Computer Science-Economics

The joint Computer Science-Economics concentration exposes students to the theoretical and practical connections between computer science and economics. It prepares students for professional careers that incorporate aspects of economics and computer technology and for academic careers conducting research in areas that emphasize the overlap between the two fields. Concentrators may choose to pursue either the A.B. or the Sc.B. degree. While the A.B. degree allows students to explore the two disciplines by taking advanced courses in both departments, its smaller number of required courses is compatible with a liberal education. The Sc.B. degree achieves greater depth in both computer science and economics by requiring more courses, and it offers students the opportunity to creatively integrate both disciplines through a design requirement. If you are interested in declaring a concentration in Computer Science-Economics, please refer to this page (https://economics.brown.edu/academics/undergraduate/concentrations/declaring/) for more information regarding the process. For more information about the CS Pathways, see this (https://cs.brown.edu/degrees/undergrad/concentrating-in-cs/concentration-requirements-2020/pathways-for-undergraduate-and-masters-students/) page.


Prerequisites (3 courses):

MATH 0100 Single Variable Calculus, Part II
MATH 0520 Linear Algebra
or MATH 0540 Linear Algebra With Theory
or CSCI 0530 Coding the Matrix: An Introduction to Linear Algebra for Computer Science

ECON 0110 Principles of Economics

Required Courses: 17 courses: 8 Computer Science, 8 Economics, and a Capstone

CSCI 1450 Advanced Introduction to Probability for Computing and Data Science
or APMA 1650 Statistical Inference I
or APMA 1655 Honors Statistical Inference I
Select one of the following Series:

Series A
CSCI 0150 & CSCI 0200 Introduction to Object-Oriented Programming and Computer Science and Program Design with Data Structures and Algorithms

Series B
CSCI 0170 & CSCI 0200 Computer Science: An Integrated Introduction and Program Design with Data Structures and Algorithms

Series C
CSCI 0190 Accelerated Introduction to Computer Science (and an additional CS course not otherwise used to satisfy a concentration requirement; this course may be CSCI 0200, an intermediate-level CS course, or a 1000-level course.)

Series D

Two of the following intermediate courses, one of which must be math-oriented and one systems-oriented.

CSCI 0220 Introduction to Discrete Structures and Probability (math)
CSCI 0320 Introduction to Software Engineering (systems)
CSCI 0330 Introduction to Computer Systems (systems)
or CSCI 0300 Fundamentals of Computer Systems
CSCI 1010 Theory of Computation (math)

A pair of 1000-level CS courses that, along with the intermediate courses and math courses, satisfy one of the CS Pathways, as described for the CSCI ScB.

An additional CS course that is either at the 1000-level or is an intermediate course not already used to satisfy concentration requirements. CSCI 1450 may not be used to satisfy this requirement.

ECON 1130 Intermediate Microeconomics (Mathematical)
ECON 1210 Intermediate Macroeconomics
ECON 1630 Mathematical Econometrics I

Three courses from the "mathematical economics" group (CSCI 1951K can be counted as one of them, if it has not been used to satisfy the computer science requirements of the concentration and if the student has taken either ECON 1470 or ECON 1870):

ECON 1170 Welfare Economics and Social Choice Theory
ECON 1225 Advanced Macroeconomics: Monetary, Fiscal, and Stabilization Policies
ECON 1255 Unemployment: Models and Policies
ECON 1470 Bargaining Theory and Applications
ECON 1490 Designing Internet Marketplaces
ECON 1545 Topics in Macroeconomics, Development and International Economics
ECON 1640 Mathematical Econometrics II
ECON 1660 Big Data
ECON 1670 Advanced Topics in Econometrics
ECON 1680 Machine Learning, Text Analysis, and Economics
ECON 1750 Investments II
ECON 1805 Economics in the Laboratory
ECON 1820 Theory of Behavioral Economics
ECON 1850 Theory of Economic Growth
ECON 1860 The Theory of General Equilibrium
ECON 1870 Game Theory and Applications to Economics

Two additional 1000-level Economics courses excluding 1620, 1960, 1970.

One capstone course in either CS or Economics: a one-semester course, normally taken in the student's last semester undergraduate year, in which the student (or group of students) use a significant portion of their undergraduate education, broadly interpreted, in studying some current topic (preferably at the intersection of computer science and economics) in depth, to produce a culminating artifact such as a paper or software project. A senior thesis, which involved two semesters of work, may count as a capstone.

Total Credits

1 APMA 1650 or APMA 1655 may be used in place of CSCI 1450 in CS pathway requirements. However, concentration credit will be given for only one of APMA 1650, APMA 1655, and CSCI 1450.

2 CSCI 1010 may be used either as a math-oriented intermediate course or as an advanced course. CSCI 1010 was formerly known as CSCI 0510: They are the same course and hence only one may be taken for credit.
Computer Science-Economics


4 Or ECON 1110 with permission. For students matriculating at Brown in Fall 2021 or later, note that if ECON 1110 is used, then one additional course from the mathematical-economics group will be required.

5 Students may apply, at most, one Economics course whose number is in the range of 1000 to 1099 toward the concentration. However, 1620 and 1960 can be used for concentration credit.

Standard Program for the A.B. degree:

Prerequisites (3 courses):

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 0100</td>
<td>Single Variable Calculus, Part II</td>
<td>1</td>
</tr>
<tr>
<td>MATH 0520</td>
<td>Linear Algebra</td>
<td>1</td>
</tr>
<tr>
<td>or MATH 0540</td>
<td>Linear Algebra With Theory</td>
<td>1</td>
</tr>
<tr>
<td>or CSCI 0530</td>
<td>Coding the Matrix: An Introduction to Linear Algebra for Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>ECON 0110</td>
<td>Principles of Economics</td>
<td>1</td>
</tr>
</tbody>
</table>

Required Courses: 13 courses: 7 Computer Science and 6 Economics

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>CSCI 1450</td>
<td>Advanced Introduction to Probability for Computing and Data Science</td>
<td>1</td>
</tr>
<tr>
<td>or APMA 1650</td>
<td>Statistical Inference I</td>
<td>1</td>
</tr>
<tr>
<td>or APMA 1655</td>
<td>Honors Statistical Inference I</td>
<td>1</td>
</tr>
</tbody>
</table>

Select one of the following series:

Series A

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 0150 &amp; CSCI 0160</td>
<td>Introduction to Object-Oriented Programming and Computer Science and Introduction to Algorithms and Data Structures</td>
<td>1</td>
</tr>
</tbody>
</table>

Series B

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 0170 &amp; CSCI 0180</td>
<td>Computer Science: An Integrated Introduction and Computer Science: An Integrated Introduction</td>
<td>1</td>
</tr>
</tbody>
</table>

Series C

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 0190</td>
<td>Accelerated Introduction to Computer Science (and an additional CS course not otherwise used to satisfy a concentration requirement; this course may be CSCI 0200, an intermediate-level course, or a 1000-level course)</td>
<td>1</td>
</tr>
</tbody>
</table>

Series D

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 0111 &amp; CSCI 0180</td>
<td>Computing Foundations: Data and Computer Science: An Integrated Introduction</td>
<td>1</td>
</tr>
</tbody>
</table>

Two of the following intermediate courses, one of which must be math-oriented and one systems-oriented:

<table>
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<tr>
<th>Course</th>
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<th>Credits</th>
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<tr>
<td>CSCI 0220</td>
<td>Introduction to Discrete Structures and Probability (math)</td>
<td>1</td>
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<tr>
<td>CSCI 0320</td>
<td>Introduction to Software Engineering (systems)</td>
<td>1</td>
</tr>
<tr>
<td>CSCI 0330</td>
<td>Introduction to Computer Systems (systems)</td>
<td>1</td>
</tr>
<tr>
<td>or CSCI 0300</td>
<td>Fundamentals of Computer Systems</td>
<td>1</td>
</tr>
<tr>
<td>CSCI 1010</td>
<td>Theory of Computation (math)</td>
<td>1</td>
</tr>
</tbody>
</table>

Two additional CS courses; at least one must be at the 1000-level. The other must either be at the 1000-level or be an intermediate course not already used to satisfy concentration requirements. CSCI 1450 may not be used to satisfy this requirement.

<table>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 1130</td>
<td>Intermediate Microeconomics (Mathematical)</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Credits: 13

1 Or ECON 1110 with permission. For students matriculating at Brown in Fall 2021 or later, note that if ECON 1110 is used, then one additional course from the mathematical-economics group will be required.

2 CSCI 1951K can be counted as one of them, if it has not been used to satisfy the computer science requirements of the concentration and if the student has taken either ECON 1470 or ECON 1870.

3 Note that ECON 1620, ECON 1960, and ECON 1970 (independent study) cannot be used for concentration credit. However, 1620 and 1960 can be used for university credit and up to two 1970s may be used for university credit.

Honors

Students who meet stated requirements are eligible to write an honors thesis in their senior year. Students should consult the listed honors requirements of whichever of the two departments their primary thesis advisor belongs to, at the respective departments' websites. If the primary thesis advisor belongs to Economics (Computer Science), then students must have a reader in the Computer Science (respectively, Economics) department.

Professional Track

The requirements for the professional track include all those of the standard track, as well as the following:

Students must complete full-time professional experiences doing work that is related to their concentration programs, totaling 2-6 months, whereby each internship must be at least one month in duration in cases where students choose to do more than one internship experience. Such work is normally done at a company, but may also be at a university under the supervision of a faculty member. Internships that take place between the end of the fall and the start of the spring semesters cannot be used to fulfill this requirement.

On completion of each professional experience, the student must write and upload to ASK a reflective essay about the experience addressing the following prompts, to be approved by the student's concentration advisor:

- Which courses were put to use in your summer's work? Which topics, in particular, were important?
- In retrospect, which courses should you have taken before embarking on your summer experience? What are the topics from these courses
that would have helped you over the summer if you had been more familiar with them?
• Are there topics you should have been familiar with in preparation for your summer experience, but are not taught at Brown? What are these topics?
• What did you learn from the experience that probably could not have been picked up from course work?
• Is the sort of work you did over the summer something you would like to continue doing once you graduate? Explain.
• Would you recommend your summer experience to other Brown students? Explain.