Computer Science and Business Honors Program

The College of Business and the Computer Science and Engineering Department in the P.C. Rossin College of Engineering and Applied Science jointly offer the Computer Science and Business (CSB) Honors Program. The mission of the program is to provide rigorous computer science education integrated with in-depth business training that prepares high quality undergraduate students with diverse backgrounds for lifelong learning and to assume positions of leadership in the business community. This carefully crafted 136 credit-hour degree integrates technology skills in software development with a solid background in business and economics. Deep immersion in both of these areas distinguishes CSB from programs offered by other universities. At the same time, it is well balanced with approximately one third of the courses in liberal arts, one-third in computer science, and one-third in business.

After four years, the program leads to a degree in Computer Science and in Business, which is jointly awarded by the College of Business and the P.C. Rossin College of Engineering and Applied Science. Graduates of the program are ideal candidates for placement within public accounting firms, consulting companies, top software firms, and startup companies. This program provides students with the background needed to become the CIOs, decision makers, and general managers of information age corporations.

The CSB Honors Program is a rigorous program. Students may matriculate specifically into the program or apply to enter the program at a later point. Students interested in transferring into the CSB Honors Program after starting at Lehigh must demonstrate a cumulative 3.25 GPA, and must earn a B- or better in ECO 001 and CSE 007 AND (MATH 021 OR MATH 031 OR MATH 076) and have satisfied all requirements to change their curriculum at Lehigh by the end of the Spring term in which they are applying: https://catalog.lehigh.edu/undergraduatetestsudies/curricularflexibility/lehigh.edu/undergraduatetestsudies/curricularflexibility/

Applications are due between Jan. 1 and May 15 and can be obtained by contacting the Academic Advisor, Andrea Goff at ahg212@lehigh.edu. All transfer applications will be reviewed and considered at the end of May (once Spring grades are posted) and are dependent on space available in the program. Scheduled or anticipated Summer or Fall coursework cannot be used to satisfy these requirements.

Due to impacts on the graduation timeline, applications to join the CSB Honors Program are not recommended beyond a student’s second year of study at Lehigh.

The CSB Honors Program is accredited in Business (AACSB International) and is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org (https://www.google.com/url?q=http://www.abet.org&sa=U&source=web&cd=1&cad=rja&ust=1649281704000000&ved=0ahUKEwiG0OGvOaTlAhXmMmgHHTK5DLEQFjABegQI&usg=AOvVaw0Wyee1Nw_mPqe3hxjH4KXa). The co-directors of the CSB Honors Program are George Witmer, Professor of Practice in the Department of Computer Science and Engineering (gsw2@lehigh.edu) and Vacant, College of Business.

For additional information visit the CSB website (https://csb.lehigh.edu/) or contact Andrea Goff, Academic Advisor at ahg212@lehigh.edu.

MISSION FOR PROGRAM

The Computer Science and Business Honors Program’s mission is to provide its students with a strong education in mathematics, science, business, and computer science fundamentals and to prepare them to be able to adapt to future changes in the practice of Computer Science.

PROGRAM EDUCATIONAL OBJECTIVES

Graduates of the Bachelor of Science in Computer Science and Business Honors Program will:

• Apply their education in computer science to the analysis and solution of business and industrial problems.

• Account for ethical and social issues when solving business and industrial problems.

• Function effectively in a collaborative team and effectively communicate with members of the team.

• Engage in continued education in their field of expertise.

• Attain positions of expertise in their chosen field.

• Apply their training to problems where information technologies and business processes converge.

STUDENT OUTCOMES

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.

3. Communicate effectively in a variety of professional contexts.

4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

5. Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline.

6. Apply computer science theory and business acumen to produce computing-based business solutions.

DEGREE REQUIREMENTS

The required courses for the CSB degree constitute the fundamentals of structured programming, discrete mathematics, algorithms, computer architecture, computer and information systems, programming languages, software engineering, accounting, finance, marketing, management, and economics. None of the program requirements for the CSB major may be taken pass/fail.

The requirements are stated below. To view a number of suggested sequences of courses for satisfying these requirements see Suggested Sequences of Courses (p. 2).

Required Computer Science courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 003</td>
<td>Introduction to Programming, Part A</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CSE 004</td>
<td>and Introduction to Programming, Part B</td>
<td>4</td>
</tr>
<tr>
<td>or CSE 007</td>
<td>Introduction to Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSE 017</td>
<td>Programming and Data Structures</td>
<td>3</td>
</tr>
<tr>
<td>CSE 109</td>
<td>Systems Software</td>
<td>4</td>
</tr>
<tr>
<td>CSE 140</td>
<td>Foundations of Discrete Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSE 202</td>
<td>Computer Organization and Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CSE 216</td>
<td>Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CSE 241</td>
<td>Database Systems and Applications</td>
<td>3</td>
</tr>
<tr>
<td>or CSE 341</td>
<td>Database Systems, Algorithms, and Applications</td>
<td>3</td>
</tr>
<tr>
<td>CSE 262</td>
<td>Programming Languages</td>
<td>3</td>
</tr>
<tr>
<td>CSE 303</td>
<td>Operating System Design</td>
<td>3</td>
</tr>
<tr>
<td>CSE 340</td>
<td>Design and Analysis of Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSE Elective from approved list2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Required Business courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 001</td>
<td>Foundations of Business</td>
<td>1</td>
</tr>
<tr>
<td>ACCT 151</td>
<td>Introduction to Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 152</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ECO 001</td>
<td>Principles of Economics</td>
<td>4</td>
</tr>
<tr>
<td>ECO 146</td>
<td>Intermediate Microeconomic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or ECO 119</td>
<td>Intermediate Macroeconomic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>FIN 125</td>
<td>Introduction to Finance</td>
<td>3</td>
</tr>
<tr>
<td>LAW 201</td>
<td>Legal Environment of Business</td>
<td>3</td>
</tr>
<tr>
<td>SCM 186</td>
<td>Supply Chain Operations Management</td>
<td>3</td>
</tr>
</tbody>
</table>
MGT 043 Organizational Behavior 3
MKT 111 Principles of Marketing 3
MGT 301 Strategic Management in a Global Environment 3

Required Math and Science courses
MATH 021 Calculus I (or MATH 075 followed by MATH 076) 4
MATH 022 Calculus II 4
MATH 205 Linear Methods 3
MATH 231 Probability and Statistics or ECO 045 3
Statistical Methods

Natural science courses 1 12

Required CSB courses
CSB 311 Advanced Accounting Information Systems 3
CSB 312 Design of Integrated Business Applications I 3
CSB 313 Design of Integrated Business Applications II 3

Required CSB electives
Courses approved by program co-directors 9

Humanities and Social Science requirements
ENGL 001 Critical Reading and Composition 3
BUS 003 Business Communication I 1.5
BUS 203 Business Communication II 1.5
CSE 252 Computers, the Internet, and Society 3

Humaities (HU) electives 6
Social Sciences (SS) electives 3
Free electives 7

Total Credits 136

1 Such that one course has an attached laboratory and such that two courses are in a laboratory science with the first course a prerequisite to the second course. Note that there are some NS courses that, though in a laboratory science, do not include a laboratory; instead the "attached lab" has a separate course number. See Suggested Sequences of Natural Science Courses (http://www.cse.lehigh.edu/academics/undergraduate-computer-science/bs-in-computer-science-and-business/2-uncategorised/174-natural-science-course-sequence/).

Students contemplating graduate study in computer science or employment at major computing software firms (e.g., Microsoft, Google, Oracle, IBM) should choose MATH 231 instead of ECO 045 and CSE 341 instead of CSE 241 if possible. These students must take CSE 340 prior to senior year. CSE 326 is strongly recommended as an elective choice for these students.

Students seeking to transfer into CSB from Engineering, Business or Arts and Sciences, should consult as soon as possible with the program co-directors. Note that to graduate in the normal 4 years it is necessary for CSB students to:
- Complete CSE 007 by spring of first year
- Complete CSE 017 by fall of second year
- Complete CSE 241 by spring of second year

CSE 007 and CSE 017 are offered fall and spring. CSE 241 is guaranteed only for spring semester.

Computer Science and Business - SAMPLE A1 (MATH 021)

First Year
First Semester CR Second Semester CR
BUS 001 0.1 CSE 017 3
BUS 003 1.5 MATH 022 4
CSE 007 4 MATH 231 or ECO 045 3
ECO 001 0.4 MGT 043 3
ENGL 001 3 Science elective-first course in two-course sequence
MATH 021 0.4

Second Year
First Semester CR Second Semester CR
ACCT 151 3 ACCT 152 3
CSE 109 4 CSE 202 3
MATH 205 3 CSE 241 or 341 3
MGT 111 3 CSE 140 3
Science elective or second course in science sequence 4 Science elective or second course in science sequence

Third Year
First Semester CR Second Semester CR
CSE 340 3 BUS 203 1.5
CSE 216 3 CSE 311 3
FIN 125 3 CSE 312 3
SCM 186 3 CSE 252 3
CSB Professional Elective 3 ECO 146 or 119 3
CSB Professional Elective 3 LAW 201 3

Fourth Year
First Semester CR Second Semester CR
CSB 313 3 MGT 301 3
CSE 303 3 CSE elective (See Computer Science & Business Electives)
CSE 262 3 CSE professional elective
HU electives 4 HU electives 2 4
SS Elective 3 4 Free electives 4

Total Credits: 127-136
Computer Science course from the follow...

In addition to the CSB electives, students are required to take one
COMPUTER SCIENCE & BUSINESS ELECTIVES
contribute towards satisfying the free elective requirement.

Courses are 4 credits and the credits beyond the total required by CSB
2
One credit counts as free elective
2
Two credits count as free elective. Note that most HU and SS
courses are 4 credits and the credits beyond the total required by CSB
contribute towards satisfying the free elective requirement.

COMPUTER SCIENCE & BUSINESS ELECTIVES
In addition to the CSB electives, students are required to take one
Computer Science course from the follow

CSE 242 Blockchain Algorithms and Systems 3
CSE 264 Web Systems Programming 3
CSE 265 System and Network Administration 3
CSE 271 Programming in Linux and Windows Operating Systems 3
CSE 302 Compiler Design 3
CSE 313 Computer Graphics 3
CSE 318 Introduction to the Theory of Computation 3
CSE 319 Image Analysis and Graphics 3
CSE 325 Natural Language Processing 3
CSE 326 Fundamentals of Machine Learning 3
CSE 327 Artificial Intelligence Theory and Practice 3
CSE 331 User Interface Systems and Techniques 3
CSE 335 Topics on Intelligent Decision Support Systems 3
CSE 336 Embedded Systems 3
CSE 337 Reinforcement Learning 3
CSE 342 Fundamentals of Internetworking 3
CSE 343 Network Security 3
CSE 345 WWW Search Engines 3
CSE 347 Data Mining 3
CSE 348 AI Game Programming 3
CSE 349 Big Data Analytics 3
CSE 360 Introduction to Mobile Robotics 3
CSE 371 Principles of Mobile Computing 3
CSE 375 Principles of Practice of Parallel Computing 3
CSE 376 3

Or other courses as approved by the program co-directors

SUGGESTED SEQUENCES OF NATURAL SCIENCE COURSES
The following is an incomplete list of course sequences that satisfy
the requirement: “two courses are in a laboratory science with the first
course prerequisite to the second course.” The exact set of courses
depends on what each science department offers each semester.

Any course used for the science requirement must have an "NS"
designation in the catalog (and there are some CHM, BIOS, and EES
courses that are not "NS" but rather "ND", meaning "not designated").

We list here only courses that contribute to a prerequisite sequence.
These sequences add up to between 7 and 9 credits. The remaining
credits to reach a total of 12 may consist of any NS-designated
courses.

Astronomy Sequence

PHY 005 & ASTR 105 Concepts In Physics and Introduction to Planetary Astronomy 7

PHY 010 & ASTR 105 General Physics I and Introduction to Planetary Astronomy 2 3-7

PHY 011 & ASTR 105 Introductory Physics I and Introduction to Planetary Astronomy 2 3-7

Biology Sequence

CHM 030 & BIOS 041 Introduction to Chemical Principles and Introduction to Cellular and Molecular Biology 7

Chemistry Sequences

CHM 030 & CHM 031 Introduction to Chemical Principles and Chemical Equilibria in Aqueous Systems 8

CHM 030 & CHM 110 Introduction to Chemical Principles and Organic Chemistry I 7

CHM 030 & BIOS 041 Introduction to Chemical Principles and Introduction to Cellular and Molecular Biology 7

CHM 040 & CHM 041 Honors General Chemistry I and Honors General Chemistry II 8
CHM 040 & CHM 110: Honors General Chemistry I and Organic Chemistry 1

CHM 040 & BIOS 041: Honors General Chemistry I and Introduction to Cellular and Molecular Biology

**Physics Sequences**

PHY 011 & PHY 021: Introductory Physics I and Introductory Physics II

PHY 010 & PHY 013: General Physics I and General Physics II

PHY 011 & PHY 013: Introductory Physics I and General Physics II

**Earth and Environmental Science Sequence**

EES 021 & EES 022 & EES 131: Introduction to Planet Earth and Exploring Earth and Introduction to Rocks and Minerals

EES 025 & EES 022 & EES 152: The Environment and Living Systems and Exploring Earth and Ecology

EES 028 & EES 022 & EES 152: Conservation and Biodiversity and Exploring Earth and Ecology

1 May also take optional 1-credit lab: CHM 111
2 May also take optional 1-credit lab: PHY 012

**Courses**

**CSB 242 Blockchain Concepts and Applications 3 Credits**

Blockchain is the technology underlying Bitcoin, along with other digital currencies, and a data-management technology applicable broadly in finance, accounting, marketing, supply-chain, and "smart" contracts. It offers the ability to decentralize financial transactions, automate record keeping, and increase privacy. This course gives students the basis for understanding the technological foundations of blockchain and the business impact of blockchain.

**Prerequisites:** ECO 001 and (BIS 111 or CSE 003 or CSE 007 or CSE 012) and (CSE 017 or MKT 111 or FIN 125 or SCM 186)

**CSB 256 Computing/Business Seminar 3 Credits**

Business, technical, and cultural aspects of developing, managing, and marketing computing products from the perspectives of researchers, developers, and management. Influences of patents, open source, corporate- and government-funded research, and standards. Case studies show why the best technology may not always win, unexpected impact of technical disruptions, advantages and pitfalls of technical leadership versus "following aggressively", etc. Studies include startups, mature companies, corporate R&D labs, and academic labs. Course relates to both computer-related technology, and current business events.

**Prerequisites:** ECO 001 and (CSE 109 or CSE 241 or CSE 341)

**CSB 273 Leveraging Technology 3 Credits**

Explores the types and manner in which technology can improve business outcomes. Lectures and assigned readings cover topics such as business context for leveraging technology, various common and disruptive technologies, and estimating ROI. Using consulting engagements and/or real-world scenarios, students develop and present proposals based on their acquired knowledge. Emphasis is placed on learning how to discover opportunities, determine technologies to address those opportunities, and correlate the application of technology to business metrics to garner the support of decision-makers.

**Repeat Status:** Course may be repeated.

**Prerequisites:** CSE 012 or CSE 017 or BIS 111

**CSB 304 (ENTP 304) Technology and Software Ventures 3 Credits**

Designed from the perspective of functional leaders, course provides a holistic perspective of developing successful software ventures across various industries in an interdisciplinary and experiential environment. Students develop a software-oriented idea, concurrent with module delivery content, database design, case studies, and subject-matter experts. Examines business model fundamentals, customer discovery, translating requirements to a minimum viable product, agile development, user acquisition, and traction. ENTP Capstone. Prior programming experience or technical background not required. Open to students in any college and major.

**Prerequisites:** ENTP 101 or CSE 002 or BIS 111

**CSB 311 Advanced Accounting Information Systems 3 Credits**

Application of computer technology to accounting information systems. Transaction processing systems that support the revenue, conversion, and expenditure cycles of manufacturing, service, and retail business organizations. Topics include process modeling, data modeling, internal controls, corporate IT governance, IT audit techniques, SAP and application of Generalized Audit Software.

**Prerequisites:** (ACCT 152 or ACCT 108) and (CSE 241 or CSE 341)

**Can be taken Concurrently:** CSE 241, CSE 341

**CSB 312 Design of Integrated Business Applications I 3 Credits**

Integrated Product Development (IPD) Capstone I. Industry-based business information systems design project. Information systems design methodology, user needs analysis, project feasibility analysis of design alternatives, and integrated product development methodology. Formal oral and written presentations to clients.

**Prerequisites:** CSB 311 and (CSE 241 or CSE 341) and CSE 216

**Can be taken Concurrently:** CSB 311

**CSB 313 Design of Integrated Business Applications II 3 Credits**

Integrated Product Development (IPD) Capstone Course II. This course extends the industry-based project initiated in CSB 312 into its implementation phase. Detailed design, in-house system construction and delivery, commercial software options, and systems maintenance and support. The practical component of the course is supplemented by several classroom-based modules dealing with topics that lie at the boundary of computer science and business. Formal, oral, and written presentations to clients.

**Prerequisites:** CSB 312

**CSB 314 International Practicum 3 Credits**

A faculty led, foreign-based activity to provide students the opportunity to work on consulting, assurance, or other IT-related projects with business organizations, consulting companies, and public accounting firms. Typical projects: systems analysis and design, systems configuration and implementation, best practices, case studies, and subject-matter experts. Examines business model fundamentals, customer discovery, translating requirements to a minimum viable product, agile development, user acquisition, and traction. ENTP Capstone. Prior programming experience or technical background not required. Open to students in any college and major.

**Prerequisites:** CSB 311 and (CSE 241 or CSE 341) and CSE 216

**Can be taken Concurrently:** CSB 311

**CSB 389 Honors Project 1-12 Credits**

**CSB 392 Independent Study 1-3 Credits**

An intensive study, with report, of a topic spanning both business and computer science that is not treated in any other courses.

**Repeat Status:** Course may be repeated.

**CSB 442 Blockchain: Mathematical Foundations and Financial Applications 3 Credits**

Technical and mathematical foundations of blockchain (algorithms, data structures, cryptography) with application to finance. Blockchain properties (immutability, irrefutability), security, consensus (proof-of-work, proof-of-stake, Byzantine consensus). Blockchain governance and trust models. Blockchain and finance: policy, regulation, compliance, systemic risk, relative power of nation-states, the role of central banks, economic justice. Broader impacts in such areas as foreign policy, surveillance and individual freedoms, non-financial applications. Smart contract coding and issues in blockchain software development. Lab experience interacting with a blockchain.

**Prerequisites:** MATH 021 and FIN 125 and (CSE 007 or CSE 012 or CSE 017)