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-achieving 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.

All CSB students participate in the College of Business Student to Professional Co-curriculum (https://businessundergrad.lehigh.edu/lehigh-business-student-professional-co-curriculum/). This program is designed to help students transition from a student to a young professional. They also receive training from the Lehigh Center for Career & Professional Development on technical skills which is integrated in the Computer Science course curriculum. These training combined with academics and experiential learning lead to our students being some of the highest paid upon graduation (see Success after Graduation (https://www1.lehigh.edu/admissions/success-after-graduation/) under College of Business and PC Rossin College of Engineering & Applied Sciences).

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. (https://catalog.lehigh.edu/undergraduatestudies/curricularflexibility/)lehigh.edu/undergraduatestudies/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 (https://www.aacsb.edu/accredited/l/lehigh-university/)) and is accredited by the Computing Accreditation Commission of ABET (https://amspub.abet.org/aps/name-search/?searchType=institution&keyword=Lehigh).

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 TBD, 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

CSE 003 & CSE 004	Introduction to Programming, Part A and Introduction to Programming, Part B	4
or CSE 007	Introduction to Programming	
CSE 017	Programming and Data Structures	3
CSE 109	Systems Software	4
CSE 140	Foundations of Discrete Structures and Algorithms	3
CSE 202	Computer Organization and Architecture	3
CSE 216	Software Engineering	3
CSE 241	Database Systems and Applications	3
or CSE 341	Database Systems, Algorithms, and Applications	
CSE 262	Programming Languages	3
CSE 303	Operating System Design	3
CSE 340	Design and Analysis of Algorithms	3
CSE Elective from approved list [2]		3

Required Business courses

BUS 001	Foundations of Business	1
ACCT 151	Introduction to Financial Accounting	3
ACCT 152	Introduction to Managerial Accounting	3
ECO 001	Principles of Economics	4
ECO 146	Intermediate Microeconomic Analysis	3
or ECO 119	Intermediate Macroeconomic Analysis	
FIN 125	Introduction to Finance	3
LAW 201	Legal Environment of Business	3
SCM 186	Supply Chain Operations Management	3
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	3
or ECO 045	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		
BUS 003	Business Communication I	1.5
WRT 001	Academic and Analytical Writing	3
BUS 203	Business Communication II	1.5
CSE 252	Computers, the Internet, and Society	3
Humanities (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/).

[2]

Computer Science & Business Electives (http://www.cse.lehigh.edu/academics/undergraduate-computer-science/bs-in-computer-science-and-business/2-uncategorised/124-csb-choice/) approved list.

CSB TRACKS
Students may choose to use their CSB professional electives to develop areas of concentrations or tracks from courses offered within the CSE department or CBE. In certain cases, the program co-directors may also approve courses from other departments. See some examples of CSB tracks (https://engineering.lehigh.edu/cse/undergraduate-studies/computer-science-business-bs/csb-tracks/). Note: that it is **not** required that a student complete a track, just that students fulfill the 9-credit professional elective requirement.

SAMPLE SEQUENCES OF COURSES
Below are several sample course sequences that fulfill the CSB degree requirements. These are only examples and nothing here is intended to suggest implicit requirements. It should be clear in particular that electives can easily be rearranged. All sample sequences assume a non-Physics science sequence; the first Physics course in the Physics sequence is 5 credits (4-credit course plus 1-credit lab).

None of these samples assume AP credit. Generally, students with AP move courses in the sequence earlier to leave room for more electives in the junior and/or senior years.

Sample A1 assumes MATH 021 in the fall of first year. Sample A2 assumes that MATH 021 is replaced by the sequence of MATH 075 in the fall and MATH 076 in the spring with MATH 022 deferred until sophomore year.

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 student 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, College of Health or Arts and Sciences, should consult as soon as possible with the program academic advisor. 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 fall semester.

Computer Science and Business - SAMPLE A1 (MATH 021)

First Year

First Semester	CR	Second Semester	CR
BUS 001	1	CSE 017	3
BUS 003	1.5	MATH 022	4
CSE 007	4	MATH 231 or ECO 045	3
ECO 001	4	MGT 043	3
MATH 021	4	Science elective-first course in two-course sequence	4
WRT 001	3	BZX 002	0
	17.5		**17**

Second Year

First Semester	CR	Second Semester	CR
ACCT 151	3	ACCT 152	3
CSE 109	4	CSE 202	3
MATH 205	3	Science elective or second course in science sequence	4
Science elective or second course in science sequence	4	CSE 262	3
CSE 140	3	CSE 340	3
	17		**16**

Third Year

First Semester	CR	Second Semester	CR
CSE 216	3	BUS 203	1.5
CSE 241	3	CSB 311	3
FIN 125	3	CSB 312	3
Free Elective	3	ECO 146 or 119	3
MKT 111	3	SCM 186	3

Humanities elective	3	LAW 201	3
	18		**16.5**

Fourth Year

First Semester	CR	Second Semester	CR
CSB 313	3	MGT 301	3
CSE 303	3	CSE elective (See Computer Science & Business Electives)	3
Human electives	3	CSB professional elective	3
CSE 252	3	CSB professional elective	3
CSB professional elective	3	Free electives	1
Free elective	3	Social Science elective	3
	18		**16**

Total Credits: 136

Computer Science and Business - SAMPLE A2 (MATH 075/076)

First Year

First Semester	CR	Second Semester	CR
BUS 001	1	CSE 017	3
BUS 003	1.5	MATH 076	2
CSE 007	4	ECO 045	3
ECO 001	4	MGT 043	3
MATH 075	2	MKT 111	3
WRT 001	3	Science elective - first course in two-course sequence	4
		BZX 002	0
	15.5		**18**

Second Year

First Semester	CR	Second Semester	CR
ACCT 151	3	ACCT 152	3
CSE 109	4	CSE 202	3
MATH 022	4	CSE 140	3
SCM 186	3	Science elective or second course in science sequence	4
Science elective or second course in science sequence	4	CSE 216	3
	18		**16**

Third Year

First Semester	CR	Second Semester	CR
CSE 340	3	BUS 203	1.5
FIN 125	3	CSB 311	3
CSE 241	3	CSB 312	3
MATH 205	3	CSE 252	3
CSB Professional Elective	3	ECO 146 or 119	3
CSB Professional Elective	3	LAW 201	3
	18		**16.5**

Fourth Year

First Semester	CR	Second Semester	CR
CSB 313	3	MGT 301	3
CSE 303	3	CSE elective (See Computer Science & Business electives)	3
CSE 262	3	CSB professional elective	3
HU Elective	4	HU elective[2]	4
SS Elective[1]	4	Free elective	4
	17		**17**

Total Credits: 136

[1] 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 160	Introduction to Data Science	3
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	Distributed Systems	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"). The sum of all the NS-designated science credits must be at least 12.

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 I [1]	7
CHM 040 & BIOS 041	Honors General Chemistry I and Introduction to Cellular and Molecular Biology	7

Physics Sequences

PHY 011 & PHY 021	Introductory Physics I and Introductory Physics II [2]	8
PHY 010 & PHY 013	General Physics I and General Physics II [2]	7
PHY 011 & PHY 013	Introductory Physics I and General Physics II [2]	7

Earth and Environmental Science Sequence

EES 021 & EES 022 & EES 131	Dynamic Earth and Exploring Earth: A Natural Science Laboratory Course and Introduction to Rocks and Minerals	8
EES 025 & EES 022 & EES 152	The Environment and Living Systems and Exploring Earth: A Natural Science Laboratory Course and Ecology	8
EES 028 & EES 022 & EES 152	Conservation and Biodiversity and Exploring Earth: A Natural Science Laboratory Course and Ecology	8
EES 002 & EES 022 & EES 102	Introduction to Environmental Science and Exploring Earth: A Natural Science Laboratory Course and Environmental Science and Sustainability	8

[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 specific 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 containing 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: 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, database design, user interface design, and internal control assessment. Students complete written reports and make formal presentations to client firms.

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)