

Dietrich College Interdisciplinary Majors

When addressing complex issues, we often rely on approaches that take advantage of a variety of relevant disciplines. The college houses the special category of "interdepartmental majors" for programs where this interdisciplinary approach is most pronounced and in which the varied disciplinary perspectives are most fully integrated. These majors are presented here separately, rather than as departmentally-based options, to reflect and underscore their sponsorship by more than one academic department and the unique features that follow from this structure.

Interdepartmental majors are administered by the academic department of the major's faculty advisor.

The Major in Economics and Politics

Audrey Kurth Cronin, *Director, and Trustees Professor of Security and Technology*
acronin@andrew.cmu.edu, Posner Hall 385A

Emily Half, *Deputy Director for Academic Affairs*
ehalf@andrew.cmu.edu, Posner Hall 391, 412-268-7082

Politics and economics are deeply interconnected. Political institutions and decision-making impact economic growth, income distribution, and many other aspects of economic life. Both fiscal and monetary policies affect the economy: but these policies also reflect political considerations and influence political outcomes. For example, while the United Nations is often thought of in purely political terms, the Security Council can and does impose sanctions on countries-- an example of an economic policy used for political change.

The Economics and Politics major is offered jointly between the Carnegie Mellon Institute for Strategy and Technology (<https://www.cmu.edu/cmist/>) (CMIST) and the Undergraduate Economics Program (<https://www.cmu.edu/tepper/programs/undergraduate-economics/>) (UEP). The major will appeal to any student interested in the design, evaluation, and political implementation of economic policy. It will be especially attractive to students considering careers in politics, government agencies, political and business consulting, lobbying, or the law.

The BS in Economics and Politics is an interdisciplinary major. The major will develop the political context and underpinnings of economic policy making. It will explore how political institutions resolve the tradeoffs and disagreements associated with policymaking and how they can facilitate or impede desirable economic outcomes.

CMIST's strengths lie in topics such as emerging technology, national security, and grand strategy. Economic policy is one facet of grand strategy through which governments pursue domestic and international goals. This major will enable students to understand economic statecraft from a broad perspective. It will address key issues such as how multilateral economic institutions such as the IMF and World Bank use economic coercion. Whether coercion is successful or not depends not only on the levers of power but on also on variations in regime structures, alongside complex linkages in the international economy. For example, the viability of the "Euro Zone" depends on whether the political-economic agreements necessary to mitigate institutional weaknesses are politically feasible or destined to failure. In short, international economics affects everything from human rights practices to trade patterns to energy markets to tech company investments to global compliance with climate change treaties.

Economics and Politics is available as both a primary and an additional major. The requirements are the same for both.

Curriculum

A maximum of four courses may double count between the Economics and Politics major and any other majors or minor. Unlimited double counting is permitted with general education requirements.

Mathematics (19 units)

Students must complete all of the following courses.

21-120	Differential and Integral Calculus	10
or 21-112	Integral Calculus	
21-256	Multivariate Analysis	9
or 21-259	Calculus in Three Dimensions	

Economics Core (54 units)

Students must complete all of the following courses.

73-102	Principles of Microeconomics *	9
or 73-104	Principles of Microeconomics Accelerated	
73-103	Principles of Macroeconomics	9
73-230	Intermediate Microeconomics	9
73-240	Intermediate Macroeconomics	9
73-265	Economics and Data Science	9
73-274	Econometrics I	9

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

Political Science Core (57 units)

Students must complete all of the following courses.

84-101	Introduction to Political Science	9
84-250	Writing for Political Science and Policy	9
84-266	Research Design for Political Science	9
84-310	Policy in a Global Economy 1: International Trade and Trade Policy	6
84-311	Policy in a Global Economy 2: International Macroeconomics and Finance	6

Students must complete two of the following three courses. If all three are taken, the third can count as an elective.

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

Electives (27 units)

Majors are required to take 27 units (usually three courses) from the elective lists below. At least 9 units (typically one course) must be taken from Economics (73-xxx) and at least 9 units (typically one course) must be taken from the Carnegie Mellon Institute for Strategy and Technology (84-xxx). Students may complete electives through coursework in the Carnegie Mellon University Washington Semester Program (CMU/WSP) (<https://www.cmu.edu/cmist/washington-center/washington-semester-program/>).

Economics Electives

73-328	Health Economics	12
73-332	Political Economy	9
73-338	Financial Crises and Risk	9
73-348	Behavioral Economics	9
73-352	Public Economics	9
73-353	Financial Regulation in the Digital Age	9
73-365	Firms, Market Structures, and Strategy	9
73-421	Emerging Markets	9
73-427	Sustainability, Energy, and Environmental Economics	9

Political Science Electives

84-120	Introduction to US Constitutional Law	9
84-200	Security War Game Simulation	6
84-252	Briefing in the Policy World	6
84-274	An Introduction to Technology and War	9
84-280	Popcorn and Politics: American Foreign Policy at the Movies	12
84-303	International Human Rights	6
84-304	Analysis of Current US National Security Priorities	6
84-306	Latin American Politics	9
84-309	American Political Divides and Great Debates	9
84-312	Terrorism in Sub-Saharan Africa	6
84-314	Politics, Technological Change, and Economic Growth	9
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	Who Really Runs America?: Subnational Governance and Policymaking	9
84-328	Military Strategy and Doctrine	9
84-329	Asian Strategies	6
84-331	Technology, Law, and Democracy	6
84-332	Contemporary US Constitutional Law Issues Taught in Washington, DC, through CMU/WSP	6
84-333	Law of US Democracy	9
84-338	Analysis of US Presidential Powers Taught in Washington, DC, through CMU/WSP	6
84-341	Transnational Criminal Networks & International Security	6
84-349	Digital Diplomacy: Cybersecurity Challenges and Global Governance	9
84-350	A Strategist's Introduction to Artificial Intelligence	9
84-352	Representation and Voting Rights	9
84-355	Democracy's Data: Analytics and Insights into American Elections	9
84-356	Applied Political Data Analytics	9
84-358	Money, Connections, and Power: Interests and Influence in the US	9
84-360	CMU/WSP: Internship Seminar Taught in Washington, DC, through CMU/WSP	24
84-362	Diplomacy and Statecraft	9
84-363	Click. Hack. Rule: Understanding the Power & Peril of Cyber Conflict	9
84-365	The Politics of Fake News and Misinformation	9
84-366	The 21st-Century Presidency: Expanding Powers, New Challenges	9
84-367	The Politics of Antisemitism	9
84-368	Technology Ethics	9
84-369	Decision Science for International Relations	9
84-370	Nuclear Security & Arms Control	9
84-371	International Governance of Artificial Intelligence	9
84-372	Space and National Security	9
84-373	International Law	9
84-380	US Grand Strategy	9
84-383	National Cyber Policy & Strategy	6
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	The US Congress: Legislative Progress or Paralysis?	9
84-402	Judicial Politics and Behavior	9
84-405	The Future of Warfare	9
Additional Electives		
19-411	Science and Innovation Leadership for the 21st Century: Firms, Nations, and Tech	9
70-365	International Trade and International Law	9
70-430	International Management	9
79-280	Coffee and Capitalism	9
79-318	Sustainable Social Change: History and Practice	9
80-135	Introduction to Political Philosophy	9
80-136	Social Structure, Public Policy & Ethics	9
80-335	Social and Political Philosophy	9
80-348	Health, Human Rights, and International Development	9
80-447	Global Justice	9
88-366	Behavioral Economics of Poverty and Development	9
88-411	Rise of the Asian Economies	9

CAPSTONE (18-30 units)

Students must complete all of the following courses.

73-497	Senior Project or Senior Honors Thesis in Dietrich or Tepper (18 units total)	12
84-500	Senior Seminar	9

Note: Students in the BS in Economics and Politics who complete a Dietrich or Tepper Honors Thesis in economics may use 73-497 (Senior Project) as an economics elective.

Sample four-year plan

These sample curricula represent a plan for completing the requirements for the B.S. in Economics and Politics. Economics and Politics students are encouraged to spend a semester studying and interning in Washington, DC, through the CMU/WSP (<https://www.cmu.edu/cmist/washington-center/washington-semester-program/>), and/or study abroad. The plan below demonstrates that a semester off-campus fits well into the curriculum. Students may declare the BS in Economics and Politics as early as the second semester of the freshman year and should consult frequently with the CMIST advisor about their course of study. Please note that this is only a sample plan of study and not the only possible plan of study. The Economics and Politics major and Dietrich College General Education curricula provide a high degree of flexibility in sequencing and coursework. Double counting between the major and General Education requirements is unlimited. The plan below shows a very conservative view of double counting.

First-Year		Second-Year	
Fall	Spring	Fall	Spring
21-120 Differential and Integral Calculus	21-256 Multivariate Analysis	73-230 Intermediate Microeconomics	73-240 Intermediate Macroeconomics
36-200 Reasoning with Data	73-103 Principles of Macroeconomics	73-265 Economics and Data Science	73-274 Econometrics I
73-102 Principles of Microeconomics	84-275 Comparative Politics 1 of 3 options; students must take 2	84-104 Decision Processes in American Political Institutions 1 of 3 options; students must take 2	84-250 Writing for Political Science and Policy
84-101 Introduction to Political Science	84-226 International Relations 1 of 3 options; students must take 2	84-266 Research Design for Political Science	84-310 Policy in a Global Economy 1: International Trade and Trade Policy
Grand Challenge Seminar	First-Year Writing	General Education	84-311 Policy in a Global Economy 2: International Macroeconomics and Finance
99-101 Core@CMU	Disciplinary Perspectives: Humanities		General Education

Third-Year		Fourth-Year	
Fall	Spring	Fall	Spring
General Education	CMU/WSP or Study Abroad	73-497 Senior Project	84-500 Senior Seminar
General Education	Explore	General Education	General Education
General Education	Explore	Economics & Politics Elective	Explore
General Education	Explore	Economics & Politics Elective	Explore
Economics & Politics Elective	Explore	Explore	Explore

The Major in Economics and Statistics**B.S. in Economics and Statistics**

Peter Freeman, *Undergraduate Program Director*

Location: Baker Hall 229
pfreeman@andrew.cmu.edu

Zach Branson, *Assistant Director of the Undergraduate Program*

Location: Baker Hall 232
zbranson@andrew.cmu.edu

Amanda Mitchell, *Lead Senior Academic Advisor*

Sylvie Aubin, *Academic Program Manager*

Location: Baker Hall 129
statadvising@andrew.cmu.edu (statadvising@stat.cmu.edu)

The Major in Economics and Statistics provides an interdisciplinary course of study aimed at students with a strong interest in the empirical

analysis of economic data. With a joint curriculum from the Department of Statistics and Data Science and the Undergraduate Economics Program, the major provides students with a solid foundation in the theories and methods of both fields. Students in this major are trained to advance the understanding of economic issues through the analysis, synthesis and reporting of data using the advanced empirical research methods of statistics and econometrics. Graduates are well positioned for admission to competitive graduate programs, including those in statistics, economics and management, as well as for employment in positions requiring strong analytical and conceptual skills - especially those in economics, finance, education, and public policy.

Curriculum

The requirements for the B.S. in Economics and Statistics are the following:

1. MATHEMATICAL FOUNDATIONS (PREREQUISITES) 39-52 UNITS

Mathematics is the language in which statistical models are described and analyzed, so some experience with basic calculus and linear algebra is an important component for anyone pursuing a program of study in Economics and Statistics.

Complete the following:

21-090	Precalculus	10
Complete one of the following options:		
21-111	Differential Calculus	10
21-112	Integral Calculus	10
OR		
21-120	Differential and Integral Calculus	10
And one of the following three courses:		
21-256	Multivariate Analysis	9
21-259	Calculus in Three Dimensions	10
21-268	Multidimensional Calculus	11
And one of the following three courses:		
21-240	Matrix Algebra with Applications	10
21-241	Matrices and Linear Transformations	11
21-242	Matrix Theory	11

NOTES:

- Passing the Mathematical Sciences assessment tests available during First-Year Orientation is an acceptable alternative to completing 21-090 and/or 21-120.
- It is recommended that students complete the calculus requirement during their freshman year.
- The linear algebra requirement needs to be completed before taking 36-401 Modern Regression.
- 21-241 and 21-242 are intended only for students with a very strong mathematical background.

2. ECONOMICS FOUNDATIONS 18 UNITS

Take one of the following courses:

73-102	Principles of Microeconomics *	9
73-104	Principles of Microeconomics Accelerated **	9

Take the following course:

73-103	Principles of Macroeconomics	9
--------	------------------------------	---

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

**This course requires students to complete a 4 or 5 on the AP Microeconomics exam or qualifying score on the IB/Cambridge Exams. 73-104 will substitute for any 73-102 prerequisite requirement in other courses. 73-104 is a more rigorous introduction to microeconomics, is taught at a faster pace than 73-102, and dives a bit deeper into key topics. It is designed for students who have prior knowledge to fundamental economic concepts through AP/IB/Cambridge coursework. Enrollment in 73-104 requires special permission. Students who wish to take this course should add themselves to the 73-104 waitlist once registration opens. The Tepper School will verify the advancement placement scores and will enroll students in 73-104

3. STATISTICAL FOUNDATIONS 27 UNITS

DATA ANALYSIS

Data analysis is the art and science of extracting insight from data. The art lies in knowing which displays or techniques will reveal the most interesting features of a complicated data set. The science lies in understanding the

various techniques and the assumptions on which they rely. Both aspects require practice to master.

The Beginning Data Analysis courses give a hands-on introduction to the art and science of data analysis. The courses cover similar topics but differ slightly in the examples they emphasize. 36-200 draws examples from many fields and satisfy the Dietrich College Core Requirement in Statistical Reasoning. This course is therefore required for students in the college. (Note: a score of 5 on the Advanced Placement [AP] Exam in Statistics may be used to waive this requirement). 36-220 emphasizes examples in engineering.

The Advanced Data Analysis courses draw on students' previous experience with data analysis and understanding of statistical theory to develop advanced, more sophisticated methods. These core courses involve extensive analysis of real data with emphasis on developing the oral and writing skills needed for communicating results.

Beginning Data Analysis

Choose *one* of the following courses:

36-200	Reasoning with Data *	9
36-220	Engineering Statistics and Quality Control	9

*A score of 5 on the Advanced Placement (AP) Exam in Statistics may be used to waive this requirement. 36-220 emphasizes examples in engineering and Architecture.

Note: Students who enter the program with credit for probability and statistical inference should discuss options with an advisor.

Advanced Statistics Elective

Choose *two* of the following courses:

36-303	Sampling, Survey and Society	9
36-311	Statistical Analysis of Networks	9
36-313	Statistics of Inequality and Discrimination	9
36-315	Statistical Graphics and Visualization	9
36-318	Introduction to Causal Inference	9
36-460	Special Topics: Sports Analytics	9
36-461	Special Topics: Statistical Methods in Epidemiology	9
36-462	Special Topics: Statistical Machine Learning	9
36-463	Special Topics: Multilevel and Hierarchical Models	9
36-464	Special Topics: Psychometrics: A Statistical Modeling Approach	9
36-465	Special Topics: Conceptual Foundations of Statistical Learning	9
36-466	Special Topics: Statistical Methods in Finance	9
36-467	Special Topics: Data over Space & Time	9
36-468	Special Topics: Text Analysis	9
36-469	Special Topics: Statistical Genomics and High Dimensional Inference	9
36-470	Special Topics: Statistical Methods in Health Sciences	9
36-471	Special Topics: Time Series	9
36-490	Undergraduate Research	9
36-493	Sports Analytics Capstone	9
36-497	Corporate Capstone Project	9

**Note: All Special Topics are not offered every semester, and new Special Topics are regularly added.

4. ECONOMICS CORE 27 UNITS

73-230	Intermediate Microeconomics	9
73-240	Intermediate Macroeconomics	9
70-340	Business Communications	9

5. ECONOMICS QUANTITATIVE ANALYSIS REQUIREMENTS 27 UNITS

Complete the following:

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

Take one of the following courses:

73-374	Econometrics II	9
73-423	Forecasting for Economics and Business	9
70-467	Machine Learning for Business Analytics	9

6. PROBABILITY THEORY AND STATISTICAL THEORY 18 UNITS

The theory of probability gives a mathematical description of the randomness inherent in our observations. It is the language in which statistical models are stated, so an understanding of probability is essential for the study of statistical theory. Statistical theory provides a mathematical framework for making inferences about unknown quantities from data. The theory reduces statistical problems to their essential ingredients to help devise and evaluate inferential procedures. It provides a powerful and wide-ranging set of tools for dealing with uncertainty.

To satisfy the theory requirement, complete the following:

Take one of the following courses:

36-235	Probability and Statistical Inference I	9
36-225	Introduction to Probability Theory	9

Take one of the following courses:

36-236	Probability and Statistical Inference II	9
36-226	Introduction to Statistical Inference	9
36-326	Mathematical Statistics (Honors)	9

*In order meet the prerequisite requirements for the major, a grade of C or better is required in 36-235 (or equivalents), 36-236 or 36-326 and 36-401.

#It is possible to substitute 36-218 , 36-219, 36-225, 15-259, or 21-325 for 36-235. 36-235 is the standard introduction to probability, 36-219 is tailored for engineers and computer scientists, 36-218 and 15-259 are more mathematically rigorous classes for Computer Science students and more mathematically advanced Statistics students (Statistics students need advisor approval to enroll), and 21-325 is a rigorous Probability Theory course offered by the Department of Mathematics.

**It is possible to substitute 36-226 or 36-326 for 36-236. 36-236 is the standard introduction to statistical inference.

Please note that students who complete 36-235 are expected to take 36-236 to fulfill their theory requirements. Students who choose to take 36-225 instead will be required to take 36-226 afterward, they will not be eligible to take 36-236.

Comment:

(i) In order to meet the prerequisite requirements, a grade of at least a C is required in 36-235 (or equivalent) and 36-236 (or equivalent).

7. MODERN REGRESSION AND ADVANCED METHODOLOGY 18 UNITS

Central to the practice of statistics is the implementation and interpretation of statistical models. The purpose of statistical models is to represent data-generating processes, such that predictions and inferential conclusions can be made about real-world phenomena. Proper modeling involves not just coding, but also thinking critically about data, research goals, and the validity of the models themselves, given their intrinsic assumptions. The courses 36-401 and 36-402 focus on the theory of statistical models (especially linear models and their extensions), how they are applied in real data analyses, and how to interpret and present these analyses in written reports.

Complete the following courses:

36-401	Modern Regression	9
36-402	Advanced Methods for Data Analysis	9

Note: In order to meet the prerequisite requirements, a grade of at least a C is required in 36-401.

8. STATISTICAL COMPUTING 19-21 UNITS

Fundamental to the practice of statistics and data science is the ability to effectively code data processing and analysis tasks. Within the domain of statistics, the use of the programming language R is ubiquitous, and thus we expose students to it throughout the curriculum (and in depth in Statistical Computing). Within the larger domain of data science, the use of the programming language Python is also ubiquitous, and thus we require all majors to gain, at a minimum, basic competency in the language by taking either Principles of Computing, or Fundamentals of Programming and Computer Science. We would advise those students who are considering receiving course credit for one of these two courses given their score on the AP Computer Science A exam to actually take one (or both) of them at Carnegie Mellon instead, as within data science as a whole Python is far more widely used than Java.

Take one of the following two courses:

15-110	Principles of Computing	10
--------	-------------------------	----

15-112	Fundamentals of Programming and Computer Science	12
--------	--	----

02-120	Undergraduate Programming for Scientists	12
--------	--	----

Complete the following course:

36-350	Statistical Computing	9
--------	-----------------------	---

9. ECONOMICS ELECTIVES 18 units

Students must take two advanced Economics elective courses, numbered 73-3xx and higher (excluding 73-497 and other colloquium and related courses).

73-374 or 73-423 can count toward the Advanced Economics Elective requirement if they are not being used to fulfill the Advanced Quantitative Analysis requirement.

Total number of units for the major 202-218 Units

Total number of units for the degree 360 Units

Recommendations for Prospective Ph.D. Students

Students interested in pursuing a Ph.D. in Statistics or Biostatistics (or related programs) after completing their undergraduate degree are strongly recommended to pursue the **B.S. in Statistics (Mathematical Sciences Track)** or to take additional Mathematics courses. Although 21-240 Matrix Algebra with Applications is recommended for Statistics majors, students interested in PhD programs should consider taking 21-241 Matrices and Linear Transformations or 21-242 Matrix Theory instead. Additional courses to consider are 21-228 Discrete Mathematics, 21-341 Linear Algebra, 21-355 Principles of Real Analysis I, and 21-356 Principles of Real Analysis II. Students interested in pursuing a PhD in Economics are strongly encouraged to conduct research in Economics. We also recommend that students interested in pursuing a Ph.D. gain some research experience during their undergraduate degree, as discussed further in the Research section below. Internships that involve meaningful real data analysis are also looked upon favorably in PhD programs.

Additional Major in Economics and Statistics

Students who elect Economics and Statistics as an additional major must fulfill all Economics and Statistics degree requirements. Majors in many other programs would naturally complement an Economics and Statistics Major, including Tepper's undergraduate business program, Social and Decision Sciences, Policy and Management, and Psychology.

With respect to double-counting courses, it is departmental policy that students must have at least six courses (three Economics (73-xxx) and three Statistics (36-xxx)) that do *not* count for their primary major. If students do not have at least three ECON and three STA classes, they will need to take additional advanced data analysis or economics electives, depending on where the double-counting issue is.

Students are advised to begin planning their curriculum (with appropriate advisors) as soon as possible. This is particularly true if the other major has a complex set of requirements and prerequisites or when many of the other major's requirements overlap with the requirements for a Major in Economics and Statistics.

Substitutions and Waivers

Many departments require Statistics courses as part of their Major or Minor programs. Students seeking transfer credit for those requirements from substitute courses (at Carnegie Mellon or elsewhere) should seek permission from their advisor. The final authority in such decisions rests there. The Department of Statistics and Data Science does not provide approval or permission for substitution or waiver of another department's requirements.

If a waiver or substitution is made in the home department, it is not automatically approved in the Department of Statistics and Data Science. In many of these cases, the student will need to take additional courses to satisfy the Economics and Statistics major requirements. Students should discuss this with a Statistics advisor when deciding whether to add an additional major in Economics and Statistics.

Note on additional major and minor pairings

All students pursuing the B.S. in Economics and Statistics as a primary major are prohibited from also pursuing a minor or additional major in Economics due to the significant overlap in their respective curriculums. Please see your academic advisor if you have further questions.

Research

The Statistics & Data Science program encourages students to gain research experience. Opportunities within the department include Summer Undergraduate Research Apprenticeships (SURA), run in association with the university's Office of Undergraduate Research and Scholar Development, and the departmental capstone courses 36-490 Undergraduate Research, 36-493 Sports Analytics Capstone, or 36-497 Corporate Capstone Project. (Note that these courses require an application.) Additionally, students can pursue independent study. For those students who maintain a quality point average of 3.25 overall or above, there is also the Dietrich College Senior Honors Program (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/#collegeservicesandprograms>).

The faculty in the Statistics & Data Science department largely work within the domains of statistical theory and methodological development, areas that require advanced mathematical training. Thus we encourage students to search broadly for research opportunities: faculty, post-doctoral researchers, and graduate students in many departments throughout the university have data to analyze and would welcome the help of undergraduate statistics students.

Sample Program

The following sample program illustrates one way to satisfy the requirements of the Economics and Statistics Major. Keep in mind that the program is flexible and can support other possible schedules (see footnotes below the schedule).

First-Year		Second-Year	
Fall	Spring	Fall	Spring
21-090 Precalculus	21-120 Differential and Integral Calculus	21-256 Multivariate Analysis	36-236 Probability and Statistical Inference II
36-200 Reasoning with Data	73-103 Principles of Macroeconomics	36-235 Probability and Statistical Inference I	21-240 Matrix Algebra with Applications
73-102 Principles of Microeconomics	70-340 Business Communications	73-230 Intermediate Microeconomics	73-240 Intermediate Macroeconomics
First-Year Writing	15-110 Principles of Computing	73-265 Economics and Data Science	73-274 Econometrics I
	----	----	----
	----		----

Third-Year		Fourth-Year	
Fall	Spring	Fall	Spring
36-350 Statistical Computing	36-402 Advanced Methods for Data Analysis	36-3xx or 36-4xx Advanced Data Analysis Elective	36-3xx or 36-4xx Advanced Data Analysis Elective
36-401 Modern Regression	----	Economics Elective	Economics Elective
Advanced Quantitative Analysis Course	----	----	----
----		----	----
----		----	----

*In each semester, ---- represents other courses (not related to the major) which are needed in order to complete the 360 units that the degree requires.

Prospective PhD students are advised to add 21-127 fall of sophomore year, replace 21-240 with 21-241, add 21-260 in spring of junior year and 21-355 in fall of senior year.

The Major in Ethics, History, and Public Policy

Professor Steven Schlossman, Director of Ethics, History, and Public Policy, History Department
 Location: Baker Hall 236A, 412-268-2880
 sls@andrew.cmu.edu

Patrick Doyle, Senior Academic Program Manager, Philosophy Department
 Location: Baker Hall 161G, 412-268-3704
 pdoyle2@andrew.cmu.edu

Dr. Alexandra Garnhart-Bushakra, Academic Program Manager, History Department
 Location: Baker Hall 240G, 412-268-1260
 agarnhar@andrew.cmu.edu

Ms. Beth Jameson, M.A., Academic Advisor and Humanities Coordinator, History Department
 Location: Baker Hall 240A, 412-268-5666,
 bjameson@andrew.cmu.edu

The B.A./B.S. in Ethics, History, and Public Policy (EHPP) is an interdepartmental major offered jointly by the Departments of History and Philosophy.

Preparing students to be leaders is 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.

Curriculum

Students seeking a primary major in Ethics, History, and Public Policy may elect to receive either a Bachelor of Arts or a Bachelor of Science degree (additional requirements apply; see below). Basic requirements include 120 units encompassing 45 units in History, 45 units in Philosophy, 18 units in Law and Social Science, and a 12-unit EHPP Capstone Course. This program may also be taken as an additional (i.e., second) major. All courses toward the major must be taken for a letter grade and must be passed with a grade of "C" or better. Students can double count any course for the major with another major or minor, with the exception of Social and Political History, for which a student can double count a maximum of two courses.

I. Foundation Courses in History and Philosophy 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

II. Ethics and Policy Core 36 units

Choose four 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
80-324	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

III. History and Policy Core 36 units

Choose four of the courses below:

79-145	Genocide and Weapons of Mass Destruction	9
79-175	Moneyball Nation: Data in American Life	9
79-178	Equality Under the Law	9
79-212	Jim Crow America	9
79-215	Environmental Justice from Conservation to Climate Change	9
79-230	The Arab-Israeli Conflict and Peace Process Through 1948 to Present	9
79-234	Technology and Society	9
79-246	War, Genocide, and Gender in Modern Europe	9
79-248	U.S. Constitution & the Presidency	9
79-250	Voting Rights: An Introduction	9
79-260	Nazi Germany: A Practical History	9
79-270	Anti-Semitism Then and Now: Perspectives from the Middle Ages to the Present	9
79-278	How (Not) to Change the World	9
79-289	Animal Planet: An Environmental History of People and Animals	9
79-290	The Slave Passage: From West Africa to the Americas	9
79-296	Religion in American Politics	6
79-300	Controversial Topics in the History of American Public Policy	9
79-302	Killer Robots? The Ethics, Law, and Politics of Drones and A.I. in War	9
79-320	Women, Politics, and Protest	9
79-321	Documenting Human Rights	9
79-329	LGBTQ+ History	9
79-330	Medicine and Society: Health, Healers, and Hospitals	9
79-343	Education, Democracy, and Civil Rights	9
79-355	Fake News: "Truth" in the History of American Journalism	6
79-360	Crime, Policing, and the Law: Historical and Contemporary Perspectives	9
79-380	Hostile Environments: The Politics of Pollution in Global Perspective	9

IV. Foundation Courses in Law and Social Science 18 units

Choose two of the courses below:

17-200	Ethics and Policy Issues in Computing	9
19-101	Introduction to Engineering and Public Policy	12
70-332	Business, Society and Ethics	9
73-102	Principles of Microeconomics	9
73-103	Principles of Macroeconomics	9
84-104	Decision Processes in American Political Institutions	9
84-110	The Economics of Politics and Technology	9
84-352	Representation and Voting Rights	9
84-393	The US Congress: Legislative Progress or Paralysis?	9
84-402	Judicial Politics and Behavior	9
88-281	Topics in Law: 1st Amendment	9
88-284	Topics of Law: The Bill of Rights	9

EHPP students will also be able to complete the Foundations of Law and Social Science category by participating in the Washington Semester

Program. Students are encouraged to pursue additional policy-relevant courses in law and social science, along lines consistent with their career ambitions.

V. EHPP Capstone Course 12 units

In Fall semester of senior year, EHPP students will participate in an interdisciplinary capstone course that asks students to integrate their studies in Ethics and History by addressing a policy topic of contemporary national urgency (e.g., climate change, immigration, infrastructure, abortion, hate speech, reparations, law enforcement and policing, charter schools, affirmative action, vaccination, taxation, voting rights, global justice). The Departments of History and Philosophy will alternate teaching the EHPP Capstone Course.

79-449	EHPP Capstone Course [cross-listed]	12
80-449	EHPP Capstone Course [cross-listed]	12

VI. Bachelor of Science Option

Students may elect to earn a Bachelor of Science rather than a Bachelor of Arts degree by completing two courses from the list below, or by petitioning the Director of EHPP to accept equivalent courses as substitutions.

36-202	Methods for Statistics & Data Science	9
or 70-208	Regression Analysis	
36-303	Sampling, Survey and Society	9
36-309	Experimental Design for Behavioral & Social Sciences	9
70-257	Optimization for Business	9
80-305	Game Theory	9
80-306	Decision Theory	9
88-221	Markets, Democracy, and Public Policy	9
88-223	Decision Analysis	12
88-251	Empirical Research Methods	9
88-300	Programming and Data Analysis for Social Scientists	9

Additional Major

The B.A./B.S. in Ethics, History, and Public Policy may be scheduled as an additional major in consultation with the Director of Ethics, History, and Public Policy.

Ethics, History, and Public Policy Sample Curriculum

Third-Year		Fourth-Year	
Fall	Spring	Fall	Spring
Foundations Course in History	Foundations Course in Law and Social Sciences	EHPP Capstone Course	Ethics and Policy Core Course
Foundations Course in Philosophy	Foundations Course in Law and Social Sciences	Ethics and Policy Core Course	History and Policy Core Course
Ethics and Policy Core Course	Ethics and Policy Core Course	History and Policy Core Course	Third Course (open)
History and Policy Core Course	History and Policy Core Course	Fourth Course (open)	Fourth Course (open)
Fifth Course Open	Fifth Course (open)	Fifth Course (open)	Fifth Course (open)

The above sample program is presented as a two-year (junior-senior year) plan for completing EHPP major requirements. Its purpose is to show that this program can be completed in as few as two years; not that it must be.

Students may enter the EHPP major, and begin major course requirements, as early as they wish. Students should consult their advisor when planning their program.

The Major in Information Systems

Joseph S. Mertz, Jr., Faculty Program Director
Location: Hamburg Hall 3028, JoeMertz@cmu.edu

Artificial intelligence. Machine learning. Deep learning. Big data. Social networks. Neural networks. Robotics. Automated voice assistants. Blockchain. Driverless vehicles. Web design. Carnegie Mellon University's Information Systems (IS) program (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/informationssystemsf/>) will help you do just that. At CMU, Information Systems is a joint degree program between Heinz College and Dietrich College of Humanities and Social Sciences and is strongly technical, drawing from Carnegie Mellon's leadership in computer science, human-centered

design, business management, and software engineering. It is deeply rooted in the humanities and social sciences, allowing students the lifelong benefits of a rich liberal arts education. And it provides pathways for students to find their own Information Systems niche through advanced study and exploration with leading researchers.

In addition to General Education Requirements and basic prerequisites in Mathematics and Computer Science, The IS program curriculum includes a broad grounding in humanities and social sciences to promote critical thinking, and interdisciplinary problem-solving, an Information Systems Core to provide business-facing skills needed to design and build effective real-world systems solutions, an Information Systems Breadth focused on professional communications, quantitative analysis, and how technology functions in society, and a concentration that gives you the flexibility and agency to gain expertise in a supporting area and define your own niche in IS.

The IS major is the perfect place for you if you are passionate about using technology for positive gains across society, both economic and humanistic.

For full program information, go to The Major in Information Systems (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/informationssystemsf/>).

The Major in Linguistics

Patrick Doyle, *Senior Academic Program Manager*

Location: Baker Hall 161G

pdoyle2@andrew.cmu.edu

<https://go.oncehub.com/PatDoyle> (<https://go.oncehub.com/PatDoyle/>)

Linguistics is the scientific study of human language. The central goal of the Linguistics Major is to provide students with the analytical skills and linguistic concepts needed to understand language scientifically, whether formally, as researchers, or informally, as participants in daily linguistic interactions. The foundation of the Linguistics Major is a set of rigorous core courses, informed by contemporary approaches to the study of linguistic form and meaning.

The **Core courses** cover the principal domains of linguistic analysis: phonetics and phonology, syntax and meaning.

Students then move on to the **Extended Core**, which includes more advanced courses as well as courses on a wider range of topics, such as intonation and language variation. These courses are supplemented by a wide-ranging set of electives including linguistically relevant courses taught in other departments.

Primary majors complete their course of study with a Senior Thesis, a semester-long research project carried out independently with one-on-one guidance from a member of the linguistics faculty.

Curriculum

The Linguistics **primary major** requires a total of 12 courses plus a senior thesis. The Linguistics **additional major** requires a total of 13 courses (senior thesis not required). This includes 2 semesters of sequential language study for all majors. At least three courses (not including specific language courses) must be at the 300-level or higher. All courses counted towards the major must be taken for a letter grade and passed with a grade of "C" or above. No more than two courses transferred from another institution may count towards the major requirements. Students may double count any course for the major simultaneously with another major or minor.

Linguistics Core (36 units)

Complete the following requirements.

80-180	Introduction to Linguistics	9
80-282	Phonetics and Phonology I	9
80-280	Linguistic Analysis	9
or 80-285	Natural Language Syntax	
80-381	Meaning in Language	9
or 80-383	Language in Use	

Extended Core (27 units)

Choose three courses (27 units) from Extended Core and/or additional courses from Linguistics Core.

36-468	Special Topics: Text Analysis	9
76-389	Rhetorical Grammar	9
80-283	It Matters How You Say It	9
80-286	Words and Word Formation: Introduction to Morphology	9

80-287	Language Variation and Change	9
80-288	Intonation: The Meaning of Linguistic Tunes	9
80-382	Laboratory Phonology	9
80-384	Linguistics of Turkic Languages	9
80-385	Linguistics of Germanic Languages	9
80-388	Linguistic Typology: Diversity and Universals	9
80-484	Language and Thought	9
80-488	Acoustics of Human Speech: Theory, Data, and Analysis	9

Electives

Primary and additional majors choose **six** additional electives (54 or more units). These Electives can be additional courses from the Core or Extended Core courses listed above, the electives list below, or any other course which is approved by the Senior Academic Program Manager as a linguistics elective. Up to two electives may be taken as a sequence of a foreign language. Up to one elective may be taken in the form of a senior thesis.

Listed below are the additional electives taught on a regular basis. Additional appropriate courses are offered irregularly or on a one-off basis. The Senior Academic Program Manager will provide students with a list of possible electives each semester, and will assist students in selecting electives which are consistent with their goals and interests.

Philosophy		
80-484	Language and Thought	9
80-486	RAship in Linguistics ^{Up to 12 units}	Var.
English		
76-318	Communicating in the Global Marketplace	9
76-325	Intertextuality	9
76-380	Methods in Humanities Analytics	9
76-386	Language & Culture	9
76-388	Coding for Humanists	9
76-389	Rhetorical Grammar	9
Languages, Cultures, and Applied Linguistics		
82-239	Crazy Linguistically Rich Asian Languages	9
82-283	Language Diversity & Cultural Identity	9
82-334	Structure of Chinese	9
82-373	Structure of the Japanese Language	9
82-387	Introduction to Linguistic Data Analysis Using R	9
82-383	Second Language Acquisition: Theories and Research	9
Psychology		
85-354	Infant Language Development	9
85-421	Language and Thought	9
Language Technologies Institute		
11-411	Natural Language Processing	12
11-423	ConLing: Lrng Ling & Lang Tech via Constr Artif. Lang	12
11-492	Speech Technology for Conversational AI	12

Note: all 11-xxx courses have significant Computer Science prerequisites. Interested students should check with the course instructor and with the Linguistics Senior Academic Program Manager before registering.

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

SENIOR THESIS (optional)

Students who wish to complete a senior thesis (a workload equivalent to a 9-unit course), may choose to do so in their final semester. 80-595 Senior Thesis. Topics must be approved by an advisor, who will work with the student and guide the thesis project. Students are responsible for identifying their topic and securing their thesis advisor. Because topics are subject to approval, students wishing to write a senior thesis will be enrolled in 3 units of 80-594 Research Project Development course during the first semester of your senior year.

The Major in Psychology and Biological Sciences

This unified major is intended to reflect the interdisciplinary nature of our current research in the fields of psychology and biology, as well as the national trend in some professions to seek individuals broadly trained in both the social and natural sciences. Students entering from the Dietrich College of Humanities and Social Sciences will earn a Bachelor of Science in Psychology and Biological Sciences. Students entering from the Mellon College of Sciences receive a Bachelor of Science in Biological Sciences and Psychology.

Pre-Major Requirements

The unified major specifies particular pre-major requirements in the areas of mathematical sciences and statistics, natural science, and computational reasoning. Particular courses are specified in these areas because they are prerequisites for courses required in the major and therefore they are the most efficient way to complete the general education requirements for either Dietrich College or SHS. All other general education categories can be filled in any way that satisfies the requirements of the student's college or of the SHS program.

The major in Psychology and Biological Sciences is offered only as a B.S. degree. Full curriculum requirements can be viewed under the Department of Psychology (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofpsychology/#psbiotext>) section of the Catalog.

Student-Defined Major Program

Joseph E. Devine, *Director and Associate Dean for Undergraduate Studies*
 Location: Baker Hall 154
 jd0x@andrew.cmu.edu
www.cmu.edu/dietrich/academics/degrees-majors-minors/student-defined-majors.html (<https://www.cmu.edu/dietrich/academics/degrees-majors-minors/student-defined-majors.html>)

If you are an undergraduate whose academic goals will be best supported by a self-created curriculum rather than those offered by existing Dietrich College majors or minors, the student-defined program may be the best choice for you. Student-defined majors and minors empower you to take a hands-on approach to your education, creating a course of study tailored to you. Student-defined options are possible as primary majors, additional majors and minors.

Proposal & Approval Process

To establish a student-defined major or minor, you will first need to write a proposal making the case for your program's coherence, viability and suitability to your educational goals. Follow the guidelines (pdf) (<https://www.cmu.edu/dietrich/docs/undergraduate/student-defined-major-proposal-guidelines-and-procedures.pdf>) and use the template (docx) (<https://www.cmu.edu/dietrich/docs/undergraduate/dietrich-college-student-defined-program-proposal-template.docx>) to craft your proposal. Your proposal must be approved by Joseph Devine, Dietrich College's student-defined program director, and a group of faculty and administrators identified through the proposal process as relevant experts and stakeholders in your proposed major or minor. Once your proposal is approved by the college, final approval will come from the Provost's Office. Your proposal must be approved **at least one academic year** before your expected graduation date, so begin developing it near the end of your first or second year of study so that you can begin your approved student-defined major or minor at the beginning of your sophomore or junior year.

College Affiliation

Student-Defined Primary Majors

- Your home college will be Dietrich College.
- If you are approved for a student-defined primary major at Dietrich but are not yet a Dietrich College student, you must take the additional step of applying for internal transfer into Dietrich.
- All Dietrich College students pursuing student-defined primary majors must complete the college's general education requirements (<https://www.cmu.edu/dietrich/gened/>).

Student-Defined Additional Majors & Minors

- If your student-defined program is for an additional major or a minor, your primary major and college affiliation will not be affected.

Monitoring Progress & Graduation

- The student-defined program director, in partnership with faculty and college content experts, will monitor your progress through your student-defined program.
- The student-defined program director will certify your successful completion of the program for graduation purposes.
- If you've elected a student-defined additional major or minor, the program director will inform your primary major and college once you complete your student-defined program.
- If you complete a student-defined primary major, you will invited to a special commencement diploma ceremony and will receive a degree with the major marked as "student-defined."