  
80-288 Intonation: Transcription and Analysis 9  
80-382 Phonetics and Phonology II 9  
80-384 Linguistics of Turkic Languages 9  
80-385 Linguistics of Germanic Languages 9  
80-388 Linguistic Typology: Diversity and Universals 9  
80-488 Acoustics of Human Speech: Theory, Data, and Analysis 9

**Elective Courses (3 courses, 27 units)**

Take three additional electives. These can be additional courses from the Core or Extended Core courses listed above, the electives list below, or any other course which must be approved by the concentration advisor as a linguistics elective. Listed below are the additional electives taught on a regular basis. Additional appropriate courses are offered irregularly or on a one-off basis. The concentration advisor will provide students with a list of possible electives each semester, and will assist students in selecting electives that are consistent with their goals and interests. A list of these courses must be filed in the BXA office.

**Philosophy:**
- 80-380 Philosophy of Language 9  
- 80-484 Language and Thought 9

**English:**
- 76-318 Communicating in the Global Marketplace 9  
- 76-325 Intertextuality 9  
- 76-385 Introduction to Discourse Analysis 9  
- 76-386 Language & Culture 9  
- 76-388 Coding for Humanists 9  
- 76-389 Rhetorical Grammar 9

**Modern Languages:**
- 82-239 Crazy Linguistically Rich Asian Languages 9  
- 82-305 French in its Social Contexts 9  
- 82-334 Structure of Chinese 9  
- 82-373 Structure of the Japanese Language 9  
- 82-383 Second Language Acquisition: Theories and Research 9  
- 82-585 Topics in Second Language Acquisition 9  
- 82-304 French & Francophone Sociolinguistics 9  
- 82-388 Topics in Second Language Acquisition 9

**Psychology:**
- 85-354 Infant Language Development 9  
- 85-421 Language and Thought 9

**Language Technologies Institute:**
- 11-411 Natural Language Processing 12  
- 11-492 Speech Processing 12  
- 11-422 Grammar Formalisms 12

**Statistics and Data Science:**
- 36-468 Special Topics: Text Analysis 9

**Literature & Culture Concentration**

(81 units minimum)

The BHA concentration in Literature & Culture teaches students how to read, interpret and write persuasively about novels, poems, plays and other imaginative works across a variety of genres and media forms. Along with teaching students the analytical skills and methodological tools to interpret these works, this major teaches the importance of understanding imaginative works within their cultural and historical contexts. In addition, the concentration is designed to train students in strong professional and academic skills like critical thinking, inductive reasoning and persuasive argumentation that are applicable to other fields of study and a variety of career paths.

**Prerequisite Course**

Choose one course:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-260</td>
<td>Introduction to Writing Fiction</td>
<td>9</td>
</tr>
<tr>
<td>76-261</td>
<td>Introduction to Writing Creative Nonfiction</td>
<td>9</td>
</tr>
<tr>
<td>76-265</td>
<td>Introduction to Writing Poetry</td>
<td>9</td>
</tr>
<tr>
<td>76-269</td>
<td>Introduction to Screenwriting</td>
<td>9</td>
</tr>
</tbody>
</table>

**Required Introductory Courses (2 courses, 18 units)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-245</td>
<td>Shakespeare: Tragedies &amp; Histories</td>
<td>9</td>
</tr>
<tr>
<td>76-254</td>
<td>Shakespeare: Tragedies &amp; Histories</td>
<td>9</td>
</tr>
<tr>
<td>76-274</td>
<td>Introduction to Critical Writing</td>
<td>9</td>
</tr>
</tbody>
</table>

**200-Level Literature & Culture Course (1 course, 9 units)**

Course options include but are not limited to the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-203</td>
<td>Literature &amp; Culture in the 18th Century</td>
<td>9</td>
</tr>
<tr>
<td>76-207</td>
<td>Special Topics in Literature &amp; Culture</td>
<td>9</td>
</tr>
<tr>
<td>76-210</td>
<td>Banned Books</td>
<td>9</td>
</tr>
<tr>
<td>76-217</td>
<td>Literature &amp; Culture of the 20th and 21st Century</td>
<td>9</td>
</tr>
<tr>
<td>76-221</td>
<td>Books You Should Have Read By Now</td>
<td>9</td>
</tr>
<tr>
<td>76-230</td>
<td>Literature &amp; Culture in the 19th Century</td>
<td>9</td>
</tr>
<tr>
<td>76-232</td>
<td>Introduction to Black Literature</td>
<td>9</td>
</tr>
<tr>
<td>76-233</td>
<td>Literature and Culture in the Renaissance</td>
<td>9</td>
</tr>
<tr>
<td>76-245</td>
<td>Shakespeare: Tragedies &amp; Histories</td>
<td>9</td>
</tr>
<tr>
<td>76-247</td>
<td>Shakespeare: Comedies and Romances</td>
<td>9</td>
</tr>
</tbody>
</table>

**300-Level Course (1 course, 9 units)**

Course options include but are not limited to the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-310</td>
<td>Advanced Studies in Film and Media</td>
<td>9</td>
</tr>
<tr>
<td>76-314</td>
<td>Data Stories</td>
<td>9</td>
</tr>
<tr>
<td>76-316</td>
<td>Topics in Literature: Watching HBO's The Watchmen</td>
<td>9</td>
</tr>
<tr>
<td>76-317</td>
<td>Contemporary American Fiction</td>
<td>9</td>
</tr>
<tr>
<td>76-329</td>
<td>Performing Race in Early Modernity</td>
<td>9</td>
</tr>
<tr>
<td>76-337</td>
<td>Intersectional Feminism</td>
<td>9</td>
</tr>
<tr>
<td>76-339</td>
<td>Topics in Film and Media</td>
<td>9</td>
</tr>
<tr>
<td>76-341</td>
<td>Race &amp; Gender in the Age of Jane Austen</td>
<td>9</td>
</tr>
<tr>
<td>76-342</td>
<td>Love: A Cultural History</td>
<td>9</td>
</tr>
<tr>
<td>76-343</td>
<td>Rise of the American Novel</td>
<td>9</td>
</tr>
<tr>
<td>76-350</td>
<td>Critical Theories about Literature</td>
<td>9</td>
</tr>
<tr>
<td>76-367</td>
<td>Fact Into Film: Translating History into Cinema</td>
<td>9</td>
</tr>
<tr>
<td>76-376</td>
<td>History of Critical Ideas (if not taken for the Theory Course requirement)</td>
<td>9</td>
</tr>
<tr>
<td>76-388</td>
<td>Coding for Humanists</td>
<td>9</td>
</tr>
</tbody>
</table>

**400-Level Course (1 course, 9 units)**

Course options include but are not limited to the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-407</td>
<td>Topics in Literary &amp; Cultural Studies</td>
<td>9</td>
</tr>
<tr>
<td>76-408</td>
<td>Culture and Globalization</td>
<td>9</td>
</tr>
<tr>
<td>76-410</td>
<td>The Long Eighteenth Century</td>
<td>9</td>
</tr>
<tr>
<td>76-423</td>
<td>Transnational Feminisms</td>
<td>9</td>
</tr>
<tr>
<td>76-429</td>
<td>Introduction to Digital Humanities</td>
<td>9</td>
</tr>
<tr>
<td>76-439</td>
<td>Seminar in Film and Media Studies</td>
<td>9</td>
</tr>
<tr>
<td>76-440</td>
<td>Postcolonial Theory: Diaspora and Transnationalism</td>
<td>9</td>
</tr>
<tr>
<td>76-446</td>
<td>Revenge Tragedy</td>
<td>9</td>
</tr>
<tr>
<td>76-448</td>
<td>Shakespeare on Film</td>
<td>9</td>
</tr>
<tr>
<td>76-452</td>
<td>Generations and Culture</td>
<td>9</td>
</tr>
<tr>
<td>76-467</td>
<td>Crime Fiction and Film</td>
<td>9</td>
</tr>
</tbody>
</table>

**Theory Course (1 course, 9 units)**

Course options include but are not limited to the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-337</td>
<td>Intersectional Feminism</td>
<td>9</td>
</tr>
<tr>
<td>76-350</td>
<td>Critical Theories about Literature</td>
<td>9</td>
</tr>
<tr>
<td>76-376</td>
<td>History of Critical Ideas (if not taken for the Theory Course requirement)</td>
<td>9</td>
</tr>
</tbody>
</table>
Rhetoric Course (1 course, 9 units)

Course options include but are not limited to the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>76-318</td>
<td>Communicating in the Global Marketplace</td>
<td>9</td>
</tr>
<tr>
<td>76-351</td>
<td>Rhetorical Invention</td>
<td>9</td>
</tr>
<tr>
<td>76-373</td>
<td>Argument</td>
<td>9</td>
</tr>
<tr>
<td>76-384</td>
<td>Race, Nation, and the Enemy</td>
<td>9</td>
</tr>
<tr>
<td>76-388</td>
<td>Coding for Humanists</td>
<td>9</td>
</tr>
<tr>
<td>76-389</td>
<td>Rhetorical Grammar</td>
<td>9</td>
</tr>
<tr>
<td>76-415</td>
<td>Mediated Power and Propaganda</td>
<td>9</td>
</tr>
<tr>
<td>76-418</td>
<td>Rhetoric and the Body</td>
<td>9</td>
</tr>
<tr>
<td>76-457</td>
<td>Rhetorical Invention</td>
<td>9</td>
</tr>
<tr>
<td>76-475</td>
<td>Law, Performance, and Identity</td>
<td>9</td>
</tr>
<tr>
<td>76-476</td>
<td>Rhetoric of Science</td>
<td>9</td>
</tr>
<tr>
<td>76-484</td>
<td>Discourse Analysis</td>
<td>9</td>
</tr>
<tr>
<td>76-491</td>
<td>Rhetorical Analysis</td>
<td>9</td>
</tr>
<tr>
<td>76-492</td>
<td>Rhetoric of Public Policy</td>
<td>9</td>
</tr>
<tr>
<td>76-496</td>
<td>Research Methods in Rhetoric &amp; Writing Studies</td>
<td>9</td>
</tr>
</tbody>
</table>

English Elective Courses (2 courses, 18 units)

Complete two additional courses from the English Department’s offerings. One course must be at the 300-level, and one must be at the 400-level. Electives may include any courses offered by the English Department from any specialization area, with the exception of creative writing workshops.

Logic & Computation Concentration

(81 units minimum)

Students in the program take a common core of courses in logic, methodology, and computer science, together with an associated seminar in their senior year. The individual focus is achieved by selecting a sequence of four advanced and closely related courses. It is in this area of focus (or specialization) that students write their senior thesis under the supervision of a faculty member.

The resulting education in logic, analytic philosophy, mathematics, statistics and computer science enables students to pursue professional careers or graduate study. The analytic and communication skills developed in the major support a wide range of career choices, including those among the fields of technology, business and law. Fields of graduate study for which students are well prepared include, for example, computer science, cognitive science, philosophy, logic and linguistics.

Prerequisites

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-211</td>
<td>Logic and Mathematical Inquiry (Recommended prior to 21-127)</td>
<td>9</td>
</tr>
<tr>
<td>15-112</td>
<td>Fundamentals of Programming and Computer Science</td>
<td>12</td>
</tr>
<tr>
<td>21-127</td>
<td>Concepts of Mathematics</td>
<td>12</td>
</tr>
</tbody>
</table>

Logic & Computation Core (5 courses, 51 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>15-122</td>
<td>Principles of Imperative Computation</td>
<td>12</td>
</tr>
<tr>
<td>15-150</td>
<td>Principles of Functional Programming</td>
<td>12</td>
</tr>
<tr>
<td>80-150</td>
<td>Nature of Reason</td>
<td>9</td>
</tr>
<tr>
<td>80-310</td>
<td>Formal Logic</td>
<td>9</td>
</tr>
<tr>
<td>80-311</td>
<td>Undecidability and Incompleteness</td>
<td>9</td>
</tr>
</tbody>
</table>

Logic & Computation Electives (3-4 courses, 30 units minimum)

Bearing in mind prerequisites, Logic & Computation students must complete at least three advanced courses in areas that use logical and computational tools, such as philosophy, computer science, linguistics, mathematical logic, psychology or statistics. The sequence of courses, mostly at the 300-level, must be selected in consultation with the concentration advisor.

Philosophy Concentration

(81 units minimum)

The BHA Concentration in in Philosophy provides students with a broad humanities education and sharpens their analytical skills. We encourage, but do not require, students to choose a thematic concentration through their electives. Sample curricula emphasizing Pre-Law, Metaphysics and Epistemology, Ethics and Social Philosophy, and Philosophy of Mind are suggested below. However, alternative emphases can be proposed and approved by the concentration advisor.

In any of the areas listed, substitutions of courses that cohere with a student’s interest may be allowed with approval from the concentration advisor.

Introduction to Philosophy (1 course, 9 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-100</td>
<td>Introduction to Philosophy</td>
<td>9</td>
</tr>
</tbody>
</table>

Area 1: Values and Normative Theory (1 course, 9 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-130</td>
<td>Introduction to Ethics</td>
<td>9</td>
</tr>
<tr>
<td>80-234</td>
<td>Race, Gender, and Justice</td>
<td>9</td>
</tr>
<tr>
<td>80-135</td>
<td>Introduction to Political Philosophy</td>
<td>9</td>
</tr>
<tr>
<td>80-136</td>
<td>Social Structure, Public Policy &amp; Ethics</td>
<td>9</td>
</tr>
<tr>
<td>80-244</td>
<td>Environmental Ethics</td>
<td>9</td>
</tr>
<tr>
<td>80-245</td>
<td>Medical Ethics</td>
<td>9</td>
</tr>
<tr>
<td>80-246</td>
<td>Moral Psychology</td>
<td>9</td>
</tr>
<tr>
<td>80-249</td>
<td>AI, Society, and Humanity</td>
<td>9</td>
</tr>
<tr>
<td>80-330</td>
<td>Ethical Theory</td>
<td>9</td>
</tr>
<tr>
<td>80-335</td>
<td>Social and Political Philosophy</td>
<td>9</td>
</tr>
<tr>
<td>80-336</td>
<td>Philosophy of Law</td>
<td>9</td>
</tr>
<tr>
<td>80-348</td>
<td>Health, Human Rights, and International Development</td>
<td>9</td>
</tr>
<tr>
<td>80-447</td>
<td>Global Justice</td>
<td>9</td>
</tr>
</tbody>
</table>

Area 2: Philosophy of Mind/Language/Metaphysics (1 course, 9 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>80-180</td>
<td>Nature of Language</td>
<td>9</td>
</tr>
<tr>
<td>80-270</td>
<td>Problems of Mind and Body: Meaning and Doing</td>
<td>9</td>
</tr>
<tr>
<td>80-271</td>
<td>Mind and Body: The Objective and the Subjective</td>
<td>9</td>
</tr>
<tr>
<td>80-276</td>
<td>Philosophy of Religion</td>
<td>9</td>
</tr>
<tr>
<td>80-280</td>
<td>Linguistic Analysis</td>
<td>9</td>
</tr>
<tr>
<td>80-282</td>
<td>Phonetics and Phonology I</td>
<td>9</td>
</tr>
<tr>
<td>80-283</td>
<td>It Matters How You Say It</td>
<td>9</td>
</tr>
<tr>
<td>80-284</td>
<td>Invented Languages</td>
<td>9</td>
</tr>
<tr>
<td>80-285</td>
<td>Natural Language Syntax</td>
<td>9</td>
</tr>
<tr>
<td>80-286</td>
<td>Words and Word Formation: Introduction to Morphology</td>
<td>9</td>
</tr>
<tr>
<td>80-287</td>
<td>Language Variation and Change</td>
<td>9</td>
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<tr>
<td>80-288</td>
<td>Intonation: Transcription and Analysis</td>
<td>9</td>
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<tr>
<td>80-380</td>
<td>Philosophy of Language</td>
<td>9</td>
</tr>
<tr>
<td>80-381</td>
<td>Meaning in Language</td>
<td>9</td>
</tr>
<tr>
<td>80-382</td>
<td>Phonetics and Phonology II</td>
<td>9</td>
</tr>
<tr>
<td>80-383</td>
<td>Language in Use</td>
<td>9</td>
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<tr>
<td>80-384</td>
<td>Linguistics of Turkic Languages</td>
<td>9</td>
</tr>
<tr>
<td>80-385</td>
<td>Linguistics of Germanic Languages</td>
<td>9</td>
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<tr>
<td>80-388</td>
<td>Linguistic Typology: Diversity and Universals</td>
<td>9</td>
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<tr>
<td>80-580</td>
<td>Seminar on the Philosophy of Language</td>
<td>9</td>
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Area 3: Logic/Philosophy of Mathematics (1 course, 9 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>80-210</td>
<td>Logic and Proofs</td>
<td>9</td>
</tr>
<tr>
<td>80-211</td>
<td>Logic and Mathematical Inquiry</td>
<td>9</td>
</tr>
<tr>
<td>80-212</td>
<td>Arguments and Logical Analysis</td>
<td>9</td>
</tr>
<tr>
<td>80-310</td>
<td>Formal Logic</td>
<td>9</td>
</tr>
<tr>
<td>80-311</td>
<td>Undecidability and Incompleteness</td>
<td>9</td>
</tr>
<tr>
<td>80-312</td>
<td>Mathematical Revolutions</td>
<td>9</td>
</tr>
<tr>
<td>80-315</td>
<td>Modal Logic</td>
<td>9</td>
</tr>
<tr>
<td>80-411</td>
<td>Proof Theory</td>
<td>9</td>
</tr>
<tr>
<td>80-413</td>
<td>Category Theory</td>
<td>9</td>
</tr>
<tr>
<td>80-419</td>
<td>Interactive Theorem Proving</td>
<td>9</td>
</tr>
<tr>
<td>80-514</td>
<td>Categorical Logic</td>
<td>9</td>
</tr>
<tr>
<td>80-518</td>
<td>Seminar on Topics in Logic</td>
<td>9</td>
</tr>
</tbody>
</table>

Area 4: Epistemology/Methodology (1 course, 9 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>80-150</td>
<td>Nature of Reason</td>
<td>9</td>
</tr>
<tr>
<td>80-201</td>
<td>Knowledge and Justified Belief</td>
<td>9</td>
</tr>
<tr>
<td>80-208</td>
<td>Critical Thinking</td>
<td>9</td>
</tr>
<tr>
<td>80-220</td>
<td>Philosophy of Science</td>
<td>9</td>
</tr>
<tr>
<td>80-221</td>
<td>Philosophy of Social Science</td>
<td>9</td>
</tr>
<tr>
<td>80-226</td>
<td>The Nature of Scientific Revolutions</td>
<td>9</td>
</tr>
<tr>
<td>80-305</td>
<td>Game Theory</td>
<td>9</td>
</tr>
<tr>
<td>80-306</td>
<td>Decision Theory</td>
<td>9</td>
</tr>
<tr>
<td>80-324</td>
<td>Philosophy of Economics</td>
<td>9</td>
</tr>
</tbody>
</table>
Empirical Core (3 courses, 27 units)

The Empirical Core focuses on key methods for collecting and analyzing data that are needed to make informed decisions. Students learn to use interviews, surveys, experiments and econometric methods to enhance their ability to test existing, and design new policies. Students will create statistical models to address questions asked in conceptual, computational and data-driven investigations.

- 36-202 Methods for Statistics & Data Science
- 88-251 Empirical Research Methods
- 88-252 Cause and Effect
- or 88-275 Bubbles: Data Science for Human Minds

Senior Project (1 course, 12 units)

The required Senior Project course gives students hands-on experience in a policy-related area. Students work in teams to apply the research and analytical methods learned in their other courses to a real-world problem.

- 88-451/452 Policy Analysis Senior Project

Politics & Public Policy Concentration (81 units minimum)

Rooted in the discipline of political science, the concentration in Politics and Public Policy investigates US public policy issues and other matters of domestic and international politics while providing students hands-on and practical learning experiences. Students pursuing the Politics and Public Policy minor must participate in the Carnegie Mellon University Washington Semester Program (CMU/WSP) (https://www.cmu.edu/ips/washington-dc-semester-program/) for one semester during their undergraduate years.

The CMU/WSP, sponsored by the Carnegie Mellon Institute for Security and Technology (CMIST), is a semester-long program in which students live intern, and take CMU classes in Washington, DC. Undergraduates from any course of study at the university may participate in the program. Students earn 48 units for the Carnegie Mellon University Washington Semester Program, internning about twenty-four hours per week in any sector or field of interest within Washington, DC, while taking classes taught by Carnegie Mellon faculty.

From embassies to nongovernmental organizations, think tanks to advocacy organizations, government agencies to congressional offices, and consulting firms to media outlets, Washington, DC, is the center of US political, international, and public policy activities. Students in the program come into direct contact with policymakers, Congressmen, think tank leaders, and business leaders, and through hands-on experience learn about the most pressing policy issues of the day.

Through this experiential learning program, CMU/WSP participants develop professional and networking skills, explore how coursework connects to the real world, learn to give and receive constructive feedback in the workplace and classroom, and intentionally reflect on their learning and growth. Every CMU/WSP student is paired with a Washington, DC-based alumni mentor to share career advice and tips about life in DC. CMIST also sponsors events and policy-oriented opportunities in Washington for students participating in the program to further enrich their experience and enhance their understanding of how Washington functions as a hub of international and domestic policy decision making.

Foundation Courses (2 courses, 18 units)

Students must complete the following course:

- 84-104 Decision Processes in American Political Institutions

Students must complete one of the following courses:

- 84-275 Comparative Politics
- or 84-226 International Relations

Economics Course (1 course, 9 units)

Students must complete one of the following courses:

- 84-110 Foundations of Political Economy
- or 73-102 Principles of Microeconomics
- or 73-103 Principles of Macroeconomics
CMU/WSP Core Seminars (3 courses, 24 units)
Students must take the following courses while participating in the CMU/WSP:

84-360  CMU/WSP: Internship Seminar  12
84-450  Policy Seminar  6
84-451  Policy Seminar II  6

CMU/WSP Elective Seminars (3 course, 24 units minimum)
Students must take 24 units from the below list of elective seminars offered in the CMU/WSP. Offerings vary by semester:

84-330  The Shading of Democracy: The Influence of Race on American Politics  6
84-331  Money, Media, and the Power of Data in Decisionmaking  6
84-333  Power and Levers for Change in Washington, DC  12
84-334  The History and Practice of Economic Statecraft  6
84-335  US China Relations  6
84-336  Implementing Public Policy: From Good Idea To Reality  12
84-337  Biomedical Science Research, Policy, and Governance  6
84-339  Seminar in Public Policy Research  12
84-348  Advocacy, Policy and Practice  6

American Politics Elective (1 course, 6 units minimum)
Students must take one course from the below list of electives taught in Pittsburgh.

84-252  Briefing in the Policy World  6
84-304  In the News: Analysis of Current National Security Priorities  6
84-325  Contemporary American Foreign Policy  9
84-352  Representation and Voting Rights  9
84-354  The American Experiment: Unravelling the US Electoral System  6
84-362  Diplomacy and Statecraft  9
84-380  US Grand Strategy  9
84-393  Legislative Decision Making: US Congress  9
84-402  Judicial Politics and Behavior  9
84-421  Advanced Topics in American Politics  9

Professional Writing Concentration
(84 units minimum)
Professional Writing combines liberal and professional education with a strong foundation in rhetorical studies. The concentration in Professional Writing has a strong career orientation and is specifically designed to prepare students for successful careers as writers and communications specialists in a range of fields: publishing, government, journalism, the non-profit sector, education, public and media relations, corporate communications, advocacy writing and the arts. The concentration is designed to develop articulate and reflective communications professionals with both the skills needed to enter and negotiate current work contexts (including writing for the web and other digital media) and the analytic and problem-solving skills needed to understand and keep pace with cultural and technological change.

Prerequisite English Elective

Students with a concentration in Professional Writing must complete one prerequisite course from the English Department’s offerings, which focuses on the relationships between texts and their cultural and historical contexts. The course must be at or above the 200 level. 76-270 Writing for the Professions, and 76-271 Introduction to Professional and Technical Writing may not count as English electives. Appropriate courses are advertised every semester in the English department’s “What Counts for What” publication.

Foundation Courses (5 courses, 39 units)

76-26x  Introductory Genre Writing Course (Nonfiction, Fiction, Poetry or Screenwriting)  9
76-271  Introduction to Professional and Technical Writing  9

76-300  Professional Seminar  3
76-373  Argument  9
76-390  Style  9

Rhetoric/Language Studies Course (1 course, 9 units)
Students with a concentration in Professional Writing complete one course from designated Rhetoric courses offered and advertised each semester by the English Department. Rhetoric courses focus on understanding the role of language and language practices in both personal and professional contexts. Courses emphasize the relationships between texts and their contexts and pay particular attention to textual features, meaning, processes of reading and writing, and the ways in which language practices vary over time and across situations and cultures. The courses also equip students with explicit techniques for analyzing, understanding and exploring language practices. The Rhetoric/Language Studies courses may also be taken as part of the concentration requirements for three additional, Advanced Writing/Rhetoric courses and include but are not limited to the following list.

76-325  Intertextuality  9
76-351  Rhetorical Invention  9
76-360  Literary Journalism Workshop  9
76-384  Race, Nation, and the Enemy  9
76-388  Coding for Humanists  9
76-389  Rhetorical Grammar  9
76-395  Science Writing  9
76-415  Mediated Power and Propaganda  9
76-474  Software Documentation  9
76-476  Rhetoric of Science  9
76-494  Healthcare Communications  9

Advanced Writing/Rhetoric Courses (3 courses, 27 units minimum)
Students with a concentration in Professional Writing complete three Advanced Writing/Rhetoric courses at the 300- or 400-level at a minimum of 27 units, as some courses are only six units, while others are variable units. Options for these courses include all of the Rhetoric/Language Studies courses listed above plus the writing-focused courses listed below. Additional courses that fulfill these requirements are advertised on a semester-by-semester basis. For help in choosing which of the possible options are most appropriate for various professional goals – journalism, writing for new media, editing and publishing, public relations/corporate communications, or science and technical writing – consult your English Department advisor. All students with a concentration in PW, regardless of their career focus, are encouraged to take 76-391 Document & Information Design and 76-487 Information Architecture & Content Strategy (formerly titled Web Design) to extend their skills in writing for print to include information design for digital media. Both courses focus on the role of the writer in these specializations and provide lab instruction in the relevant software and related computer skills.

Courses include but are not limited to:

76-301  Internship  Var.
76-302  Communication Support Tutoring Practicum  6
76-314  Data Stories  9
76-351  Rhetorical Invention  9
76-354  Watchdog Journalism  9
76-360  Literary Journalism Workshop  9
76-372  News Writing  9
76-380  Methods in Humanities Analytics  9
76-388  Coding for Humanists  9
76-389  Rhetorical Grammar  9
76-391  Document & Information Design  9
76-395  Science Writing  9
76-415  Mediated Power and Propaganda  9
76-418  Rhetoric and the Body  9
76-425  Rhetoric, Science, and the Public Sphere  9
76-457  Rhetorical Invention  9
76-464  Creative Nonfiction Workshop  9
76-474  Software Documentation  9
76-475  Law, Performance, and Identity  9
76-476  Rhetoric of Science  9
76-481  Introduction to Multimedia Design  12
76-483  Research Methods in Technical & Professional Communication  9
76-484  Discourse Analysis  9
76-487 Web Design - Information Architecture & Content Strategy (formerly titled Web Design) 12
76-492 Rhetoric of Public Policy 9
76-494 Healthcare Communications 9
76-496 Research Methods in Rhetoric & Writing Studies (instructor permission required) 9

**English Elective (1 course, 9 units minimum)**

Students with a concentration in Professional Writing complete one additional course from the English Department’s offerings. This course should be one that focuses on the relationships between texts and their cultural and historical contexts. Courses in literature, cultural studies, rhetoric, and media that meet this requirement are advertised on a semester-by-semester basis. The English Elective may be any course offered by the Department with the exception of 76-270 Writing for the Professions, which is designed for non-majors and overlap with 76-271 Introduction to Professional and Technical Writing.

**Psychology Concentration**  
(81 units minimum)

Psychology is a science that embraces both biological and social sciences. It is a science concerned with establishing principles and laws regarding the ways in which people think, feel, and behave through the scientific study of human behavior. Students with a concentration in Psychology are expected not only to learn about findings already established by psychologists, but also to become proficient in the investigation and analysis of behavior. This includes observing behavior, formulating hypotheses, designing experiments to test these hypotheses, running experiments, performing statistical analyses and writing reports.

**Breadth Courses (4 courses, 36 units)**

To gain familiarity with the breadth of the field of Psychology, students take 85-102 Introduction to Psychology and three survey courses.

**Required Intro Course:**
85-102 Introduction to Psychology 9

**Survey Courses:**
85-104 Psychopathology 9  
85-211 Cognitive Psychology 9  
or 85-213 Human Information Processing and Artificial Intelligence 9  
85-219 Foundations of Brain and Behavior 9  
85-221 Principles of Child Development 9  
85-241 Social Psychology 9  
85-251 Personality 9

**Research Methods and Statistics (2 courses, 18 units)**

Students complete one course in Research Methods (9 units). The corresponding survey course is a prerequisite for this course.

85-310 Research Methods in Cognitive Psychology 9  
85-314 Cognitive Neuroscience Research Methods 9  
85-320 Research Methods in Developmental Psychology 9  
85-330 Analytic Research Methods 9  
85-340 Research Methods in Social Psychology 9  

The following Statistics course is a prerequisite for all the Research Methods courses. This Statistics course counts toward the Psychology concentration.

36-309 Experimental Design for Behavioral & Social Sciences -Fall 9  
or 85-309 Statistical Concepts and Methods for Behavioral and Social Science 9

**Advanced Courses (3 courses, 27 units)**

Complete any three advanced courses or seminars in Psychology numbered higher than 85-349. (excepting 85-480, 85-482, 85-484, 85-506, 85-507, 85-508).

**Russian Studies Concentration**  
(87 units minimum)

A BHA concentration in Russian Studies promotes not just language proficiency but also an understanding of Russian culture. Students who arrive at Carnegie Mellon with previous language study and/or who have high Advanced Placement, an International Baccalaureate, a Cambridge GCE Advanced level or internal placement exam scores will be able to begin taking courses in the concentration earlier in their undergraduate program.

In all cases, progress in the concentration will be accelerated by study abroad, which is recommended for all students.

**Prerequisites**

Intermediate level proficiency in Russian. This is equivalent to the completion of three courses (two at the 100-level and one at the 200-level) or exemption based on Advanced Placement, International Baccalaureate, Cambridge GCE Advanced level or Carnegie Mellon internal placement test scores.

**Core Courses in Russian Studies (3 courses, 33 units)**

82-292 Intermediate Russian II 12  
82-294 19th Century Russian Masterpieces 9  
or 82-295 20th Century Russian Masterpieces 9

79-265 Russian History: Game of Thrones 9  
or 79-266 Russian History and Revolutionary Socialism 9

**Core Courses in Modern Languages (1 course, 9 units)**

Complete one course.

82-280 Bilingual & Bicultural Experiences in the US 9  
82-282 Interpreting Global Texts & Cultures 9  
82-283 Language Diversity & Cultural Identity 9  
82-284 Multicultural Pittsburgh: VR Storytelling 9  
82-285 Podcasting: Language and Culture Through Storytelling 9  
82-286 Cultural Complexities 9  
82-383 Second Language Acquisition: Theories and Research 9  
82-388 Topics in Second Language Acquisition 9  
82-480 Translation Technologies 9  

Note: In consultation with the concentration advisor, students may substitute a Modern Languages course elective with one related to language analysis, language learning, or acquisition of language and culture from the listings in Russian Studies or from another department. Examples: 80-180 Nature of Language, 85-411 Language and Thought. In addition, students may choose to take 82-580 Senior Seminar in Modern Languages (9 units). The selected course may not double count in the Electives category.

**Russian Studies and Interdisciplinary Electives (5 courses, 45 units minimum)**

Complete two courses from Russian Studies Electives or one course from Interdisciplinary Electives in consultation with the concentration advisor.

**Russian Studies Electives:**

82-293 Russian Cinema: From the Bolshevik Revolution to Putin's Russia 9  
82-297 Russian and Soviet Science Fiction 9  
82-390 Soviet Futures: Revolutionary Design 9  
82-391 Advanced Russian I - Berlin, Paris, New York, Harbin 9  
82-392 Advanced Russian II: Great Short Works 9  
82-394 Russian for Heritage Speakers: Babushka's Russia & Beyond 9  
82-397 Radicals, Heretics, Hackers: Russian Outlaws in History, Literature, and Film 9  
82-599 Russian Studies Thesis 9  

* Students may repeat these courses with new topics.

**Interdisciplinary Electives:**

This list is compiled from possibilities such as but not limited to the following. Students should consult SIO and the concentration advisor for approval as a substitute. Note that not all courses are offered each semester.

**English**

76-239 Introduction to Film Studies 9  
76-249 History 9  
79-205 20th Century Europe 9  
79-267 The Soviet Union in World War II: Military, Political, and Social History 9  
79-322 Stalin and the Great Terror 9
Institute for Politics and Strategy (Choose in consultation with the concentration advisor)
84-380  US Grand Strategy  9
84-405  The Future of Warfare  9

Modern Languages
82-208  Eastern Europe: Society and Culture  9
82-280  Bilingual & Bicultural Experiences in the US  9
82-282  Interpreting Global Texts & Cultures  9
82-283  Language Diversity & Cultural Identity  9
82-284  Multicultural Pittsburgh: VR Storytelling  9
82-285  Podcasting: Language and Culture Through Storytelling  9
82-286  Cultural Complexities  9
82-383  Second Language Acquisition: Theories and Research  9
82-388  Topics in Second Language Acquisition  9
82-480  Translation Technologies  9

Philosophy
80-180  Nature of Language  9
80-280  Linguistic Analysis  9
80-380  Philosophy of Language  9

Psychology
85-375  Crosscultural Psychology  9
85-421  Language and Thought  9

* Students may repeat these courses with new topics.

Social & Political History Concentration
(B4 units minimum)
The BHA concentration in Social & Political History focuses on new ways to understand the past and new ways to use what we know, as well as on connections between past and present and on how historical knowledge facilitates understanding of social, cultural and policy change. The History concentration emphasizes empirical methods and conceptual analysis, as well as specific research skills relevant to many types of jobs and further professional training. The History concentration combines a structured sequence of courses, training in research methods, theoretical concepts, and analytical writing skills, plus a considerable array of electives.

The BHA concentration in Social & Political History emphasizes broad-based, cumulative knowledge and interpretive skills in the study of the past. Offerings at the 200- and 300-level are designed to allow maximum flexibility in meeting requirements and maximum choice in focusing on particular themes, places, or eras. Upper-level courses aim to give students majoring in History more time together in smaller classes and more experience working with primary and secondary sources. The senior capstone seminar, Historical Research Seminar, provides training and experience in conducting original research and in interpretive, analytical writing—skills that prepare graduates for professional careers as well as for graduate or law school.

Required History Courses (2 courses, 21 units)
Students must earn a final grade of "C" or better for these courses to count toward the concentration.
79-200  Introduction to Historical Research & Writing - Sophomore or Junior year  9
79-420  Historical Research Seminar -Fall, Senior year  12

Required Survey Courses (2 courses, 18 units)
79-160  Introduction to the History of Science  9
79-202  Flesh and Spirit: Early Modern Europe, 1400-1750  9
79-203  The Other Europe: The Habsburgs, Communism, & Central/Eastern Europe, 1740-1990  9
79-204  American Environmental History  9
79-205  20th Century Europe  9
79-206  Crime and Punishment in Early Modern Europe  9
79-211  Modern Southeast Asia: Colonialism, Capitalism, and Cultural Exchange  9
79-212  Jim Crow America  9
79-223  Mexico: From the Aztec Empire to the Drug War  9
79-225  West African History in Film  9
79-226  African History: Earliest Times to 1780  9
79-227  Modern Africa: The Slave Trade to the End of Apartheid  9
79-229  The Origins of the Palestinian-Israeli Conflict, 1880-1949  9
79-230  The Arab-Israeli Conflict and Peace Process 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
79-244  Women in American History  9
79-245  Capitalism and Individualism in American Culture  9
79-248  U.S. Constitution & the Presidency  9
79-249  20th Century U.S. History  9
79-250  Voting Rights: An Introduction  9
79-260  Nazi Germany  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: Game of Thrones  9
79-266  Russian History and Revolutionary Socialism  9
79-269  Russian History: From Socialism to Capitalism  9
79-272  Coexistence and Conflict: Muslims, Christians and Jews in Spain and Portugal  9
79-282  Europe and the World Since 1800  9
79-288  Bananas, Baseball, and Borders: Latin America and the United States  9
79-320  Women, Politics, and Protest  9

Social & Political History Elective Courses (5 courses, 45 units minimum)
A minimum of 45 additional History units must be approved with the History advisor. Any History courses not fulfilling another major requirement may be chosen as an elective. Any History (79-xxx) class can count as an SPH elective except for 79-198, 79-200, 79-400, 79-420, 79-449, 79-491. See the History Department website (www.cmu.edu/dietrich/history) or contact the History advisor for the most current elective offerings.

Students may satisfy the elective requirements in SPH with up to 27 units of the following courses offered by other departments in Dietrich College:
73-476  American Economic History  9
76-230  Literature & Culture in the 19th Century  9
76-239  Introduction to Film Studies  9
76-295  Russian Cinema: From the Bolshevik Revolution to Putin's Russia  9
76-449  Race and Media  9
80-135  Introduction to Political Philosophy  9
80-226  The Nature of Scientific Revolutions  9
80-335  Social and Political Philosophy  9
82-208  Eastern Europe: Society and Culture  9
82-245  New Directions in Hispanic Studies  9
82-247  US Latinos Literature  9
82-293  Russian Cinema: From the Bolshevik Revolution to Putin's Russia  9
82-327  The Emergence of the German Speaking World  9
82-420  The Crucible of Modernity-Vienna 1900  9
82-427  Nazi and Resistance Culture  9
84-275  Comparative Politics  9
84-322  Nonviolent Conflict and Revolution  9
84-324  The Future of Democracy  9
84-325  Contemporary American Foreign Policy  9
84-362  Diplomacy and Statecraft  9
84-380  US Grand Strategy  9
84-386  The Privatization of Force  9
84-389  Terrorism and Insurgency  9
85-380  In Search of Mind: The History of Psychology  9
88-281  Topics in Law: 1st Amendment  9
88-284  Topics of Law: The Bill of Rights  9

Statistics Concentration
(81 units minimum)
In the BHA concentration in Statistics, students develop and master a wide array of skills in computing, mathematics, statistical theory, and the
interpretation and display of complex data. In addition, students with a BHA concentration in Statistics gain experience in applying statistical tools to real problems in other fields and learn the nuances of interdisciplinary collaboration.

**Prerequisites**
These courses are not counted as part of your DC Concentration. They may be used to satisfy general education or free elective requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>21-120</td>
<td>Differential and Integral Calculus</td>
<td>10</td>
</tr>
<tr>
<td>21-256</td>
<td>Multivariate Analysis</td>
<td>9</td>
</tr>
<tr>
<td>or 21-259</td>
<td>Calculus in Three Dimensions</td>
<td></td>
</tr>
<tr>
<td>21-240</td>
<td>Matrix Algebra with Applications</td>
<td>10</td>
</tr>
<tr>
<td>or 21-241</td>
<td>Matrices and Linear Transformations</td>
<td></td>
</tr>
<tr>
<td>or 21-242</td>
<td>Matrix Theory</td>
<td></td>
</tr>
<tr>
<td>15-110</td>
<td>Principles of Computing</td>
<td>10</td>
</tr>
<tr>
<td>or 15-112</td>
<td>Fundamentals of Programming and Computer Science</td>
<td></td>
</tr>
</tbody>
</table>

Note: 21-240, 21-241, 21-242 must be completed before taking 36-401 Modern Regression. 21-241 and 21-242 are intended only for students with a very strong mathematical background.

**Statistics Core (6 courses, 54 units)**

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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>36-202</td>
<td>Methods for Statistics &amp; Data Science</td>
<td>9</td>
</tr>
<tr>
<td>or 36-290</td>
<td>Introduction to Statistical Research Methodology</td>
<td></td>
</tr>
<tr>
<td>36-235</td>
<td>Probability and Statistical Inference I -</td>
<td>9</td>
</tr>
<tr>
<td>or 36-225</td>
<td>(recommended)</td>
<td></td>
</tr>
<tr>
<td>36-236</td>
<td>Probability and Statistical Inference II -</td>
<td>9</td>
</tr>
<tr>
<td>or 36-226</td>
<td>(recommended)</td>
<td></td>
</tr>
<tr>
<td>36-350</td>
<td>Statistical Computing</td>
<td>9</td>
</tr>
<tr>
<td>36-401</td>
<td>Modern Regression</td>
<td>9</td>
</tr>
<tr>
<td>36-402</td>
<td>Advanced Methods for Data Analysis</td>
<td>9</td>
</tr>
</tbody>
</table>

**Special Topics and Electives (3 courses, 27 units)**

Students must take a total of three courses from Special Topics (numbered 36-46x) and Statistics Electives listed below. Students will consult with the concentration advisor to select the Special Topics and Electives courses that best fit for their areas of interest.

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Units</th>
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<tbody>
<tr>
<td>36-303</td>
<td>Sampling, Survey and Society</td>
<td>9</td>
</tr>
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<td>36-311</td>
<td>Statistical Analysis of Networks</td>
<td>9</td>
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<td>9</td>
</tr>
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<td>36-318</td>
<td>Introduction to Causal Inference</td>
<td>9</td>
</tr>
<tr>
<td>36-46x</td>
<td>Special Topics (topics and offerings vary)</td>
<td>9</td>
</tr>
<tr>
<td>36-490</td>
<td>Undergraduate Research</td>
<td>9</td>
</tr>
<tr>
<td>36-493</td>
<td>Sports Analytics Capstone</td>
<td>9</td>
</tr>
<tr>
<td>36-497</td>
<td>Corporate Capstone Project</td>
<td>9</td>
</tr>
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</table>

**Statistics & Machine Learning Concentration**
(87 units minimum)

In the BHA concentration in Statistics & Machine Learning, develop and master a wide array of skills in computing, mathematics, statistical theory, and the interpretation and display of complex data. In addition, students with a BHA concentration in Statistics & Machine Learning gain experience in applying statistical tools to real problems in other fields and learn the nuances of interdisciplinary collaboration. This program is geared towards students interested in statistical computation, data science or “Big Data” problems.

**Prerequisites**
These five courses are not counted as part of your DC Concentration. They may be used to satisfy general education or free elective requirements.

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**Statistics Core (5 courses, 45 units)**

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<td>36-235</td>
<td>Probability and Statistical Inference I -</td>
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<td></td>
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<td>Statistical Computing</td>
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<td>Modern Regression</td>
<td>9</td>
</tr>
<tr>
<td>36-402</td>
<td>Advanced Methods for Data Analysis</td>
<td>9</td>
</tr>
</tbody>
</table>

**Data Analysis Electives (1 course, 9 units)**

Students must take one course from the Statistics Electives listed below. Students will consult with the concentration advisor to select the Special Topics and Electives courses that best fit for their areas of interest.

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<td>36-318</td>
<td>Introduction to Causal Inference</td>
<td>9</td>
</tr>
<tr>
<td>36-46x</td>
<td>Special Topics (topics and offerings vary)</td>
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</tr>
<tr>
<td>36-497</td>
<td>Corporate Capstone Project</td>
<td>9</td>
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</table>

**Machine Learning Core (2 courses, 24 units)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-122</td>
<td>Principles of Imperative Computation</td>
<td>12</td>
</tr>
<tr>
<td>or 10-301</td>
<td>Introduction to Machine Learning (Undergrad)</td>
<td>12</td>
</tr>
</tbody>
</table>

**Machine Learning Elective (1 course, 9 units minimum)**

Students must take one course from the ML Electives listed below. Students will consult with the Statistics & Machine Learning advisor to choose an elective that best fits their area of interest. This course may have additional pre-requisites. Keep in mind this is not an exhaustive list and other applicable courses can be reviewed to be approved as an ML elective.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>02-510/710</td>
<td>Computational Genomics</td>
<td>12</td>
</tr>
<tr>
<td>05-317</td>
<td>Design of Artificial Intelligence Products</td>
<td>12</td>
</tr>
<tr>
<td>05-434/11-344</td>
<td>Machine Learning in Practice</td>
<td>12</td>
</tr>
<tr>
<td>10-403/703</td>
<td>Deep Reinforcement Learning &amp; Control</td>
<td>12</td>
</tr>
<tr>
<td>10-405/605</td>
<td>Machine Learning with Large Datasets (Undergraduate)</td>
<td>12</td>
</tr>
<tr>
<td>10-417</td>
<td>Intermediate Deep Learning</td>
<td>12</td>
</tr>
<tr>
<td>10-418/618</td>
<td>Machine Learning for Structured Data</td>
<td>12</td>
</tr>
<tr>
<td>10-613</td>
<td>Machine Learning Ethics and Society</td>
<td>12</td>
</tr>
<tr>
<td>10-707</td>
<td>Advanced Deep Learning</td>
<td>12</td>
</tr>
<tr>
<td>10-708</td>
<td>Probabilistic Graphical Models</td>
<td>12</td>
</tr>
<tr>
<td>11-324/624</td>
<td>Human Language for Artificial Intelligence</td>
<td>12</td>
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<tr>
<td>11-411</td>
<td>Natural Language Processing</td>
<td>12</td>
</tr>
<tr>
<td>11-441</td>
<td>Machine Learning for Text and Graph-based Mining</td>
<td>9</td>
</tr>
<tr>
<td>11-485</td>
<td>Introduction to Deep Learning</td>
<td>9</td>
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<tr>
<td>11-661/761</td>
<td>Language and Statistics</td>
<td>12</td>
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<td>15-281</td>
<td>Artificial Intelligence: Representation and Problem Solving</td>
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<td>15-386</td>
<td>Neural Computation</td>
<td>9</td>
</tr>
<tr>
<td>15-387</td>
<td>Computational Perception</td>
<td>9</td>
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<tr>
<td>15-482</td>
<td>Autonomous Agents</td>
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<td>16-311</td>
<td>Introduction to Robotics</td>
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<tr>
<td>16-385/720</td>
<td>Computer Vision</td>
<td>12</td>
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<tr>
<td>17-445</td>
<td>Machine Learning in Production</td>
<td>12</td>
</tr>
<tr>
<td>85-419</td>
<td>Introduction to Parallel Distributed Processing</td>
<td>9</td>
</tr>
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</table>

**Statistics Electives (1 course, 9 units)**

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<td>Advanced Deep Learning</td>
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<td>10-708</td>
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</table>
Technical Writing Concentration

(87 units minimum)

The concentration in Technical Writing is specifically designed to prepare students for successful careers involving scientific, technical, and computer-related communication, including writing and designing for digital media. Technical communicators develop and design web sites, explain science and technology to the public, develop print and multimedia materials, develop information management systems, design and deliver corporate training, and develop support systems for consumer products ranging from software to complex data management systems. The Technical Writing concentration includes a common core of foundation courses in print and on-line communication as well as a set of prerequisites in math, statistics and computer programming.

Students with a Technical Writing concentration take two Theory/Specialization courses specific to either the Technical Communication (TC) or the Scientific and Medical Communication (SMC) track. In addition, students in the SMC track take two courses in the natural sciences or engineering relevant to their areas of interest, while TC students take two electives in management, technology and social issues.

Prerequisite Courses

21-111 Calculus I 10
or 21-112 Calculus II
or 21-120 Differential and Integral Calculus
or 21-127 Concepts of Mathematics

15-110 Principles of Computing
(recommended for SMC-track students)

15-112 Fundamentals of Programming and Computer Science
(recommended for TC-track students)

Technical Writing Core Courses (6 courses, 51 units)

76-26x Introductory Genre Writing Course (Nonfiction, Fiction, Poetry or Screenwriting)
76-271 Introduction to Professional and Technical Writing
76-300 Professional Seminar 3
76-390 Style 9
76-391 Document & Information Design 9
76-487 Web Design - Information Architecture & Content Strategy (formerly titled Web Design) 12

Theory/Specialization Courses (3 courses, 27 units minimum)

Complete three courses to deepen your area of specialty in Technical Communication or Scientific and Medical Communication. One course must be chosen from among courses designated as Recommended Options. Check with the English department each semester for additional options.

Recommended Options:

76-314 Data Stories 9
76-327 Equity & Communication: Strategies for Institutional Change 9
76-380 Methods in Humanities Analytics 9
76-395 Science Writing 9
76-425 Rhetoric, Science, and the Public Sphere 9
76-474 Software Documentation 9
76-476 Rhetoric of Science 9
76-481 Introduction to Multimedia Design 12
76-491 Rhetorical Analysis 9
76-494 Healthcare Communications 9

Additional Options include but are not limited to the following:

76-301 Internship Var.
76-302 Communication Support Tutoring Practicum 9
76-318 Communicating in the Global Marketplace 9
76-325 Intertextuality 9
76-327 Equity & Communication: Strategies for Institutional Change 9
76-351 Rhetorical Invention 9
76-354 Watchdog Journalism 9
76-360 Literary Journalism Workshop 9
76-372 News Writing 9
76-384 Race, Nation, and the Enemy 9
76-389 Rhetorical Grammar 9
76-391 Document & Information Design 9
76-395 Science Writing 9
76-425 Rhetoric, Science, and the Public Sphere 9
76-474 Software Documentation 9
76-475 Law, Performance, and Identity 9
76-476 Rhetoric of Science 9
76-481 Introduction to Multimedia Design 12
76-484 Discourse Analysis 9
76-487 Web Design - Information Architecture & Content Strategy (formerly titled Web Design) 12
39-605 Engineering Design Projects 12

Electives (1 course, 9 units)

Students with a Technical Writing concentration take one course outside of English to deepen their area of specialty in their track. Typically, students in the SMC track select courses in the natural sciences, computer science, math or statistics, or (for example) healthcare-related courses in the Heinz School. Students in the TC track typically select courses from business, design, psychology, and social and decision sciences, or HCI. Students should work with the concentration advisor to select courses that are meaningful for their track.

COLLEGE OF FINE ARTS CONCENTRATION

(number of courses vary, 108-114 units minimum)

BHA students choose one of the following concentrations:

• Architecture (108 units)
• Art (114 units)
• Design (108 units)
• Drama (108 units)
• Music (108 units)

Architecture Concentration

(108 units minimum)

Architecture Required Courses (7 courses, 52 units minimum)

48-100 Architecture Design Studio: POIESIS STUDIO 1 - Fall, Freshman or Sophomore year 10-15
or 48-095 Spatial Concepts for Non-Architecture Majors 10
62-122 Digital Media I -Fall, Freshman year 6
62-125 Drawing I-Fall, Freshman year 6
62-123 Digital Media II -Spring, Freshman year 6
62-126 Drawing II -Spring, Freshman year 6
48-240 History of World Architecture, I-Spring, Freshman year 9
48-241 History of Modern Architecture -Fall, Sophomore year 9

Architecture Electives (56 units minimum)

A minimum of 56 additional Architecture units must be approved by the Architecture advisor. A list of these selected courses must be filed in the BHA office.

Art Concentration

(114 units minimum)

First-Year Seminar (1 course, 6 units)

60-104 Foundations: Art First-Year Seminar 6

Foundation Studios (3 courses, 30 units)

Complete three courses:

60-110 Foundations: Time-Based Media 10
60-120 Foundations: Digital Media 10
60-131 Foundations: Sculpture 10
60-135 Foundations: Sculpture II 10
60-150 Foundations: Drawing 10
60-170 Foundations: Paint/Print 10

Intermediate Studios (3 courses, 30 units)

Complete three courses:
60-2xx  Intermediate Studio Elective  10
60-2xx  Intermediate Studio Elective  10
60-2xx  Intermediate Studio Elective  10

Advanced Studios (3 courses, 30 units)

Students may take courses in any media area (ETB, SIS, CP or DP3). They may take all courses in one media area if a focus is desired. With approval from the Art advisor, BXA students can take an additional intermediate studio in lieu of an advanced studio to increase breadth.

Complete three courses:
60-401/402  Senior Studio  10
60-403  Senior Critique Seminar  10
Advanced Electronic and Time-Based Work (ETB) (course numbers 60-410 through 60-429)  10
Advanced Sculpture, Installation and Site-Work (SIS) (course numbers 60-430 through 60-447)  10
Advanced Contextual Practice (CP) (course numbers 60-448 through 60-449)  10
Advanced Drawing, Painting, Print Media and Photography (DP3) (course numbers 60-450 through 60-498)  10
60-499  Studio Independent Study (one only)  10

* Courses offered intermittently; speak with a BXA advisor to determine course availability.

Critical Studies (2 courses, 18 units)
60-107  Foundations: Critical Studies - Spring  9
60-3xx  Critical Studies Elective  9

Review Requirement (1 required review, 0 units)
Complete required review:
60-200  Sophomore Review - Spring (pass/no pass)  0

Design Concentration
(108 units minimum)

Design Required Courses (16 courses, 98 units)
51-101  Studio: Survey of Design - Fall, First-year  10
51-121  Visualizing - Fall, First-year  10
51-175  Design Studies: Place - Fall, First-year (mini-1)  5
51-177  Design Studies: Histories - Fall, First-year (mini-2)  5
51-102  Design Lab - Spring, First-year  10
51-122  Collaborative Visualizing - Spring, First-year  10
51-176  Design Studies: Futures - Spring, First-year (mini-3)  5
51-178  Design Studies: Experience - Spring, First-year (mini-4)  5
51-277  Design Studies: Systems - Fall, Sophomore year (mini-1)  5
51-279  Design Studies: Cultures - Fall, Sophomore year (mini-2)  5
51-282  Design Studies: Persuasion - Spring, Sophomore year (mini-3)  5
51-284  Design Studies: Power - Spring, Sophomore year (mini-4)  5
51-225  Communications Studio I: Understanding Form & Context  4.5
51-245  Products Studio I: Understanding Form & Context  4.5
51-265  Environments Studio I: Understanding Form & Context  4.5
51-227  Prototyping Lab I: Communications  4.5
51-247  Prototyping Lab I: Products  4.5
51-267  Prototyping Lab I: Environments  4.5

Choose Two Studios - Fall, Sophomore year:  4.5+4.5

Design Electives (10 units)
A minimum of 10 additional Design units must be approved by the Design advisor. A list of these selected courses must be filed in the BXA office.

Drama Concentration
(108 units minimum)

Options available in the following areas: 1) Design, 2) Directing, 3) Dramaturgy, 4) Production Technology and Management

Required Courses for All Concentration Options (4 courses, 19 units)
54-175  Conservatory Hour  1
54-177  Foundations of Drama I  6
54-281  Foundations of Drama II (prerequisite: 54-177)  6
54-381  Special Topics in Drama: History, Literature and Criticism  6
54-362  Anti-Racist & Equitable Practices in Theater (optional)  6

Work with Drama Faculty Area Chair to Approve Concentration Option (89 units minimum).

Design Required Courses (2 courses, 26 units)
54-151-54-152  Stagecraft-Stagecraft  26

A minimum of 63 additional Design units must be approved by the Design faculty area chair. A list of these selected courses must be filed in the BXA office.

Directing Required Courses (10 courses, 64 units)
54-121-54-122  Directing I: A Director's Mindset - Directing I: A Director's Preparation  18
54-221-54-222  Directing II: In the Studio - Directing II: In The Room  18
54-159-54-159  Production Practicum-Production Practicum (two times)  12
54-517  Directors Common Hour (four times)  16

A minimum of 25 additional Directing units must be approved by the Directing faculty area chair. A list of these selected courses must be filed in the BXA office.

Dramaturgy Required Courses (9 courses, 59 units minimum)
54-109  Dramaturgy 1: Approaches to Text  9
54-184  Dramaturgy 2: Introduction to Production  9
54-121  Directing I: A Director's Mindset  9
54-159-54-159  Production Practicum-Production Practicum (two times)  12
54-200-54-200  Dramaturgy Forum-Dramaturgy Forum - Fall (minimum of two; every semester it is offered while enrolled)  2
54-xxx  Dramaturgy 3, 4, 5 or 6 (minimum of two; all four if enrolled as BXA for six semesters or more)  18

A minimum of 30 additional Dramaturgy units must be approved by the Dramaturgy faculty area chair. A list of these selected courses must be filed in the BXA office.

Production Technology and Management Required Courses (2 courses, 26 units)
54-151-54-152  Stagecraft-Stagecraft  26

A minimum of 63 additional PTM units must be approved by the PTM faculty area chair. A list of these selected courses must be filed in the BXA office.

Music Concentration
(108 units minimum)

Options available in the following areas: 1) Audio Recording & Production, 2) Composition, 2) Music Performance (instrumental, organ, piano, voice), 4) Sound Theory & Practice

Required Course for All Concentration Options (1 course, 9 units)
57-152  Harmony I  9
or 57-149  Basic Harmony I

Work with Music Advisor to Approve Concentration Option (99 units minimum).
Audio Recording & Production Required Courses (7 courses, 40 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-101</td>
<td>Introduction to Music Technology</td>
<td>6</td>
</tr>
<tr>
<td>or 57-171</td>
<td>Introduction to Music Technology (self-paced)</td>
<td></td>
</tr>
<tr>
<td>57-181</td>
<td>Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-180</td>
<td>Basic Solfege I</td>
<td></td>
</tr>
<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
<td></td>
</tr>
<tr>
<td>57-173</td>
<td>Survey of Western Music History</td>
<td>9</td>
</tr>
<tr>
<td>(co-requisite: 57-188)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-337</td>
<td>Sound Recording</td>
<td>6</td>
</tr>
<tr>
<td>57-338</td>
<td>Sound Editing and Mastering</td>
<td>6</td>
</tr>
<tr>
<td>57-438</td>
<td>Multitrack Recording</td>
<td>9</td>
</tr>
</tbody>
</table>

Choose 59 units from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-153</td>
<td>Harmony II</td>
<td>9</td>
</tr>
<tr>
<td>or 57-150</td>
<td>Basic Harmony II</td>
<td></td>
</tr>
<tr>
<td>57-182</td>
<td>Solfege II</td>
<td>3</td>
</tr>
<tr>
<td>or 57-186</td>
<td>Advanced Solfege II</td>
<td></td>
</tr>
<tr>
<td>10-301</td>
<td>Introduction to Machine Learning (Undergrad)</td>
<td>12</td>
</tr>
<tr>
<td>15-104</td>
<td>Introduction to Computing for Creative Practice</td>
<td>10</td>
</tr>
<tr>
<td>15-213</td>
<td>Introduction to Computer Systems</td>
<td>12</td>
</tr>
<tr>
<td>15-322</td>
<td>Introduction to Computer Music</td>
<td>9</td>
</tr>
<tr>
<td>18-090</td>
<td>Twisted Signals: Multimedia Processing for the Arts</td>
<td>10</td>
</tr>
<tr>
<td>33-114</td>
<td>Physics of Musical Sound</td>
<td>9</td>
</tr>
<tr>
<td>54-166</td>
<td>Introduction to Sound Design for Theatre</td>
<td>6</td>
</tr>
<tr>
<td>54-275</td>
<td>History of Sound Design</td>
<td>3</td>
</tr>
<tr>
<td>54-666</td>
<td>Production Audio</td>
<td>6</td>
</tr>
<tr>
<td>57-161</td>
<td>Eurhythmics I</td>
<td>3</td>
</tr>
<tr>
<td>57-344</td>
<td>Experimental Sound Synthesis</td>
<td>9</td>
</tr>
<tr>
<td>57-347</td>
<td>Electronic and Computer Music</td>
<td>6</td>
</tr>
<tr>
<td>57-358</td>
<td>Introduction to Electronic Music (with instructor permission as space allows)</td>
<td>9</td>
</tr>
<tr>
<td>57-421</td>
<td>Exploded Ensemble</td>
<td>6</td>
</tr>
<tr>
<td>57-427</td>
<td>Advanced Seminar in Film Musicology</td>
<td>9</td>
</tr>
<tr>
<td>57-478</td>
<td>Survey of Historical Recording</td>
<td>6</td>
</tr>
<tr>
<td>57-622</td>
<td>Independent Study in Sound Recording Production</td>
<td>3</td>
</tr>
<tr>
<td>60-131</td>
<td>Foundations: Sculpture</td>
<td>10</td>
</tr>
</tbody>
</table>

Note: Students completing an IDeATe minor may double-count up to two of the IDeATe minor courses towards the Audio Recording & Production concentration.

Composition Required Courses (12 courses, 76 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-161</td>
<td>Eurhythmics I</td>
<td>3</td>
</tr>
<tr>
<td>(recommended co-requisite: 57-181)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-181</td>
<td>Solfege I</td>
<td>3</td>
</tr>
<tr>
<td>or 57-180</td>
<td>Basic Solfege I</td>
<td></td>
</tr>
<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
<td></td>
</tr>
<tr>
<td>57-173</td>
<td>Survey of Western Music History</td>
<td>9</td>
</tr>
<tr>
<td>(co-requisite: 57-188)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-49x</td>
<td>BXA Studio (4 semesters)</td>
<td>36</td>
</tr>
<tr>
<td>57-xxx</td>
<td>Major Ensemble (4 semesters)</td>
<td>24</td>
</tr>
</tbody>
</table>

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

Music Performance Required Courses (12 courses, 76 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-161</td>
<td>Eurhythmics I</td>
<td>3</td>
</tr>
<tr>
<td>(recommended co-requisite: 57-181)</td>
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<td></td>
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<tr>
<td>57-181</td>
<td>Solfege I</td>
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<td></td>
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<tr>
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<td>Survey of Western Music History</td>
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<td>(co-requisite: 57-188)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-49x</td>
<td>BXA Studio (4 semesters)</td>
<td>36</td>
</tr>
<tr>
<td>57-xxx</td>
<td>Major Ensemble (4 semesters)</td>
<td>24</td>
</tr>
</tbody>
</table>

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

Sound Theory & Practice Required Courses (7 courses, 47 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>57-101</td>
<td>Introduction to Music Technology</td>
<td>6</td>
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<td>or 57-171</td>
<td>Introduction to Music Technology (self-paced)</td>
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<td>57-181</td>
<td>Solfege I</td>
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<td>Basic Solfege I</td>
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<tr>
<td>or 57-185</td>
<td>Advanced Solfege I</td>
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<td>57-173</td>
<td>Survey of Western Music History</td>
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</tr>
<tr>
<td>(co-requisite: 57-188)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57-188</td>
<td>Repertoire and Listening for Musicians</td>
<td>1</td>
</tr>
<tr>
<td>57-180</td>
<td>Twisted Signals: Multimedia Processing for the Arts</td>
<td>10</td>
</tr>
<tr>
<td>57-911</td>
<td>Music Since 1945</td>
<td>9</td>
</tr>
<tr>
<td>57-616</td>
<td>Independent Study in Sound Studies</td>
<td>9</td>
</tr>
</tbody>
</table>

Choose 52 units from:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>57-153</td>
<td>Harmony II</td>
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<td>Solfege II</td>
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<tr>
<td>or 57-186</td>
<td>Advanced Solfege II</td>
<td></td>
</tr>
<tr>
<td>15-104</td>
<td>Introduction to Computing for Creative Practice</td>
<td>10</td>
</tr>
<tr>
<td>15-322</td>
<td>Introduction to Computer Music (prerequisite: 15-112)</td>
<td>9</td>
</tr>
<tr>
<td>33-114</td>
<td>Physics of Musical Sound</td>
<td>9</td>
</tr>
<tr>
<td>57-337</td>
<td>Sound Recording</td>
<td>6</td>
</tr>
<tr>
<td>57-338</td>
<td>Sound Editing and Mastering</td>
<td>6</td>
</tr>
<tr>
<td>57-343</td>
<td>Music, Technology, and Culture</td>
<td>9</td>
</tr>
<tr>
<td>57-344</td>
<td>Experimental Sound Synthesis</td>
<td>6</td>
</tr>
<tr>
<td>57-347</td>
<td>Electronic and Computer Music (prerequisite: 57-101 or 57-171)</td>
<td>6</td>
</tr>
<tr>
<td>57-358</td>
<td>Introduction to Electronic Music (with instructor permission as space allows)</td>
<td>9</td>
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<td>57-421</td>
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<td>Multitrack Recording</td>
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<td>57-478</td>
<td>Survey of Historical Recording</td>
<td>6</td>
</tr>
<tr>
<td>60-131</td>
<td>Foundations: Sculpture</td>
<td>10</td>
</tr>
</tbody>
</table>

Note: Students completing an IDeATe minor may double-count up to two of the IDeATe minor courses towards the Sound Theory & Practice concentration.

Free Electives

(approximately 4-7 courses, 31-63 units)

Take any Carnegie Mellon course. Many BHA students use their electives to broaden or deepen their concentrations. A maximum of 9 units of physical education and/or military science may be counted toward this requirement.

Bachelor of Science and Arts Degree Program

The Bachelor of Science and Arts (BSA) intercollege degree program combines the strengths of the College of Fine Arts (CFA) and the Mellon College of Science (MCS). This degree is designed for students who are gifted in both the fine arts and the natural sciences or mathematics, and who have the interest and the exceptional ability to pursue both disciplines simultaneously. Students choose their arts concentration from the following schools in CFA: Architecture, Art, Design, Drama or Music. Students choose their science concentration from among the departments in MCS: Biological Sciences, Chemistry, Environmental & Sustainability Studies, Mathematical Sciences, Neurobiology or Physics.

The BSA curriculum has three main components: general core requirements, fine arts concentration requirements and natural sciences/mathematics concentration requirements. Each student's course of study is structured so they can complete this rigorous program in four years.

Students receive extensive advising support. The academic advisors in the BXA Intercollege Degree Programs are the primary advisors and liaisons between CFA and MCS. Each student has two additional academic advisors: an advisor in the admitting school of CFA to guide their focus in the arts and an advisor in MCS to guide their focus in the sciences.
BSA Curriculum

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. BSA General Education</td>
<td>129</td>
</tr>
<tr>
<td>II. MCS Concentration</td>
<td>114-145</td>
</tr>
<tr>
<td>III. CFA Concentration</td>
<td>108-114</td>
</tr>
<tr>
<td>IV. Free Electives</td>
<td>0-29</td>
</tr>
<tr>
<td><strong>Total BSA Degree Requirements</strong></td>
<td><strong>380</strong></td>
</tr>
</tbody>
</table>

**BSA General Education**

*(18 courses, 129 units minimum)*

- Mathematics (2 courses, 20 units, 21-120 and 21-122 or 21-124 required)
- Science (3 courses, 31 units, 03-121, 09-105, and 33-121 or 33-151 required)
- First-year Courses (2 courses, 12 units, 76-101 and 99-101 required)
- ENGAGE (3 courses, 3 units)
- Cultural/Global Understanding (1 course, 9 units)
- Humanities and Social Sciences (2 courses, 18 units)
- BXA Required Courses (5 courses, 36 units, 52-190, 52-291, 52-392, 52-401, 52-402)

Technical Breadth Requirements (5 courses, 51 units)

As a 21st Century practicing scientist or mathematician, our graduates will work with others from a variety of technical backgrounds. Therefore, all of our students will be broadly trained within the technical fields of science and math. Students will fulfill this training by completing five (5) introductory technical courses in the Mellon College of Science at Carnegie Mellon University.

A student must take the five (5) courses listed below. AP/IB/Cambridge credit may be used to fulfill some of these requirements, but STEM electives must be taken at CMU or at another university for transfer credit to reach the total of five (5) Technical Breadth courses. A list of STEM electives can be found in the MCS general education requirements (http://coursecatalog.web.cmu.edu/schools-colleges/melloncollegeofscience/#generaleducationrequirementstextcontainer).

- Mathematics (2 courses, 20 units)
  - 21-120 Differential and Integral Calculus 10
  - 21-122 Integration and Approximation 10
  - or 21-124 Calculus II for Biologists and Chemists
- Science (3 courses, 31 units)
  - 03-121 Modern Biology 9
  - 09-105 Introduction to Modern Chemistry I 10
  - 33-121 Physics I for Science Students 12
  - or 33-151 Matter and Interactions I

Nontechnical Breadth Requirements (8 courses, 42 units)

MCS aspires for all of our undergraduates to leave our campus with a strong sense of personal integrity, social responsibility, ethics, working with diverse others, global engagement, and personal health and well-being. The following non-technical breadth requirements will require students to develop a personalized plan for their course selection and meta-curricular participation to maximize their CMU experience. Our graduates will be well trained to be life-long and life-wide learners that will lead the scientific community and the world at large.

All candidates for BSA degree must complete the following non-technical breadth requirements:

- First-year Courses (2 courses, 12 units)
  - 76-101 Interpretation and Argument 9
  - or 76-102 Advanced First Year Writing: Special Topics
  - or 76-106 Writing about Literature, Art and Culture
  - or 76-107 Writing about Data
  - & 76-108 and Writing about Public Problems

All undergraduate students must complete the First-Year Writing requirement—the Department of English does not accept any Advanced Placement exemptions. This requirement can be completed in two different ways. Enroll in one of two full-semesters courses 101 or 102 (by invitation only), 9 units, or enroll in two of three half-semester mini courses (back-to-back within a single semester) 106/107/108, 4.5 + 4.5 units.

Course options and topics: [www.cmu.edu/hss/english/first_year/index.html](http://www.cmu.edu/hss/english/first_year/index.html)

99-101 Computing @ Carnegie Mellon 3

**ENGAGE (3 courses, 3 units)**

The ENGAGE courses are self-directed learning opportunities (using the MyCORE online platform) designed to enhance students’ engagement with wellness and community service. Choose three courses from the list below:

- 38-110 ENGAGE in Service 1
- 38-230 ENGAGE in Wellness: Looking Inward 1
- 38-330 ENGAGE in Wellness: Looking Outward 1
- 38-430 ENGAGE in Wellness: Looking Forward 1

**Cultural/Global Understanding (1 course, 9 units)**

Cultural or global understanding course(s) may be taken at any time. Nine (9) or more units from the following group of courses will fulfill this requirement. Any student who finds an appropriate Carnegie Mellon course not on the list below that might fulfill this requirement should contact their academic advisor to review the course description to determine if it can be substituted. Cultural and global understanding courses that are taken while studying abroad can be used to fulfill this category. In addition, transfer courses will also be considered for this category. However, this course requirement cannot be satisfied with AP/IB/Cambridge exam credit.

- 57-173 Survey of Western Music History 9
- 57-209 The Beatles 9
- 57-306 World Music 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
- 76-376 Language & Culture 9
- 79-145 Genocide and Weapons of Mass Destruction 9
- 79-189 Democracy and History: Thinking Beyond the Self 9
- 79-201 Introduction to Anthropology 9
- 79-202 Flesh and Spirit: Early Modern Europe, 1400-1750 9
- 79-205 20th Century Europe 9
- 79-208 Witchcraft and Witch-Hunting 9
- 79-211 Modern Southeast Asia: Colonialism, Capitalism, and Cultural Exchange 9
- 79-223 Mexico: From the Aztec Empire to the Drug War 9
- 79-227 Modern Africa: The Slave Trade to the End of Apartheid 9
- 79-229 The Origins of the Palestinian-Israeli Conflict, 1880-1948 9
- 79-230 The Arab-Israeli Conflict and Peace Process since 1948 9
- 79-232 Arabian Peninsula Environmental History 9
- 79-234 Technology and Society 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
- 79-244 Women in American History 9
- 79-245 Capitalism and Individualism in American Culture 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
- 79-263 Mao and the Chinese Cultural Revolution 9
- 79-265 Russian History: Game of Thrones 9
- 79-266 Russian History and Revolutionary Socialism 9
- 79-267 The Soviet Union in World War II: Military, Political, and Social History 9
Biological Sciences Concentration

MCS concentration at any time following the initial declaration must meet (which serves as declaration). All BSA students wishing to change their must have chosen an MCS concentration at the time of their application Declaration form. BSA students who are admitted through internal transfer have met with a concentration advisor and have submitted their signed BSA students who are admitted as freshmen are undeclared until they the degree requirements beyond 380 units.

Note: The BSA Physics concentration requires additional coursework totaling semester break of the student's first year.

BXA Seminar II: Transferring Knowledge -Spring, Junior year
BXA Seminar III: Undergraduate Seminar III - Undergraduate Seminar III
BXA Seminar IV: Capstone Project Research
BXA Seminar V: Capstone Project Production

Mellon College of Science Concentration

(number of courses vary, 114-144 units)

BSA students declare one of the following concentrations, through consultation with their BXA advisor and the MCS concentration advisors. A completed MCS Concentration Declaration form must be approved by the concentration advisor and submitted to the BXA office, by spring mid-semester break of the student's first year.

Note: The BSA Physics concentration requires additional coursework totaling the degree requirements beyond 380 units.

• Biological Sciences (114 units)
• Chemistry (121 units)
• Environmental & Sustainability Studies (123 units)
• Mathematical Sciences (127 units)
• Neurobiology (114 units)
• Physics (145 units)

BSA students who are admitted as freshmen are undeclared until they have met with a concentration advisor and have submitted their signed Declaration form. BSA students who are admitted through internal transfer must have chosen an MCS concentration at the time of their application (which serves as declaration). All BSA students wishing to change their MCS concentration at any time following the initial declaration must meet with the advisor of their intended concentration area to complete a new Declaration form.

BSA Intercollege Degree Programs

79-275 Introduction to Global Studies 9
79-280 Coffee and Capitalism 9
79-283 Hungry World: Food and Famine in Global Perspective 9
79-343 Education, Democracy, and Civil Rights 9
79-345 Roots of Rock & Roll 9
79-350 Early Christianity 9
79-377 Food, Culture, and Power: A History of Eating 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: Making Ideas Work 9
80-276 Philosophy of Religion 9
82-xxx Any course from Modern Languages 9
84-380 US Grand Strategy 9

Humans and Social Sciences (2 courses, 18 units)

To fulfill this requirement, students must complete a minimum of two (2) non-technical courses totaling at least 18 units in the Tepper School of Business and/or the Dietrich College of Humanities and Social Sciences. Courses counted toward the Cultural/Global Understanding requirement, and 76-101, do not count toward this requirement.

Check our web site for courses from DC, CFA, and Tepper that may NOT be used (http://www.cmu.edu/mcs/undergrad/advising/hss-finearts/deletions.html) to satisfy this requirement because they are too technical in nature, plus a list of courses in other colleges (including SCS, CIT, Tepper, and Heinz College) that do satisfy (http://www.cmu.edu/mcs/undergrad/advising/hss-finearts/additions.html) this requirement.

BXA Required Courses (5 courses, 36 units)

BXA-specific courses give students the opportunity to integrate their areas of concentration by focusing on interdisciplinary approaches and arts-based research techniques.

52-190 BXA Seminar I: Building the Wunderkammer - Spring, Freshman (mini-4) 4.5
52-291 BXA Seminar II: Transferring Knowledge -Spring, Sophomore (mini-3) 4.5
52-392 BXA Seminar III: Deconstructing Disciplines 9
52-401 BXA Seminar IV: Capstone Project Research 9
52-402 BXA Seminar V: Capstone Project Production 9

Biological Sciences Required Courses (11 courses, 96 units minimum)

03-201 Undergraduate Colloquium for Sophomores 2
03-220 Genetics - Fall, Sophomore year 9
03-231 Honors Biochemistry - Spring, Sophomore year 9
03-320 Cell Biology - Fall, Junior year 9
03-343 Experimental Techniques in Molecular Biology - Fall, Junior year 12
09-106 Modern Chemistry II 10
09-207 Techniques in Quantitative Analysis 9
09-208 Techniques for Organic Synthesis and Analysis 9
or 03-344 Experimental Biochemistry 9
or 03-345 Experimental Cell and Developmental Biology 9
or 03-346 Experimental Neuroscience 9
09-217 Organic Chemistry I 9
09-218 Organic Chemistry II 9
33-122 Physics II for Biological Sciences & Chemistry Students 9

Biological Sciences Electives (2 courses, 18 units)

One course must be an advanced elective selected from 03-3xx or higher, excluding 03-445 and 03-545.

Chemistry Concentration

(118 units minimum)

Chemistry Required Courses (13 courses, 100 units)

09-106 Modern Chemistry II 10
09-219 Modern Organic Chemistry 10
09-220 Modern Organic Chemistry II 10
09-331 Modern Analytical Instrumentation 9
09-348 Inorganic Chemistry 10
09-221 Laboratory I: Introduction to Chemical Analysis 12
09-222 Laboratory II: Organic Synthesis and Analysis 12
09-321 Laboratory III: Molecular Design and Synthesis 12
or 09-323 Bioorganic Chemistry Laboratory 9
09-201-09-202 Undergraduate Seminar I - Undergraduate Seminar II: Safety and Environmental Issues for Chemists - Undergraduate Seminar III 3
09-402 Undergraduate Seminar VI 3
33-122 Physics II for Biological Sciences & Chemistry Students 9

Note: Students who have a strong chemistry background, should enroll in 09-107 rather than 09-105. Students who complete 09-107 with an "A" grade will be exempted from the requirement to take 09-106 Modern Chemistry II.

Advanced Chemistry Electives (2 courses, 18 units)

May be any upper level chemistry course, 09-3xx or higher, or Biochemistry I, 03-231 or 03-232, with the exception of 09-435 Independent Study, which can be used only by permission of the Director of Undergraduate Studies.

Environmental & Sustainability Studies Concentration

(123 units minimum)

Additional Required Courses (2 courses, 18 units minimum)

09-217 Organic Chemistry I 9
33-122 Physics II for Biological Sciences & Chemistry Students 9
or 33-142 Physics II for Engineering and Physics Students 9

Core Courses (4 courses, 30 units)

24/09-291 Environmental Systems on a Changing Planet 9
24/09-381 Environmental Systems on a Changing Planet: Science & Engineering Addendum (co-req: 24/09-291) 3
66-236 Introduction to Environmental Ideas 9
66-506 Senior Capstone (Interdisciplinary Research: Capstone in ESS) 9

Earth and Environmental Science (1 course, 9 units)

Choose one course from the list below.
DC Electives:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-128</td>
<td>Biology for Life Special Topics</td>
<td>9</td>
</tr>
<tr>
<td>03-140</td>
<td>Ecology and Environmental Science</td>
<td>9</td>
</tr>
<tr>
<td>09-225</td>
<td>Climate Change: Chemistry, Physics and Planetary Science</td>
<td>9</td>
</tr>
<tr>
<td>09-510</td>
<td>Chemistry and Sustainability</td>
<td>9</td>
</tr>
<tr>
<td>09-524</td>
<td>Environmental Chemistry</td>
<td>9</td>
</tr>
<tr>
<td>09-529</td>
<td>Introduction to Sustainable Energy Science</td>
<td>9</td>
</tr>
<tr>
<td>09-538</td>
<td>Exposure and Risk Assessment for Environmental Pollutants</td>
<td>9</td>
</tr>
<tr>
<td>33-226</td>
<td>Physics of Energy</td>
<td>9</td>
</tr>
</tbody>
</table>

* Additional prerequisites

MCS Electives:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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Global Course (1 course, 3 units)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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Statistics and Data Science (1 course, 9 units)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</table>

Political Economy (1 course, 9 units minimum)

Choose one course from the list below.

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</table>

Electives (5 courses, 45 units minimum)

Choose three MCS Electives and two DC Electives in consultation with the concentration advisor.

MCS Electives:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
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DC Electives:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
</table>

Mathematical Sciences Concentration (127 units minimum)

Mathematical Sciences Required Courses (9 courses, 91 units minimum)

(Reasonable substitutions within the core program will be allowed.)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
</table>

Mathematical Sciences Electives (2 courses, 18 units)

Students with a Music concentration should take 21-469 Computational Introduction to Partial Differential Equations.

Mathematical Sciences, Statistics, or Computer Science Electives (2 courses, 18 units)

May be computer science course above the 100-level, mathematical science courses beyond the calculus sequence, and statistics courses at the level of 36-225 or higher.

Neurobiology Concentration (114 units minimum)

Neurobiology Required Courses (12 courses, 96 units)

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Units</th>
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Neurobiology Electives (2 courses, 18 units)

One course must be an advanced elective selected from 03-3xx or higher.

Physics Concentration (145 units minimum)

Physics Required Courses (16 courses, 127 units)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</table>
from the Art advisor, BXA students can take an additional intermediate studio in lieu of an advanced studio to increase breadth.

Complete three courses:
- 60-401/402 Senior Studio
- 60-403 Senior Critique Seminar
- Advanced Electronic and Time-Based Work (ETB) (course numbers 60-410 through 60-429)
- Advanced Sculpture, Installation and Site-Work (SIS) (course numbers 60-430 through 60-447)
- Advanced Contextual Practice (CP) (course numbers 60-448 through 60-449)
- Advanced Drawing, Painting, Print Media and Photography (DP3) (course numbers 60-450 through 60-498)
- 60-499 Studio Independent Study (one only)

* Courses offered intermittently; speak with a BXA advisor to determine course availability.

Critical Studies (2 courses, 18 units)
- 60-107 Foundations: Critical Studies -Spring
- 60-3xx Critical Studies Elective

Review Requirement (1 required review, 0 units)
Complete required review:
- 60-200 Sophomore Review -Spring (pass/no pass)

Design Concentration
(108 units minimum)

Design Required Courses (16 courses, 98 units)
- 51-101 Studio: Survey of Design -Fall, First-year
- 51-121 Visualizing -Fall, First-year
- 51-175 Design Studies: Place -Fall, First-year (mini-1)
- 51-177 Design Studies: Histories -Fall, First-year (mini-2)
- 51-102 Design Lab -Spring, First-year
- 51-122 Collaborative Visualizing -Spring, First-year
- 51-176 Design Studies: Futures -Spring, First-year (mini-3)
- 51-178 Design Studies: Experience -Spring, First-year (mini-4)
- 51-277 Design Studies: Systems -Fall, Sophomore year (mini-1)
- 51-279 Design Studies: Cultures -Fall, Sophomore year (mini-2)
- 51-282 Design Studies: Persuasion -Spring, Sophomore year (mini-3)
- 51-284 Design Studies: Power -Spring, Sophomore year (mini-4)
- Choose Two Studios -Fall, Sophomore year: 4.5+4.5
- 51-225 Communications Studio I: Understanding Form & Context
- or 51-245 Products Studio I: Understanding Form & Context
- or 51-265 Environments Studio I: Understanding Form & Context
- Choose Two Corresponding Labs -Fall, Sophomore year: 4.5+4.5
- 51-227 Prototyping Lab I: Communications
- or 51-247 Prototyping Lab I: Products
- or 51-267 Prototyping Lab I: Environments

Design Electives (10 units)
A minimum of 10 additional Design units must be approved by the Design advisor. A list of these selected courses must be filed in the BXA office.

Drama Concentration
(108 units minimum)

Options available in the following areas: 1) Design, 2) Directing, 3) Dramaturgy, 4) Production Technology and Management

Required Courses for All Concentration Options (4 courses, 19 units)
- 54-175 Conservatory Hour
- 54-177 Foundations of Drama I
54-281 Foundations of Drama II (prerequisite: 54-177) 6
54-381 Special Topics in Drama: History, Literature and Criticism 6
54-362 Anti-Racist & Equitable Practices in Theater (optional) 6

Work with Drama Faculty Area Chair to Approve Concentration Option (89 units minimum).

**Design Required Courses (2 courses, 26 units)**
54-151-54-152 Stagecraft-Stagecraft (13 units + 13 units) 26

A minimum of 63 additional Design units must be approved by the Design faculty area chair. A list of these selected courses must be filed in the BXA office.

**Directing Required Courses (10 courses, 64 units)**
54-121-54-122 Directing I: A Director's Mindset - Directing II: A Director's Preparation 18
54-221-54-222 Directing II: In the Studio - Directing II: In The Room 18
54-159-54-159 Production Practicum-Production Practicum (two times) 12
54-517 Directors Common Hour (four times) 16

A minimum of 25 additional Directing units must be approved by the Directing faculty area chair. A list of these selected courses must be filed in the BXA office.

**Dramaturgy Required Courses (9 courses, 59 units minimum)**
54-109 Dramaturgy 1: Approaches to Text 9
54-184 Dramaturgy 2: Introduction to Production Dramaturgy 9
54-121 Directing I: A Director's Mindset 9
54-159-54-159 Production Practicum-Production Practicum (two times) 12
54-200-54-200 Dramaturgy Forum-Dramaturgy Forum -Fall (minimum of two; every semester it is offered while enrolled) 2
54-xxx Dramaturgy 3, 4, 5 or 6 (minimum of two; all four if enrolled as BXA for six semesters or more) 18

A minimum of 30 additional Dramaturgy units must be approved by the Dramaturgy faculty area chair. A list of these selected courses must be filed in the BXA office.

**Production Technology and Management Required Courses (2 courses, 26 units)**
54-151-54-152 Stagecraft-Stagecraft (13 units + 13 units) 26

A minimum of 63 additional PTM units must be approved by the PTM faculty area chair. A list of these selected courses must be filed in the BXA office.

**Music Concentration (108 units minimum)**

Options available in the following areas: 1) Audio Recording & Production, 2) Composition, 2) Music Performance (instrumental, organ, piano, voice), 4) Sound Theory & Practice

**Required Course for All Concentration Options (1 course, 9 units)**
57-152 Harmony I 9
57-149 Basic Harmony I

Work with Music Advisor to Approve Concentration Option (99 units minimum).

**Audio Recording & Production Required Courses (7 courses, 40 units)**
57-101 Introduction to Music Technology 6
57-181 Solfege I 3
57-180 Basic Solfege I
57-185 Advanced Solfege I
57-173 Survey of Western Music History (co-requisite: 57-188) 9

57-188 Repertoire and Listening for Musicians 1
57-337 Sound Recording 6
57-338 Sound Editing and Mastering 6
57-438 Multitrack Recording 9

Choose 59 units from:
57-153 Harmony II 9
57-349 Basic Harmony II
57-182 Solfege II 3
57-185 Advanced Solfege II 3
10-301 Introduction to Machine Learning (Undergrad) 12
15-104 Introduction to Computing for Creative Practice 10
15-213 Introduction to Computer Systems 12
15-322 Introduction to Computer Music 9
18-090 Twisted Signals: Multimedia Processing for the Arts 10

33-114 Physics of Musical Sound 9
54-166 Introduction to Sound Design for Theatre 6
54-275 History of Sound Design 3
54-666 Production Audio 6
57-161 Eurhythmics I 3
57-344 Experimental Sound Synthesis 9
57-347 Electronic and Computer Music 6
57-358 Introduction to Electronic Music (with instructor permission as space allows) 9
57-421 Exploded Ensemble 6
57-427 Advanced Seminar in Film Musicology 9
57-478 Survey of Historical Recording 6
57-622 Independent Study in Sound Recording Production 3
60-131 Foundations: Sculpture 10

Note: Students completing an IDeATe minor may double-count up to two of the IDeATe minor courses towards the Audio Recording & Production concentration.

**Composition Required Courses (12 courses, 76 units)**
57-161 Eurhythmics I (recommended co-requisite: 57-181) 3
57-181 Solfege I or 57-180 or 57-185 Advanced Solfege I 3
57-173 Survey of Western Music History (co-requisite: 57-188) 9
57-188 Repertoire and Listening for Musicians 1
57-49x BXA Studio (4 semesters) 36
57-xxxx Major Ensemble (4 semesters) 24

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

**Music Performance Required Courses (12 courses, 76 units)**
57-161 Eurhythmics I (recommended co-requisite: 57-181) 3
57-181 Solfege I or 57-180 or 57-185 Advanced Solfege I 3
57-173 Survey of Western Music History (co-requisite: 57-188) 9
57-188 Repertoire and Listening for Musicians 1
57-49x BXA Studio (4 semesters) 36
57-xxxx Major Ensemble (4 semesters) 24

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

**Sound Theory & Practice Required Courses (7 courses, 47 units)**
57-101 Introduction to Music Technology 6
57-171 Introduction to Music Technology (self-paced) 6
57-181 Solfege I or 57-180 or 57-185 Advanced Solfege I 3
57-173 Survey of Western Music History (co-requisite: 57-188) 9
EA Curriculum

Choose 52 units from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
</table>
| 57-153      | Harmony II | 9
| or 57-150   | Basic Harmony II | 9
| 57-182      | Solfège II | 3
| or 57-186   | Advanced Solfège II | 3
| 15-104      | Introduction to Computing for Creative Practice | 10
| 15-322      | Introduction to Computer Music (prerequisite: 15-112) | 9
| 33-114      | Physics of Musical Sound | 9
| 57-337      | Sound Recording | 6
| 57-338      | Sound Editing and Mastering | 6
| 57-343      | Music, Technology, and Culture | 9
| 57-344      | Experimental Sound Synthesis | 9
| 57-347      | Electronic and Computer Music (prerequisite: 57-101 or 57-171) | 6
| 57-358      | Introduction to Electronic Music (with instructor permission as space allows) | 9
| 57-421      | Exploded Ensemble | 6
| 57-438      | Multitrack Recording | 9
| 57-478      | Survey of Historical Recording | 6
| 60-131      | Foundations: Sculpture | 10

Note: Students completing an IDEaTe minor may double-count up to two of the IDEaTe minor courses towards the Sound Theory & Practice concentration.

Free Electives

(approximately 0-3 courses, 0-29 units)

Take any Carnegie Mellon course. A maximum of 9 units of physical education and/or military science may be counted toward this requirement. Physical education and military science courses will not be calculated in a student's QPA.

Engineering and Arts Additional Major

The Engineering and Arts (EA) additional major combines the strengths of the College of Fine Arts (CFA) and the College of Engineering (ENG). This additional major provides students with formal practice and training in the creative arts that is more robust than a minor, as well as the foundation of interdisciplinary research to accomplish the integration of their interests. Students who currently have a primary major in engineering, choose their arts concentration from the following schools in CFA:

- Architecture
- Art
- Drama
- Music

The EA curriculum has two main components: BXA requirements and fine arts concentration requirements. Each student's course of study is structured so it can be completed alongside their primary engineering major.

Students receive extensive advising support. The academic advisors in the BXA Intercollege Degree Programs are the advisors and liaisons between CFA and Engineering. Each student has two additional academic advisors: an advisor in the admitting school of CFA to guide their focus in the arts and their primary advisor in Engineering to guide their full major in engineering.

BXA Requirements

BXA Required Courses (5 courses, 36 units)

- 52-190 BXA Seminar I: Building the Wunderkammer - Spring, Freshman (mini-4) 4.5
- 52-291 BXA Seminar II: Transferring Knowledge - Spring, Sophomore (mini-3) 4.5
- 52-392 BXA Seminar III: Deconstructing Disciplines 9
- 52-401 BXA Seminar IV: Capstone Project Research 9
- 52-402 BXA Seminar V: Capstone Project Production 9

COLLEGE OF FINE ARTS CONCENTRATION

(number of courses vary, 108-114 units minimum)

EA students choose one of the following concentrations:

- Architecture (108 units)
- Art (114 units)
- Drama (108 units)
- Music (108 units)

Architecture Concentration

(108 units minimum)

Architecture Required Courses (7 courses, 52 units minimum)

- 48-100 Architecture Design Studio: POIESIS STUDIO 1 - Fall, Freshman or Sophomore year 10-15
- or 48-095 Spatial Concepts for Non-Architecture Majors 10-15
- 62-122 Digital Media I - Fall, Freshman year 6
- 62-125 Drawing I - Fall, Freshman year 6
- 62-123 Digital Media II - Spring, Freshman year 6
- 62-126 Drawing II - Spring, Freshman year 6
- 48-240 History of World Architecture, I - Spring, Freshman year 9
- 48-241 History of Modern Architecture - Fall, Sophomore year 9

Architecture Electives (56 units minimum)

A minimum of 56 additional Architecture units must be approved by the Architecture advisor. A list of these selected courses must be filed in the BXA office.

Art Concentration

(114 units minimum)

First-Year Seminar (1 course, 6 units)

- 60-104 Foundations: Art First-Year Seminar 6

Foundation Studios (3 courses, 30 units)

Complete three courses:

- 60-110 Foundations: Time-Based Media 10
- 60-120 Foundations: Digital Media 10
- 60-131 Foundations: Sculpture 10
- 60-135 Foundations: Sculpture II 10
- 60-150 Foundations: Drawing 10
- 60-170 Foundations: Paint/Print 10

Intermediate Studios (3 courses, 30 units)

Complete three courses:

- 60-2xx Intermediate Studio Elective 10
- 60-2xx Intermediate Studio Elective 10
- 60-2xx Intermediate Studio Elective 10

Advanced Studios (3 courses, 30 units)

Students may take courses in any media area (ETB, SIS, CP or DP3). They may take all courses in one media area if a focus is desired. With approval from the Art advisor, BXA students can take an additional intermediate studio in lieu of an advanced studio to increase breadth.
Complete three courses:

- 60-401/402 Senior Studio 10
- 60-403 Senior Critique Seminar 10
- Advanced Electronic and Time-Based Work (ETB) (course numbers 60-410 through 60-429) 10
- Advanced Sculpture, Installation and Site-Work (SIS) (course numbers 60-430 through 60-447) 10
- Advanced Contextual Practice (CP) (course numbers 60-448 through 60-449) 10
- Advanced Drawing, Painting, Print Media and Photography (DP3) (course numbers 60-450 through 60-498) 10
- 60-499 Studio Independent Study (one only) 10

* Courses offered intermittently; speak with a BXA advisor to determine course availability.

Critical Studies (2 courses, 18 units)

- 60-107 Foundations: Critical Studies -Spring 9
- 60-3xx Critical Studies Elective 9

Review Requirement (1 required review, 0 units)

Complete required review:

- 60-200 Sophomore Review -Spring (pass/no pass) 0

Drama Concentration (108 units minimum)

Options available in the following areas: 1) Design, 2) Dramaturgy, 3) Production Technology and Management

Required Courses for All Concentration Options (4 courses, 19 units)

- 54-175 Conservatory Hour 1
- 54-177 Foundations of Drama I 6
- 54-281 Foundations of Drama II (prerequisite: 54-177) 6
- 54-381 Special Topics in Drama: History, Literature and Criticism 6
- 54-362 Anti-Racist & Equitable Practices in Theater (optional) 6

Work with Drama Faculty Area Chair to Approve Concentration Option (89 units minimum).

Design Required Courses (2 courses, 26 units)

54-151-54-152 Stagecraft-Stagecraft (13 units + 13 units) 26

A minimum of 63 additional Design units must be approved by the Design faculty area chair. A list of these selected courses must be filed in the BXA office.

Dramaturgy Required Courses (9 courses, 59 units minimum)

- 54-109 Dramaturgy 1: Approaches to Text 9
- 54-184 Dramaturgy 2: Introduction to Production Drama 9
- 54-121 Directing I: A Director’s Mindset 9
- 54-159-54-159 Production Practicum-Production Practicum (two times) 12
- 54-200-54-200 Dramaturgy Forum-Dramaturgy Forum -Fall (minimum of two; every semester it is offered while enrolled) 2
- 54-xxx Dramaturgy 3, 4, 5 or 6 (minimum of two; all four if enrolled as BXA for six semesters or more) 18

A minimum of 30 additional Dramaturgy units must be approved by the Dramaturgy faculty area chair. A list of these selected courses must be filed in the BXA office.

Production Technology and Management Required Courses (2 courses, 26 units)

54-151-54-152 Stagecraft-Stagecraft (13 units + 13 units) 26

A minimum of 63 additional PTM units must be approved by the PTM faculty area chair. A list of these selected courses must be filed in the BXA office.

Music Concentration (108 units minimum)

Options available in the following areas: 1) Audio Recording & Production, 2) Composition, 2) Music Performance (instrumental, organ, piano, voice), 4) Sound Theory & Practice

Required Course for All Concentration Options (1 course, 9 units)

57-152 Harmony I
or 57-149 Basic Harmony I

Work with Music Advisor to Approve Concentration Option (99 units minimum).

Audio Recording & Production Required Courses (7 courses, 40 units)

- 57-101 Introduction to Music Technology 6
- 57-181 Solfege I
or 57-180 Basic Solfege I
or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 57-337 Sound Recording 6
- 57-338 Sound Editing and Mastering 6
- 57-438 Multitrack Recording 9

Choose 59 units from:

- 57-153 Harmony II
or 57-150 Basic Harmony II
- 57-182 Solfege II
or 57-186 Advanced Solfege II
- 10-301 Introduction to Machine Learning (Undergrad) 12
- 15-104 Introduction to Computing for Creative Practice 10
- 15-213 Introduction to Computer Systems 12
- 15-322 Introduction to Computer Music 9
- 18-090 Twisted Signals: Multimedia Processing for the Arts 10

- 33-114 Physics of Musical Sound 9
- 54-166 Introduction to Sound Design for Theatre 6
- 54-275 History of Sound Design 3
- 54-666 Production Audio 6
- 57-161 Eurhythmics I 3
- 57-344 Experimental Sound Synthesis 9
- 57-347 Electronic and Computer Music 6
- 57-358 Introduction to Electronic Music (with instructor permission as space allows) 9
- 57-421 Exploded Ensemble 6
- 57-427 Advanced Seminar in Film Musicology 9
- 57-478 Survey of Historical Recording 6
- 57-622 Independent Study in Sound Recording Production 3
- 60-131 Foundations: Sculpture 10

Note: Students completing an IDEATe minor may double-count up to two of the IDEATe minor courses towards the Audio Recording & Production concentration.

Composition Required Courses (12 courses, 76 units)

- 57-161 Eurhythmics I (recommended co-requisite: 57-181) 3
- 57-181 Solfege I
or 57-180 Basic Solfege I
or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 57-49x BXA Studio (4 semesters) 36
- 57-xxx Major Ensemble (4 semesters) 24

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.
Music Performance Required Courses (12 courses, 76 units)

- 57-161 Eurythmics I (recommended co-requisite: 57-181) 3
- 57-181 Solfege I 3
- 57-180 Basic Solfege I or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 57-49x BXA Studio (4 semesters) 36
- 57-xxx Major Ensemble (4 semesters) 24

A minimum of 23 additional Music units must be approved by the Music advisor. A list of these selected courses must be filed in the BXA office.

Sound Theory & Practice Required Courses (7 courses, 47 units)

- 57-101 Introduction to Music Technology 6
- 57-171 Introduction to Music Technology (self-paced)
- 57-181 Solfege I or 57-180 Basic Solfege I or 57-185 Advanced Solfege I
- 57-173 Survey of Western Music History (co-requisite: 57-188) 9
- 57-188 Repertoire and Listening for Musicians 1
- 18-090 Twisted Signals: Multimedia Processing for the Arts 10
- 57-911 Music Since 1945 9
- 57-616 Independent Study in Sound Studies 9

Choose 52 units from:

- 57-153 Harmony II 9
- 57-150 Basic Harmony II
- 57-182 Solfege II or 57-186 Advanced Solfege II
- 15-104 Introduction to Computing for Creative Practice 10
- 15-322 Introduction to Computer Music (prerequisite: 15-112) 9
- 33-114 Physics of Musical Sound 9
- 57-337 Sound Recording 6
- 57-338 Sound Editing and Mastering 6
- 57-343 Music, Technology, and Culture 9
- 57-344 Experimental Sound Synthesis 9
- 57-347 Electronic and Computer Music (prerequisite: 57-101 or 57-171) 6
- 57-358 Introduction to Electronic Music (with instructor permission as space allows) 9
- 57-421 Exploded Ensemble 6
- 57-438 Multitrack Recording 9
- 57-478 Survey of Historical Recording 6
- 60-131 Foundations: Sculpture 10

Note: Students completing an IDeATe minor may double-count up to two of the IDeATe minor courses towards the Sound Theory & Practice concentration.

Academic Standards and Actions

The College of Fine Arts reviews every CFA student’s academic performance and progress towards graduation at the end of each semester. If a student’s academic record falls below the standards outlined in their student handbook, they receive an academic action. The College may notify the student of specific academic and graduation requirements, outline goals for completion, and identify avenues of support to help them succeed.

A student who is not making satisfactory progress toward meeting course standards, or toward completing graduation requirements in their declared degree path, will receive an academic action. Each academic action will be reviewed by the relevant school’s appointed reviewers and then confirmed by the CFA Academic Advisory Committee, which makes the final decision.

The CFA Dean’s office will disseminate the academic action letters directly to the students and their advisors via their CMU email.

Actions are assigned based on the most recent semester under review but include a cumulative review of a student’s performance to date. The actions listed below may be given out of sequence, if a student meets the listed criteria.

Incomplete grades will be conditionally actioned by the default grades until the student completes the missing coursework. If the student does not complete their missing coursework by the faculty deadline agreed upon, their default grade and action will become permanent.

In order to support academic success, a student placed on an escalated academic action (probation and final probation) is not permitted to overload, undertake independent studies, or study abroad until they return to good standing. (See school/program handbook for specifics.)

Warning

A Warning notifies the student of unsatisfactory performance and suggests that the student take steps to determine and correct the cause of the difficulty. Warnings are issued when one or more of the listed criteria are met within the semester under review:

- Receiving one or more R, D, N, or W grade(s) in a required major course(s);
- Failure to earn the minimum 2.00 quality point average.

If the student meets new actionable criteria in the following semesters, they may be assigned an escalated academic action.

Probation

Probation notifies the student of severe and/or continuous performance issues and suggests that the student take immediate steps to correct the cause of the difficulty. A previous action is not required. A student will be placed on Probation for failure to meet the academic and professional standards of their program including:

- Receiving one or more R, D, N, or W grade(s) in a required major course(s);
- Receiving two or more R, D, N, or W grades in elective or general education courses (either during one semester or over two semesters);
- Failure to complete the semester’s coursework as required by the student’s major curriculum (either two or more courses during one semester or over multiple semesters);
- Failure to earn the minimum 2.00 quality point average.

In order to return to good standing, a student must:

- Receive a C or better in all courses in the next semester;
- Complete required courses within the defined school timeline;
- Have a minimum of 2.00 GPA.

If the student does not meet these standards, they may continue on Probation or be assigned a successive academic action.

Students who are on academic Probation have restrictions from participating in some school, college, and university activities, including eligibility for study abroad or school awards. Refer to school/program handbooks for specific information.

Final Probation

A student will be placed on Final Probation for continued poor performance, or for continued failure to meet the requirements of their declared degree path, as outlined under the previous section on Probation. At least one previous action (warning and/or probation) must have been assigned prior to assigning final probation.

- Receiving multiple R, D, N, or W grades in a required major course(s) for two or more semesters;

Academic Policies

Professional and Community Standards

As a condition of enrollment BXA, and as a student in the College of Fine Arts, we expect you to positively contribute to the community in order to fully engage in the intellectual life at CFA. Classrooms, studios, rehearsal and performance spaces, exhibition venues and off-campus curricular destinations are safe spaces for expression and self-identification. Students are expected to treat everyone with respect, regardless of race, country of origin, gender identity and expression, sexual orientation, disability, physical appearance, age, religion, political affiliation or marital status. Lack of respect and harassment includes offensive comments related to any protected personal characteristic, deliberate intimidation, sustained disruption of speech, inappropriate physical contact and unwelcome sexual attention.

Violations of this agreement are subject to a response to be determined by the BXA Director and CFA Associate Deans.
• Receiving three or more R, D, N, or W grades in elective or general education courses over multiple semesters;
• Failure to complete the semester’s coursework as required by the student’s major curriculum (three or more semesters);
• Continued failure to earn the minimum 2.00 quality point average (two or more semesters).

In order to return to good standing, a student must:
• Receive a C or better in all courses in the next semester;
• Complete required courses within the defined school timeline;
• Have a minimum of 2.00 QPA.

If the student does not meet these standards, they may continue on Final Probation or be assigned a successive academic action.

Students who are on academic Final Probation have restrictions from participating in some school, college, and university activities, including eligibility for study abroad or school awards. Refer to school/program handbooks for specific information.

### Academic Suspension

All University Suspenisons are a required, temporary leave from the university. This document covers Academic Suspension from the University. (For more information on Disciplinary Suspension or Administrative Suspension visit the student life sections on the university website: [https://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html](https://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html)).

An Academic Suspension is intended to allow the student time to address or rectify any issues impeding or affecting their performance and progress towards meeting the academic standards of their declared degree path. The student is required to temporarily withdraw from the university for a specific period as defined in their suspension letter. Return from suspension is also subject to the conditions specified in the suspension letter and approval of the CFA Dean’s office. At least two previous actions must have been assigned prior to assigning Academic Suspension.

A student will be placed on Academic Suspension for:
• Continued history of poor academic performance (three or more semesters);
• Continued lack of progress towards their declared degree (three or more semesters);
• Continued failure to meet the requirements of their declared degree path for continuing in the program; (three or more semesters)
• Failure to earn the minimum 2.00 quality point average. (three or more semesters)

A student returning from an Academic Suspension will be placed on Probation for the semester. In order to return to good standing, a student must:
• Receive a C or better in all courses in the next semester;
• Complete required courses within the defined school timeline;
• Have a minimum of 2.00 QPA.

If the student does not meet these standards, they may be considered for an Academic Drop.

A student who has been suspended from the university is required to leave the campus, including residence halls and fraternity/sorority houses, within a maximum of two days after the action and to remain off the campus for the duration of the time specified in the suspension letter. In addition, the student may not:
• register for courses at Carnegie Mellon
• attend classes
• live in residence halls or fraternity/sorority housing
• use campus facilities, including athletic facilities, library and computer clusters
• participate in student activities
• be members of student organizations
• have student jobs

(Note: students on academic suspension may still be eligible for a summer campus job if they accepted the job before they were suspended.) Go to the university policy webpage on student life for more information on a University Suspension: [https://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html](https://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html)

### Academic Drop

Students receive an Academic Drop from their School only when the student’s academic progress is insufficient to warrant continuing in the current professional field of study. This action terminates the student’s enrollment in their current School/Program but is not intended to prejudice admission to another academic program within Carnegie Mellon University, or to another institution. Once a student receives an Academic Drop they may choose to:

1. Transfer to another CMU Department or School. Noting that the student must successfully transfer prior to resuming study at Carnegie Mellon.
2. Withdraw from Carnegie Mellon University. A link to the application for Withdrawal/Leave of Absence form is embedded with the letter notifying the student of this academic action, and is also available at [https://www.cmu.edu/hub](https://www.cmu.edu/hub).

### Appeal of Academic Action

Students have the right to appeal academic actions. If a student believes an academic action is inconsistent with BXA policies or merits additional review, a student should submit a formal written appeal, as specified in the initial academic action letter, to the assistant/associate deans listed below, with a copy to the deans of both CFA and their academic college. Appeals should include all relevant materials to substantiate their case and support their concerns.

A student may appeal to the relevant assistant/associate deans within seven days from the date of their academic action letter. All appeals should be in written form, under three pages in length (not including appendices) and authored by the student.

BCSA Appeals should be addressed to:
Kristen Letts Kovak, Senior Associate Dean for Academics, College of Fine Arts
Guy Bielloch, Associate Dean for Undergraduate Education, Computer Science Department
BESA Appeals should be addressed to:
Kristen Letts Kovak, Senior Associate Dean for Academics, College of Fine Arts
Conrad Zapanta, Associate Dean for Undergraduate Studies, College of Engineering

### Disabilities

Students with a learning disability or a physical disability are encouraged to email access@andrew.cmu.edu. The circumstances will remain confidential to the extent desired. The university has a formal procedure for documenting disabilities, notifying advisors and faculty, and making arrangements to utilize university resources in support of expressed needs, but will take no action until contacted by the student. The BXA academic advisors will work with the student to coordinate assistance. Please note that requests for accommodations are not retroactive; you must ask that accommodation requests be put in place before you anticipate needing them.

### Grading Policies

University grading policies may vary depending on the particular school/department. Please consult the [Undergraduate Academic Regulations](http://coursecatalog.web.cmu.edu/servicesandoptions/undergraduateacademicregulations/).

### Intercollege Deans’ List

Students who earn 36 graded units (no “pass/no pass” grades) with a grade point average of 3.5 or higher, no “incompletes” and “no grades” qualify
for BCSA, BESA, BHA or BSA Deans’ List. The BXA Intercollege Deans’ List Honors are posted online each semester.

**Intercollege Honors**

BXA students who successfully complete a BXA Capstone Project under the guidance of a faculty member will graduate with BCSA, BESA, BHA, BSA or EA Intercollege Honors if all of the following conditions are met:

- grade of “A” achieved in 62-401 and 62-402;
- overall QPA of 3.25 or higher;
- research results presented at Meeting of the Minds Undergraduate Research Symposium.

As a citizen of two colleges, a BXA student also has the opportunity to graduate with CFA College Honors, DC College Honors, ENG College Honors, MCS College Honors and SCS College Honors. These particular honors are defined by each college. BXA students will receive honors color cords during Commencement Weekend.

**University Honors**

Students who graduate with an overall QPA of 3.5 or higher will graduate with University Honors. Students will receive an honors medallion during Commencement Weekend.

**Internal Transfer/Additional Major Process**

For current Carnegie Mellon students who wish to apply to a BXA program, an internal transfer and additional major (EA) application process takes place in both the fall and spring semester. Applications are available online and are reviewed by a committee of BCSA, BESA, BHA, BSA and EA advisors in October and in March. However, certain concentrations consider applications only once a year; please consult with a BXA advisor for guidance on scheduling your application.

All students applying for internal transfer should meet with their current advisor, a BXA advisor and an advisor in their target area, as well as take preliminary coursework in their target area and complete their first semester before applying. For all concentrations, there are required courses that must be taken before an application will be considered; please consult with a BXA advisor for guidance on scheduling these courses.

Current BXA students who wish to change their BXA program (e.g. BHA to BCSA) or change their CFA concentration (e.g. BHA architecture to BHA art) or delineated options within CFA concentrations (e.g. music performance to music composition) must apply for that change through the internal transfer process. Current BESA, BHA and BSA students who wish to change their academic college concentration after declaring (e.g. BHA creative writing to BHA psychology, BSA physics to BSA mathematical sciences) or delineated options within their academic college concentration (e.g. BESA chemical engineering to BESA mechanical engineering) after declaring must submit a new BESA ENG/BHA DC/BSA MCS Concentration Declaration form for approval of that change. Current BXA students seeking internal transfer out of BXA into another college program must apply and meet entry requirements to that program. Students who do not remain in BCSA can only return to their original major.

**Study Abroad**

Studying abroad is encouraged to broaden BXA students’ interdisciplinary experiences through traditional and non-traditional study abroad, from coursework and artistic studios to for-credit internships, volunteer service and research opportunities.

Courses taken while studying abroad may count toward your BXA concentration requirements, your general education requirements or your free electives. Studying abroad should not delay your graduation, as long as you work with your study abroad advisor and your BXA advisor to plan the most appropriate courses.

The timing and length of program are important considerations while planning. Due to required BXA coursework, students should avoid studying abroad in their last three semesters (junior spring, senior fall/spring). Spending an entire year abroad is not typically possible for BXA students without intending to take an additional semester at Carnegie Mellon. Many students study abroad during the spring of their sophomore year or the fall semester of their junior year, as well as during the summer, and over winter and spring breaks. Talk to your BXA academic advisor early in your academic career to identify the best time for study abroad.

When studying abroad, students are still enrolled at Carnegie Mellon. A student never takes a leave of absence to study abroad. Prior to studying abroad, all students must attend a required pre-departure orientation offered by the Office of International Education (OIE).

Students must also complete a Study Abroad Transfer Credit (SATC) form prior to departure for study abroad, which must be signed after completion by the BXA advisor. The SATC will guarantee transfer credit for courses taken abroad, and is filled out by the corresponding departments to the coursework being transferred. Unlike regular transfer credit, there is no limit to the number of courses transferable from study abroad, but there may exist stricter limits on the use of coursework to fulfill concentration or general education requirements.

Students will receive credit for courses for which they receive a grade of “C” or better. However, grades received abroad do not count toward a student’s Carnegie Mellon University QPA.

**Transfer Credit**

Once a BXA student enrolls at Carnegie Mellon University as a degree candidate, they may transfer a maximum of five courses from another institution (excepting official study abroad programs through the CMU Office of International Education) for credit towards their BXA degree. This applies to courses taken at other institutions in the United States, as well as courses taken internationally in the student’s home country.

Individual departments may impose stricter limits regarding the number or type of courses students propose to take elsewhere to fulfill requirements. Some departments may not accept transfer credit from online courses.

Students must have prior approval to transfer courses from their BXA advisor, as well as concentration advisors, to use coursework towards requirements. To receive permission, students must provide course information (syllabi) to the corresponding department for evaluation of appropriate credit. When the course is finished, official transcripts must be sent to Carnegie Mellon University before credit will be recorded.

Transfer courses must be taken for a letter grade and students must earn a C (2.00) or above (B or above at a community college). Transfer credit is not factored into a student’s CMU QPA.

The following courses must be taken at CMU and cannot be transferred in:

- First-Year Writing Requirement Course (76-101, 76-102, 76-106/108)
- Humanities (79-104, 79-145, 79-189)
- 36-200: Statistical Reasoning (AP credit only)
- 99-101: Computing @ Carnegie Mellon

Students currently on university suspension are permitted to take no more than three courses per semester at another institution and no more than a total of five courses.

**Withdrawal or Leave of Absence**

A student who decides to leave the university must meet with their BXA advisor and complete a Withdrawal or Leave of Absence form. Withdrawal means leaving the university with no intention of returning. Leave of Absence means temporarily leaving the university with a stated intention to return. A withdrawal or leave of absence from the university at any time up to and including the last day of classes (excluding the final examination period), means that grades of W will be recorded for all classes for the semester. Financial responsibility for the semester is dependent upon the date of and the reasons for filing the form. Questions about financial responsibility should be directed to the HUB.

A leave of absence may be voluntary or involuntary. If the leave is voluntary, the student may return any time within four years following the beginning of the leave by filing an Application for Return from Leave of Absence form. If the leave is involuntary, that is, required for academic or disciplinary reasons, the conditions for return will be stated.

Students currently on university suspension are permitted to take no more than three courses per semester at another institution and no more than a total of five courses.