

HUMAN-CENTERED DESIGN AND DEVELOPMENT, B.S. (CAPITAL)

Begin Campus: Any Penn State Campus

End Campus: Harrisburg

Program Description

The Human-Centered Design and Development major (HCDD) in the College of Information Sciences and Technology is a Bachelor of Science degree program that will educate students in the fundamental concepts and state-of-the-art skills in developing applications of technology for people, with a focus on learning outcomes needed to: a) identify opportunities to support human activity with technology; b) design and create useful and usable technology-mediated activities; and c) evaluate and iterate designed technologies in their context of use. Students graduating with a degree in HCDD will be positioned for successful careers in industry, government, and education, helping to ensure that our world of increasingly complex and pervasive technologies remains aligned with human aspirations, requirements, and limitations.

The HCDD major is interdisciplinary, combining foundational coursework in mathematics, statistics, information technology, and application development with specialized courses in social and psychological aspects of information and technology use, usability engineering, user research methods, and user interface design. The major draws on courses already taught as part of the IST BS degree, but also includes new courses that expand the user-centered analysis and design concepts and methodological rigor needed to succeed as an HCDD professional.

What is Human-Centered Design and Development?

Human-Centered Design and Development is the study of how to identify, design, build, and evaluate technologies to enhance people's lives. The field focuses on understanding people and their use of technology, the methods and tools used for designing and building effective technology solutions, and the modern information technologies used to create effective solutions. The field involves working with potential users and customers to understand their needs and unique contexts, and then how to design, build, and evaluate impactful products and services. Human-centered design and development integrates ideas from design thinking, human-computer interaction (HCI), interaction design, and user experience design with the skills and techniques needed for software development.

MORE INFORMATION ABOUT HUMAN-CENTERED DESIGN AND DEVELOPMENT (<https://ist.psu.edu/prospective/undergraduate/academics/hcdd/>)

You Might Like This Program If...

- You are passionate about designing and building interactive technologies
- You want to design, build, and evaluate web, mobile, and other software applications
- You enjoy working with people to understand how they live and how technology fits into their lives

- You want to design, conduct, and interpret data from user studies
- You embrace uncertainty and change, and are not afraid to fail on the path to getting things right

MORE INFORMATION ABOUT WHY STUDENTS CHOOSE TO STUDY HUMAN-CENTERED DESIGN AND DEVELOPMENT (<https://ist.psu.edu/prospective/undergraduate/academics/hcdd/>)

Entrance to Major

To be eligible for the Human-Centered Design and Development (HCDD) major, students must:

1. Have completed the following entrance-to-major requirements with a grade of C or better in each: HCDD 113S or HCDD 113, IST 140 or (CMPSC 101 and IST 240) or CMPSC 121 or CMPSC 131, IST 210, IST 220, IST 242 or CMPSC 122 or CMPSC 132, STAT 200
2. Have achieved a minimum cumulative grade point average of 2.00 prior to and through the end of the semester during which the entrance to major is requested.

Degree Requirements

For the Bachelor of Science degree in Information Sciences and Technology, a minimum of 120 credits is required:

Requirement	Credits
General Education	45
Electives	6-12
Requirements for the Major	78-84

15 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 6 credits of GQ courses, 3 credits of GS courses, 6 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
IST 495	Internship	1
<i>Prescribed Courses: Require a grade of C or better</i>		
HCDD 264	Design Practice in Human-Centered Design and Development	3
HCDD 340	Human-Centered Design for Mobile Computing	3
HCDD 364W	Methods for Studying Users	3
HCDD 440	Human-Centered Design and Development Capstone Course	3
IST 210	Organization of Data	3
IST 220	Networking and Telecommunications	3
IST 230	Language, Logic, and Discrete Mathematics	3
IST 256	Programming for the Web	3
IST 311	Object-Oriented Design and Software Applications	3
IST 402	Emerging Issues and Technologies	3
IST 411	Distributed-Object Computing	3
IST 412	The Engineering of Complex Software Systems	3

STAT 200	Elementary Statistics	4
Additional Courses		
ENGL 15 or ENGL 30H	Rhetoric and Composition Honors Rhetoric and Composition	3
ENGL 202C or ENGL 202D	Effective Writing: Technical Writing Effective Writing: Business Writing	3
PSYCH 100 or SOC 3	Introductory Psychology Introductory Social Psychology	3
Select 12 credits from the Application Focus course listings. These are listings maintained by the department as support of major courses. At least one course must be at the 400 level. Students may also complete a custom Application Focus course sequence with approval from an academic adviser and an HCDD teaching faculty member. Students may want to consider choosing courses that also fulfill US and/or IL requirements.		12
<i>Additional Courses: Require a grade of C or better</i>		
HCDD 113S or HCDD 113	Foundations of Human-Centered Design and Development FYS Foundations of Human-Centered Design and Development	3
IST 261 or IST 361	Application Development Design Studio I Application Development Design Studio II	3
MATH 110 or MATH 140	Techniques of Calculus I Calculus With Analytic Geometry I	4
Select one of the following:		3-6
IST 140	Introduction to Application Development	
CMPSC 121	Introduction to Programming Techniques	
CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 101 & IST 240	Introduction to Programming and Introduction to Computer Languages	
Select one of the following:		3-6
IST 242	Intermediate & Object-Oriented Application Development	
CMPSC 221 & CMPSC 122	Object Oriented Programming with Web-Based Applications and Intermediate Programming	
CMPSC 132 & CMPSC 221	Programming and Computation II: Data Structures and Object Oriented Programming with Web-Based Applications	

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- **United States Cultures:** 3 credits
- **International Cultures:** 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or

within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Learning Objectives

- **Understanding Humans:** Understanding how humans' physical and cognitive capabilities inform interaction and experience design.
- **Understanding Context:** Understanding the context and technology requirements of users and other stakeholders, and articulating how design and evaluation concerns are affected by their context.
- **Modeling Human Activity:** Developing models of human activity with and without technology support.
- **Prototyping:** Envisioning, designing, and evaluating new technology prototypes using appropriate interaction modalities, styles and techniques.
- **Developing Production and Technologies:** Developing working, production technologies to address identified design opportunities.
- **Evaluating:** Applying and developing skills in a mix of qualitative and quantitative methods to collect and analyze formative and summative usability data.
- **Managing HCDD Projects:** Selecting, organizing and implementing design and development activities involving users and other stakeholders.
- **Communicating:** Communicating with colleagues, users, and other stakeholders about complex ideas describing actual and envisioned technology in use.
- **Enacting Ethics:** Understanding the importance of professional ethics and enacting these in human-centered design and development practice.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and-out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

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Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2023-24 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contains suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

Human-Centered Design and Development, B.S. at Harrisburg Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
HCDD 113S ^{*#}	3 IST 210 ^{*#}	3
IST 140 ^{*#}	3 IST 242 ^{*#}	3
MATH 110 or 140 (GQ) ^{††}	4 CAS 100A or 100S [†]	3
Application Focus Selection 1	3 ENGL 15, 15S, 30T, or ESL 15 (GWS) [†]	3
PSYCH 100 or SOC 3 (GS) ^{††}	3 STAT 200 (GQ) ^{*††}	4

16 **16**

Second Year

Fall	Credits Spring	Credits
IST 220 ^{*#}	3 IST 311 [*]	3
HCDD 264 [*]	3 Application Focus Selection 2	3
IST 230 [*]	3 Elective	3
General Education Course (GS/GH/GA/GN/GHW)	3 IST 256 [*]	3
IST 261 [*]	3 General Education Course (GS/GH/GA/GN/GHW)	3

15 **15**

Third Year

Fall	Credits Spring	Credits Summer	Credits
HCDD 340 [*]	3 HCDD 364W [*]	3 IST 495 ^{*1}	1
Application Focus Selection 3	3 IST 361 (or Elective) [*]	3	

General Education Course (GS/GH/GA/GN/GHW)	3 IST 412*	3
General Education Course (GS/GH/GA/GN/GHW)	3 General Education Course (GS/GH/GA/GN/GHW)	3
ENGL 202C or 202D (GWS) ^{††}	3 General Education Course (GS/GH/GA/GN/GHW)	3
	15	15
Fourth Year		1
Fall	Credits Spring	Credits
IST 411*	3 HCDD 440*	3
IST 402*	3 General Education Course (GS/GH/GA/GN/GHW)	3
Application Focus Selection 4	3 General Education Course (GS/GH/GA/GN/GHW)	3
General Education Course (GS/GH/GA/GN/GHW)	3 Elective	3
	Elective	3
	12	15

Total Credits 120

- * Course requires a grade of C or better for the major
 ‡ Course requires a grade of C or better for General Education
 # Course is an Entrance to Major requirement
 † Course satisfies General Education and degree requirement

¹ IST 495 is typically completed the summer after junior year, but may be completed at any time during the student's academic career.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry

the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

Advising Notes:

Students are encouraged to meet the general education requirements of inter-domain and linked courses in their general education credits.

Students are encouraged to complete the US and IL university requirements as part of their General Education course selections or, in some cases, as part of their Application Focus course selections.

Students pick one of the application focuses areas below or create a custom four-course application focus. Students must pick three credits at the 400 level. All twelve credits must be in the same application focus area.

Students in the Human-Centered Design and Development (HCDC_A_BS) major are expected to complete 24 credits of upper-level course work in the major at Penn State Harrisburg. This is in compliance with Faculty Senate Policy 83-80.5.

Psychology

Code	Title	Credits
PSYCH 244	Introduction to the Psychology of Human Factors Engineering ¹	3
PSYCH 221	Introduction to Social Psychology ¹	3
PSYCH 253	Introduction to Psychology of Perception	3
PSYCH 256	Introduction to Cognitive Psychology ¹	3
PSYCH 301W	Basic Research Methods in Psychology ¹	4
PSYCH 370	Psychology of the Differently-Abled	3
PSYCH 420	Advanced Social Psychology ¹	3
PSYCH 421	Self and Social Judgment	3
PSYCH 423	Social Psychology of Interpersonal/Intergroup Relationships	3
PSYCH 458	Visual Cognition	3

¹ Course available at Harrisburg campus

- Note that this assumes PSYCH 100 will be chosen from Additional Courses, as it is a prerequisite for many of these classes.

Sociology

Code	Title	Credits
SOC 207	Research Methods in Sociology ¹	3
SOC 403	Advanced Social Psychology ¹	3
SOC 404	Social Influence and Small Groups ¹	3
SOC 405	Sociological Theory ¹	3
SOC 425	Social Conflict ¹	3
SOC 429	Social Stratification ¹	3
SOC 435/HDFS 434	Perspectives on Aging ¹	3
SOC 471	Qualitative Research Methods in Sociology	3

¹ Course available at Harrisburg campus

- Note that this assumes SOC 3 will be chosen from Additional Courses, as it is a prerequisite for many of these classes.

Informatics

Code	Title	Credits
IST 222H	Community Informatics	3
IST 234N	Digital Cultures	3
IST 237	Digital Entrepreneurship	3
IST 301	Information and Organizations ¹	3
IST 337	Technologies for Digital Entrepreneurs	3
IST 402	Emerging Issues and Technologies ¹	3
IST 437	Digital Design & Innovation	3
IST 431	The Information Environment	3
IST 441		3
IST 446	An Introduction to Building Computer/Video Games	3

¹ Course available at Harrisburg campus

Security and Risk

Code	Title	Credits
CYBER 100	Computer Systems Literacy ¹	3
SRA 111	Introduction to Security and Risk Analysis ¹	3
SRA 211	Threat of Terrorism and Crime ¹	3
SRA 221	Overview of Information Security ¹	3
SRA 231	Decision Theory and Analysis ¹	3
CYBER 262	Cyber-Defense Studio ¹	3
SRA 268	Visual Analytics	3
SRA 311	Risk Analysis in a Security Context ¹	3
CYBER 366	Malware Analytics ¹	3
SRA 421	The Intelligence Environment	3
SRA 468	Spatial Analysis of Risks	3
SRA 472	Integration of Privacy and Security ¹	3

¹ Course available at Harrisburg campus

Geographic Information Systems

Code	Title	Credits
GEOG 6N	Maps and the Geospatial Revolution	3
GEOG 260	Geographic Information in a Changing World: Introduction to GIScience	3
GEOG 361	Cartography--Maps and Map Construction	3
GEOG 362	Image Analysis	3
GEOG 363	Geographic Information Systems	3
GEOG 364	Spatial Analysis	3
CAS 101N	Introduction to Human Communication ¹	3
GEOG 461W	Dynamic Cartographic Representation	3
GEOG 463	Geospatial Information Management	3
GEOG 464	Advanced Spatial Analysis	3
GEOG 485	GIS Programming and Software Development	3

¹ Course available at Harrisburg campus

Digital Arts and Communication

Code	Title	Credits
CAS 101N	Introduction to Human Communication ¹	3
GD 100	Introduction to Graphic Design ¹	3
AA 121	Design Thinking and Creativity ¹	3
COMM 100N	The Mass Media and Society ¹	3
AA 122	Introduction to Graphic Storytelling	3
CAS 175		3
CAS 215	Argumentation	3
CAS 271N	Intercultural Communication	3
CAS 383N	Culture and Technology	3
CAS 471	Intercultural Communication Theory and Research	3
COMM 190/ GAME 140	Gaming and Interactive Media ¹	3
COMM 241	Graphic Design for Communications ¹	3
COMM 310	Digital Media Metrics	3
COMM 318		
COMM 325	Effects of digital games	3
COMM 418	Media Effects: Theory and Research	3
COMM 441	Advanced Graphic Design for Communications ¹	3
COMM 450A	Digital Campaigns	3

¹ Course available at Harrisburg campus

Data Sciences

Code	Title	Credits
DS 120	Scripting for Data Sciences	1
DS 200	Introduction to Data Sciences ¹	4
DS 220	Data Management for Data Sciences	3
DS 310	Machine Learning for Data Analytics	3
STAT 184	Introduction to R ¹	2
DS 300	Privacy and Security for Data Sciences	3
DS 330	Visual Analytics for Data Sciences	3
STAT 380	Data Science Through Statistical Reasoning and Computation ¹	3
DS 402	Emerging Trends in the Data Sciences	3
DS 410	Programming Models for Big Data	3
MIS 301	Business Analytics ¹	3
MIS 431	Business Data Management ¹	3
MIS 441	Business Intelligence for Decision Making ¹	3
MIS 445	Business Intelligence	4

¹ Course available at Harrisburg campus

Healthcare

Code	Title	Credits
HPA 101	Introduction to Health Services Organization ¹	3
HPA 210	Health Care Payment ¹	3
HPA 211	Financial Decisions in Health Care Organizations ¹	3
HPA 332	Health Systems Management ¹	3
HPA 470	Health Care Information Management ¹	3
HDFS 210Z		3
HDFS 249N	Adult Development and Aging ¹	3

HDFS 445	Development Throughout Adulthood ¹	3
BBH 101	Introduction to Biobehavioral Health ¹	3
BBH 302	Diversity and Health ¹	3
BBH 305	Introduction to Global Health Issues ¹	3
BBH 315	Gender and Biobehavioral Health ¹	3
BBH 316	Foundations and Principles of Health Promotion ¹	3
BBH 402	African Health & Development	3
BBH 432	Biobehavioral Aspects of Stress ¹	3
BBH 440	Principles of Epidemiology ¹	3

¹ Course available at Harrisburg campus

Custom Application Focus

There is an option for a student to create a custom 4-course application focus sequence. It must be a coherent sequence of courses that provides context for the student in terms of content relevant to the HCDD program. It must contain three credits of 400-level coursework, so it's important to consider course prerequisites when creating your custom application focus area. It must be selected in consultation with a teaching HCDD faculty member and an academic adviser.

Career Paths

Society increasingly recognizes the need for technologies designed to account for people's capabilities, needs, desires, and limitations. Human-Centered Design and Development graduates have many career paths available to them depending on their strengths, interests, and focus of study.

Students with more technical interests can become web and mobile application developers, front-end developers, and user interface/user experience designers and developers. Those most interested in the human dimension of technology can become usability researchers, interaction designers, and product managers. In addition, there are many opportunities to pursue graduate study in these areas.

MORE INFORMATION ABOUT POTENTIAL CAREER OPPORTUNITIES FOR GRADUATES OF THE HUMAN-CENTERED DESIGN AND DEVELOPMENT PROGRAM (<https://www.ist.psu.edu/current/careers/development/process/path/>)

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