

# : ACCOUNTANCY + DATA SCIENCE, BS

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## In Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu)
2. 1346 Head (sougianni@illinois.edu; anlamb@illinois.edu)
3. 1434 Head (namato@illinois.edu; vmahesh@illinois.edu; egunter@illinois.edu)
4. 1257 Head (tyson@illinois.edu)
5. 1992 Head (knox@illinois.edu)
6. 1583 Head (libo@illinois.edu)
7. KP Committee Chair (bsnewell@illinois.edu; danko@illinois.edu; kcp@illinois.edu; jmakela@illinois.edu)
8. KP Dean (candyd@illinois.edu)
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11. KM Committee Chair (josephm@illinois.edu)
12. KM Dean (peecher@illinois.edu; mlschltz@illinois.edu)
13. University Librarian (jpwilkin@illinois.edu)
14. Provost (kmartens@illinois.edu)
15. Senate EPC (bjlehman@illinois.edu; moorhouz@illinois.edu; kmartens@illinois.edu)
16. Senate (jtempel@illinois.edu)
17. U Senate Conf (none)
18. Board of Trustees (none)
19. IBHE (none)
20. DMI (eastuby@illinois.edu; aledward@illinois.edu; dforgacs@illinois.edu)

## Approval Path

1. Tue, 30 Mar 2021 19:26:53 GMT  
Deb Forgacs (dforgacs): Approved for U Program Review
2. Wed, 31 Mar 2021 14:19:23 GMT  
Theo Sougiannis (sougianni): Approved for 1346 Head
3. Thu, 01 Apr 2021 16:38:25 GMT  
Elsa Gunter (egunter): Approved for 1434 Head
4. Thu, 01 Apr 2021 16:41:44 GMT  
Jeremy Tyson (tyson): Approved for 1257 Head
5. Thu, 01 Apr 2021 16:44:28 GMT  
Emily Knox (knox): Approved for 1992 Head
6. Thu, 01 Apr 2021 19:53:45 GMT  
Bo Li (libo): Approved for 1583 Head
7. Tue, 06 Apr 2021 19:04:06 GMT  
Brooke Newell (bsnewell): Approved for KP Committee Chair
8. Tue, 06 Apr 2021 19:05:51 GMT  
Candy Deaville (candyd): Approved for KP Dean
9. Tue, 06 Apr 2021 19:14:39 GMT  
Emily Knox (knox): Approved for LP Dean
10. Tue, 06 Apr 2021 19:27:51 GMT  
Kelly Ritter (ritterk): Approved for KV Dean
11. Sat, 10 Apr 2021 01:04:46 GMT  
Joseph Mahoney (josephm): Approved for KM Committee Chair
12. Sat, 10 Apr 2021 02:27:49 GMT  
Mark Peecher (peecher): Approved for KM Dean
13. Sat, 10 Apr 2021 02:35:35 GMT  
John Wilkin (jpwilkin): Approved for University Librarian
14. Sat, 10 Apr 2021 14:07:08 GMT  
Kathy Martensen (kmartens): Approved for Provost

## New Proposal

Date Submitted: Tue, 30 Mar 2021 19:06:14 GMT

### Viewing:: Accountancy + Data Science, BS

Changes proposed by: Ashley Lamb

## Proposal Type

### Proposal Type:

Major (ex. Special Education)

Proposal Title:

**If this proposal is one piece of a multi-element change please include the other impacted programs here. *example: A BS revision with multiple concentration revisions***

A proposal to create an Accountancy plus Data Science degree program ("ACCY+DS Degree") as part of the University-wide "X+DS Degree" initiative.

### EP Control Number

EP.21.124

### Official Program Name

Accountancy + Data Science, BS

### Effective Catalog Term

Fall 2021

### Sponsor College

Gies College of Business

### Sponsor Department

Accountancy

### Sponsor Name

Theodore Sougiannis

### Sponsor Email

sougiani@illinois.edu

### College Contact

Jessen Hobson

## College Contact Email

jlhobson@illinois.edu

## Program Description and Justification

Provide *abrief* description and justification of the program, including highlights of the program objectives, and the careers, occupations, or further educational opportunities for which the program will prepare graduates, when appropriate.

A degree plan incorporating simultaneously a strong foundation in data science and deep engagement with ACCY, including substantial research or discovery experiences as part of the degree.

The ACCY+DS degree is comprised of these components:

1. The data science core coursework
  - a. This coursework is comprised of:
    - i. Two (2) courses from Statistics
    - ii. Two (2) courses from Computer Science
    - iii. Two (2) courses from the iSchool
    - iv. Two (2) courses from Mathematics
2. The coursework in the area of specialization
3. Coursework in non-major general business

### JUSTIFICATION:

Ubiquitous digital technology and the generation of massive amounts of data are rapidly transforming society and multiple fields of inquiry. This transformation has created exciting opportunities and worrisome scenarios across multiple domains of human endeavor. Like the industrial technologies of the early-20th century, the new digital technologies of the early-21st century have great potential to transform society, for good or ill. The University of Illinois has a high calling to prepare students to lead society's digital transformation.

There is substantial demand, both from students and from employers, for educational programs in data science. A 2017 study by researchers at IBM and Burning Glass Technologies predicts the demand for Data Scientists will grow by 28% by 2020. Enrollment in the undergraduate majors "Statistics" and "Statistics and Computer Science," which provide students access to some of the competencies of data science, have grown by a factor of six in the last ten years.

Data science is emerging as a subject of great importance in many domains of human and scholastic endeavor. National policy documents for data science majors emphasize that engagement with an application domain is an important part of data science education. The University of Illinois' white paper on data science education recommended the development of "X+Data Science Majors" as an innovative approach to offering broad collaborative opportunities for Illinois students to engage with data science.

### The ACCY+DS Degree

The major international accounting firms, the principal employer of Accountancy graduates, have promoted and advocated for data science education for many years. Increased demand for data science education has seen dramatic increases within Accountancy graduate programs. A data science component to the ACCY undergraduate program would provide more options for undergraduate employment and would better prepare students for graduate work. A survey notes that employees with the ability to be business translators—e.g., to combine data savvy with industry and functional expertise—are in rare supply<sup>2</sup>. This degree seeks to develop students precisely at that intersection. The Association to Advance Collegiate Schools of Business (AACSB) mandates in their Accounting Standard A7 that "learning experiences that develop skills and knowledge related to the integration of information technology in accounting and business...[include] the development of skills and knowledge related to data creation, data sharing, data analytics, data mining, data reporting, and storage within and across organizations."<sup>3</sup> In a 2015 report, PricewaterhouseCoopers LLP, one of our students' primary employers, recommends that skills such as understanding of structured and unstructured databases, obtaining and cleaning data, univariate and multivariate regression, machine learning, and programming languages such as Python, Java, or R be added to undergraduate accounting education.<sup>4</sup>

Data Science is a broad, far-reaching and encompassing discipline that is embedded in every field. This proposal builds on the University-wide initiative discussed above, which seeks to expand the Data Science vision for Illinois to every department, through a model of "X+DS" programs hosted in the department of the specialization ("X"). This proposal is just one of many, submitted as a group, which has the full support of the Data Science Education Task Force and the Data Science Education committee, and integrates a solid core of data science courses from LAS, CS and the iSchool to this "X" major.

### Corresponding Degree

BS Bachelor of Science

**Is this program interdisciplinary?**

Yes

**Interdisciplinary Colleges and Departments (list other colleges/departments which are involved other than the sponsor chose above)**

In Spring 2017, the College of Liberal Arts & Sciences submitted an Investment for Growth Proposal to “Jump Start Data Science”, focusing on undergraduate data science education. Interim Provost John Wilkin supported the proposal, but called on LAS to work with three colleges (Engineering, the iSchool, and the Gies College of Business) to develop a collaborative approach to undergraduate data science at Illinois.

Those deans formed a task force (herein the “Data Science Education Task Force” or DSETF) to explore opportunities and make proposals for undergraduate data science education at Illinois. The DSETF conducted its work during academic years 2017–2018 and 2018–2019. At the core of their work was the vision that every Illinois undergraduate should have the opportunity to have a meaningful exposure to data science.

In February 2019, the four deans agreed to support a shared framework for X+Data Science majors, based on suggestions from the DSETF. The framework consisted of the following pieces.

- 1) A set of core competencies and common features which will be expected of X+Data science majors, together with a reference standard set of courses and activities that fulfills the data science portion of those expectations.
- 2) Each college can propose its own X+Data Science majors, which will be majors of that college. They may differ from the reference standard approach. When they do so, they should explain how the proposed major provides the expected competencies and features of an X+Data Science major in a manner that is appropriate for their students.
- 3) The deans will engage with the campus leadership to establish a Data Science Education committee. The committee will:
  - Keep track of offerings related to data science to facilitate collaboration and reduce redundancy
  - Facilitate the development of data science programs by connecting undergraduate data science education resources across the university
  - Advise colleges on matters related to undergraduate data science education
  - Review X+Data Science major proposals, commenting on how they meet the expectations for X+Data Science majors and engage collaboratively and strategically with the university's resources in data science education

**College**

Grainger College of Engineering

**Department**

Computer Science

**Do you need to add an additional interdisciplinary relationship?**

Yes

**College**

Liberal Arts & Sciences

**Department**

Mathematics

**Do you need to add an additional interdisciplinary relationship?**

Yes

**College**

Information Science, School of

**Department**

Information Sciences

**Do you need to add an additional interdisciplinary relationship?**

Yes

**College**

Liberal Arts & Sciences

**Department**

Statistics

**Academic Level**

Undergraduate

**Will you admit to the concentration directly?**

No

**Is a concentration required for graduation?**

No

**CIP Code**

307102 - Business Analytics.

**Is This a Teacher Certification Program?**

No

**Will specialized accreditation be sought for this program?**

No

## Institutional Context

University of Illinois at Urbana-Champaign

Describe the historical and university context of the program's development. Include a short summary of any existing program(s) upon which this program will be built.

**Explain the nature and degree of overlap with existing programs and, if such overlap exists, document consultation with the impacted program's home department(s).**

The university's 2018 Strategic Plan The Next 150 calls for "[p]rovid[ing] all Illinois students the opportunity to have a meaningful exposure to data science."

In Spring 2017, the College of Liberal Arts & Sciences submitted an Investment for Growth Proposal to "Jump Start Data Science," focusing on undergraduate data science education. Interim Provost John Wilkin supported the proposal, but called on LAS to work with the colleges (Engineering, the iSchool, and the Gies College of Business) to develop a collaborative approach to undergraduate data science at Illinois. Those deans formed a task force (herein the "Data Science Education Task Force" or DSETF) to explore opportunities and make proposals for undergraduate data science education at Illinois. The DSETF conducted its work during academic years 2017–2018 and 2018–2019. At the core of their work was the vision that every Illinois undergraduate should have the opportunity to have a meaningful exposure to data science. The degree program differs from other undergraduate degree programs in data science because it provides the student with substantial exposure to data science and to Scholarship in Accounting. It differs from other degrees in Accounting because of the unique, interdisciplinary exposure to data science.

University of Illinois

**Briefly describe how this program will support the University's mission, focus and/or current priorities. Demonstrate the program's consistency with and centrality to that mission.**

Data science is an increasingly important part of scholarship across multiple fields of inquiry. New tools are enabling new modes of discovery in multiple disciplines. Demand for these jobs is growing rapidly in all sectors of the economy, including agriculture, finance, manufacturing, and marketing, to name just a few. At the same time, the advent of automated tools to suggest conclusions from massive data sets has serious social and ethical implications. The ACCY+DS major will prepare a student for deep engagement with Accounting using the tools of data science.

All business is being transformed by technology and data. Accounting is a discipline charged with organizing, analyzing, auditing, and communicating the "data" of business. As such, the accountant, auditor, and tax consultant of the present and future must increasingly have a native familiarity with data, a natural facility for consuming and analyzing data, and a ready ability to communicate the lessons from that analysis.

The program will serve the University's educational mission by preparing students to collaborate, communicate, and work effectively and ethically in a data-rich and interdisciplinary work environment.

State of Illinois

**Indicate which of the following goals of the Illinois Board of Higher Education's Strategic Initiative are supported by this program: (choose all that apply)**

Educational Attainment - increase educational attainment to match the best-performing states.

High Quality Credentials to Meet Economic Demand - Increase the number of high-quality post-secondary credentials to meet the demands of the economy and an increasingly global society.

Integration of Educational, Research and Innovation Assets - Better integrate Illinois' educational, research and innovation assets to meet economic needs of the state and its regions.

**Describe how the proposed program supports these goals.**

In the private sector, the demand for data science professionals is growing at a very rapid pace, with the number of data science job openings expected to grow by 15% to 25% over the next five years, depending on the job description.

A data science component to the ACCY undergraduate program would provide more options for undergraduate employment and would better prepare students for graduate work. A survey notes that employees with the ability to be business translators—combine data savvy with industry and functional expertise—are in rare supply. This degree seeks to develop students precisely at that intersection. The Association to Advance Collegiate Schools of Business (AACSB) mandates in their accounting standards (in Accounting Standard A7) “learning experiences that develop skills and knowledge related to the integration of information technology in accounting and business...[including] the development of skills and knowledge related to data creation, data sharing, data analytics, data mining, data reporting, and storage within and across organizations.” In a 2015 report, PricewaterhouseCoopers LLP, one of our students’ primary employers, recommended that skills such as understanding of structured and unstructured databases, obtaining and cleaning data, univariate and multivariate regression, machine learning, and programming languages such as Python, Java, or R be added to undergraduate accounting education.

## Admission Requirements

### Desired Effective Admissions Term

Fall 2021

**Provide a brief narrative description of the admission requirements for this program. Where relevant, include information about licensure requirements, student background checks, GRE and TOEFL scores, and admission requirements for transfer students.**

These are the same as those for our other degrees, which means the requirements are handled at the campus level.

### Describe how critical academic functions such as admissions and student advising are managed.

Admissions is managed through campus. ACCY+DS graduates will benefit from the same extensive career services and advising services provided to all Gies students. The Departments of Statistics and Computer Science and the iSchool will provide advising for the data science portion of the degree program and will interface with our advisors.

## Enrollment

### Number of Students in Program (estimate)

#### Year One Estimate

10

#### 5th Year Estimate (or when fully implemented)

50

### Estimated Annual Number of Degrees Awarded

#### Year One Estimate

0

#### 5th Year Estimate (or when fully implemented)

10

### What is the matriculation term for this program?

Fall

**What is the typical time to completion of this program?**

4 years

**What are the minimum Total Credit Hours required for this program?**

124 hours

## **Delivery Method**

**This program is available:**

On Campus

## **Budget**

**Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?**

No

## **Resource Implications**

Facilities

**Will the program require new or additional facilities or significant improvements to already existing facilities?**

No

Technology

**Will the program need additional technology beyond what is currently available for the unit?**

No

Non-Technical Resources

**Will the program require additional supplies, services or equipment (non-technical)?**

No

## Resources

For each of these items, be sure to include in the response if the proposed new program or change will result in replacement of another program(s). If so, which program(s), what is the anticipated impact on faculty, students, and instructional resources? Please attach any letters of support/acknowledgement from faculty, students, and/or other impacted units as appropriate.

### Faculty Resources

Please address the impact on faculty resources including any changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc. Describe how the unit will support student advising, including job placement and/or admission to advanced studies.

No changes in number of faculty outside of the Gies College is needed beyond the faculty increases outlined in the "Data Science" major proposal. No increases in number of faculty within the Gies College is required. We currently have capacity to address the expected minor increases in enrollments due to this program. ACCY+DS students will benefit from the same career services and advising services provided to all Gies students. The Departments of Statistics and Computer Science and the iSchool will provide advising for the data science portion of the degree program and will interface with our advisors.

### Library Resources

Describe your proposal's impact on the University Library's resources, collections, and services. If necessary please consult with the appropriate disciplinary specialist within the University Library.

There is no expected impact.

### Instructional Resources

Will there be any reduction in other course offerings, programs or concentrations by your department as a result of this new program/proposed change?

No

Does the program include other courses/subjects impacted by the creation/revision of this program?

No

## Financial Resources

How does the unit intend to financially support this proposal?

This is a revision of an existing degree program to partner with a data science component, and for the most part involves merely a shift in enrollments of courses taken within the units already. New courses largely shift enrollments away from existing courses (e.g., STAT 100 and CS 105 -> STAT/CS/IS 107; STAT 200 + STAT 212 -> STAT 207; MATH 225; etc.). In particular, as the appendix depicts, this new major simply adds a core of data science courses to the existing ACCY major. Three of these courses, STAT/CS/IS 107, STAT 207, and CS 307, will take the place of three existing courses in the Business Core, namely, CS 105, BADM 210, and BADM 211.

**Will the unit need to seek campus or other external resources?**

No

**Attach letters of support**

Letters of support.pdf

**Are you seeking a change in the tuition rate or differential for this program?**

Yes

**If yes, please enter your college budget office contact information and have them contact provostbudget@illinois.edu for next steps.**

Gina Oleynichak, Director of Budgets and Resource Planning  
goleynic@uillinois.edu

## **Market Demand**

**What market indicators are driving this proposal? If similar programs exist in the state, describe how this program offers a unique opportunity for students:**

In the private sector, the demand for data science professionals is growing at a very rapid pace, with the number of data science job openings expected to grow by 15% to 25% over the next five years, depending on the job description.

**What type of employment outlook should these graduates expect? Explain how the program will meet the needs of regional and state employers, including any state agencies, industries, research centers, or other educational institutions that expressly encourage the program's development.**

The major international accounting firms, the principal employer of Accountancy graduates, have promoted and advocated for data science education for many years. Increased demand for data science education has seen dramatic increases within Accountancy graduate programs. A data science component to the ACCY undergraduate program would provide more options for undergraduate employment and would better prepare students for graduate work. A survey notes

that employees with the ability to be business translators—e.g., to combine data savvy with industry and functional expertise—are in rare supply<sup>2</sup>. This degree seeks to develop students precisely at that intersection. The Association to Advance Collegiate Schools of Business (AACSB) mandates in their Accounting Standard A7 that “learning experiences that develop skills and knowledge related to the integration of information technology in accounting and business...[include] the development of skills and knowledge related to data creation, data sharing, data analytics, data mining, data reporting, and storage within and across organizations.”<sup>3</sup> In a 2015 report, PricewaterhouseCoopers LLP, one of our students’ primary employers, recommends that skills such as understanding of structured and unstructured databases, obtaining and cleaning data, univariate and multivariate regression, machine learning, and programming languages such as Python, Java, or R be added to undergraduate accounting education.<sup>4</sup>

Data Science is a broad, far-reaching and encompassing discipline that is embedded in every field. This proposal builds on the University-wide initiative discussed above, which seeks to expand the Data Science vision for Illinois to every department, through a model of “X+DS” programs hosted in the department of the specialization (“X”). This proposal is just one of many, submitted as a group, which has the full support of the Data Science Education Task Force and the Data Education committee, and integrates a solid core of data science courses from LAS, CS and the iSchool to this “X” major.

**What resources will be provided to assist students with job placement?**

ACCY+DS graduates will benefit from the same extensive career services and advising services provided to all Gies students.

## Program Regulation and Assessment

Briefly describe the plan to assess and improve student learning, including the program's learning objectives; when, how, and where these learning objectives will be assessed; what metrics will be used to signify student's achievement of the stated learning objectives; and the process to ensure assessment results are used to improve student learning. (Describe how the program is aligned with or meets licensure, certification, and/or entitlement requirements, if applicable).

Traditional course and program metrics currently used in our ACCY major will be used to assess and improve student performance. These include student satisfaction and hiring/placement statistics.

**Is the career/profession for graduates of this program regulated by the State of Illinois?**

No

## Program of Study

"Baccalaureate degree requires at least 120 semester credit hours or 180 quarter credit hours and at least 40 semester credit hours (60 quarter credit hours) in upper division courses" (source: <https://www.ibhe.org/assets/files/PrivateAdminRules2017.pdf>). For proposals for new bachelor's degrees, if this minimum is not explicitly met by specifically-required 300- and/or 400-level courses, please provide information on how the upper-division hours requirement will be satisfied.

**All proposals must attach the new or revised version of the Academic Catalog program of study entry. Contact your college office if you have questions.**

**For new programs, attach Program of Study**

Accy+DS\_25Mar2021\_s.pdf

Academic Catalog Entry for Accountancy + DS, BS.docx

Catalog Page Text

**Catalog Page Text: Description of program for the catalog page. This is not official content, it is used to help build the catalog pages for the program. Can be edited in the catalog by the college or department.**

This major is sponsored by the Accountancy Department in the Gies College of Business, in collaboration with the Departments of Statistics, Computer Science, iSchool, and Mathematics. The ACCY+Data Science major is designed for students seeking to supplement their accounting foundation with a strong background in data science. The major prepares students for professional or graduate work in all Accounting fields, but particularly those focused on analytics.

For the Degree of Bachelor of Science in Accountancy

Major in Accountancy + Data Science

E-mail: ACCY@illinois.edu

General education: Students must complete the Campus General Education requirements including the campus general education language requirement.

Twelve hours of 300 and 400-level courses must be taken on this campus.

Minimum hours required for graduation: 124 hours

Departmental distinction: To graduate with distinction requires a specified minimum grade point average in all Accountancy, Computer Science, Statistics, Information Science, and Mathematics courses listed below.

A GPA of 3.25 is required for Distinction, 3.5 for High Distinction, and 3.75 for Highest Distinction.

## Statement for Programs of Study Catalog

Minimum hours for graduation: 120 hours

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### University Composition Requirements

Code	Title	Hours
	Composition I: Principles of Composition <sup>1</sup>	4-7
	Advanced Composition	3

### General Education Requirements

Code	Title	Hours
	A minimum of six courses is required, as follows:	18
	Humanities & the Arts: Literature & the Arts (1-2 courses) <sup>3</sup>	
	Humanities & the Arts: Historical & Philosophical Perspectives (1-2 courses) <sup>3</sup>	
	Natural Sciences & Technology: Physical Sciences (0-2 courses) <sup>4</sup>	
	Natural Sciences & Technology: Life Sciences (0-2 courses) <sup>4</sup>	
	Behavioral Sciences (1 course)	
	Cultural Studies: Non-Western Cultures (1 course)	
	Cultural Studies: U.S. Minorities Cultures (1 course)	
	Cultural Studies: Western/Comparative Cultures (1 course)	
	Quantitative Reasoning (2 courses)	

### Language Other Than English

Code	Title	Hours
	Completion of the third semester or equivalent of a language other than English is required. Completion of three years of a single language in high school satisfies this requirement.	0-15

### Business Core

Code	Title	Hours
ACCY 201 & ACCY 202	Accounting and Accountancy I and Accounting and Accountancy II	6
BADM 275	Fundamentals of Operations Management	3
BADM 300	The Legal Environment of Bus	3
BADM 310	Mgmt and Organizational Beh <sup>5</sup>	3
BADM 320	Principles of Marketing	3
BADM 449	Business Policy and Strategy	3
BUS 101	Professional Responsibility and Business <sup>2</sup>	3
BUS 201	Business Dynamics	3
BUS 401	Global Business Perspectives	3
CMN 101	Public Speaking	3
ECON 102 & ECON 103	Microeconomic Principles and Macroeconomic Principles	6
FIN 221	Corporate Finance	3
<b>Total Hours</b>		<b>42</b>

### Accounting Specialization

Code	Title	Hours
ACCY 301	Atg Measurement & Disclosure	3
ACCY 302	Decision Making for Atg	3
ACCY 303	Accounting Institutions and Regulation	3
ACCY 304	Accounting Control Systems	3

ACCY 312	Principles of Taxation	3
ACCY 405	Assurance and Attestation	3
ACCY 410 or ACCY 451	Advanced Financial Reporting Advanced Income Tax Problems	3 or 4
<b>Total Hours</b>		<b>21</b>

## Data Science Core

Code	Title	Hours
<b>Mathematical Foundations</b>		
MATH 234	Calculus for Business I	4
MATH 227 or MATH 257	Linear Algebra for Data Science Linear Algebra with Computational Applications	3
<b>Data Science Fundamentals</b>		
STAT/CS/IS 107	Data Science Discovery	4
STAT 207	Data Science Exploration	4
CS 307	Modeling and Learning in Data Science	4
<b>Computational Fundamentals</b>		
CS 277	Algorithms and Data Structures for Data Science	4
<b>Social Impact in Data Science</b>		
IS 467	Ethics and Policy for Data Science	3
IS 477	Data Management, Curation & Reproducibility	3
<b>Total Hours</b>		<b>29</b>

## Meaningful Research or Discovery Experience

Code	Title	Hours
	One of the most important skills a student will gain in an ACCY+DS degree will be the ability to present data in meaningful ways. A meaningful research and experience is as much a pillar of this degree program as both the core coursework and the area of specialization. This capstone experience can be fulfilled through BUS 301. This course is an active learning, real-client experience that will allow students to join their data science skills with their business skills.	
<b>Total Hours</b>		<b>3</b>

## Summary of Total Hours

Code	Title	Hours
	Total General Education Hours	25
	Total Business Core Hours	42
	Total Accounting Specialization Hours	21
	Total Data Science Core Hours	29
	Meaningful Research or Discovery Experience	3
<b>Total Hours</b>		<b>124</b>

<sup>1</sup> For a list of the specific courses that meet this requirement, see the college Office of Undergraduate Affairs in 1055 Business Instructional Facility or see the Course Explorer for a list of approved general education courses.

<sup>2</sup> BUS 101, BUS 201, BUS 301 and BUS 401 are required for all Gies College of Business students. Students who enter the College their first year take each sequential course every fall.  
Inter-College transfer students take BUS 301 and BUS 401 in their sophomore year. Off-campus transfer students take BUS 101 and BUS 201 in their junior year.

<sup>3</sup> Three courses in the Humanities & the Arts area are required and students must complete at least one course in the Literature & the Arts and Historical & Perspectives subcategories. At least one of the courses must be a 200 or higher level course.

<sup>4</sup> Two courses in the Natural Sciences & Technology area are required. It is strongly recommended that students complete one course in the Physical Sciences and Life Sciences subcategories.

<sup>5</sup> This course includes limited voluntary participation as a subject in experiments.

## EP Documentation

## DMI Documentation

### Program Reviewer Comments

**Deb Forgacs (dforgacs)** (Mon, 29 Mar 2021 21:02:42 GMT):Rollback: requested.

**Kathy Martensen (kmartens)** (Mon, 19 Apr 2021 19:16:55 GMT):Updated references to total hours from 120 to 124 – see attached email correspondence from sponsor in EP Documentation section. Note that the Word doc attachments contain the incorrect total hours.

Key: 968



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## ACCY+DS Proposal to the Senate Educational Policy Committee

### PROPOSAL TITLE:

A proposal to create an Accountancy plus Data Science degree program (“ACCY+DS Degree”) as part of the University-wide “X+DS Degree” initiative.

### SPONSORS:

Theodore Sougiannis, KPMG Distinguished Professor of Accountancy and Interim Department Head, 217-244-0555, [sougianni@illinois.edu](mailto:sougianni@illinois.edu)

Robert Brunner, Associate Dean for Innovation, 217-244-6099, [bigdog@illinois.edu](mailto:bigdog@illinois.edu)

### COLLEGE CONTACT:

Jessen Hobson, Professor of Accountancy, 217-265-0327, [jlhobson@illinois.edu](mailto:jlhobson@illinois.edu)

### BRIEF DESCRIPTION:

A degree plan incorporating simultaneously a strong foundation in data science and deep engagement with ACCY, including substantial research or discovery experiences as part of the degree.

The ACCY+DS degree is comprised of these components (please see the table below for details):

1. The data science core coursework
  - a. This coursework is comprised of:
    - i. Two (2) courses from Statistics
    - ii. Two (2) courses from Computer Science
    - iii. Two (2) courses from the iSchool
    - iv. Two (2) courses from Mathematics
2. The coursework in the area of specialization
3. Coursework in non-major general business

### JUSTIFICATION:

Ubiquitous digital technology and the generation of massive amounts of data are rapidly transforming society and multiple fields of inquiry. This transformation has created exciting opportunities and worrisome scenarios across multiple domains of human endeavor. Like the industrial technologies of the early-20<sup>th</sup> century, the new digital technologies of the early-21<sup>st</sup> century have great potential to transform society, for good or ill. The University of Illinois has a high calling to prepare students to lead society’s digital transformation.

There is substantial demand, both from students and from employers, for educational programs in data science. A 2017 study by researchers at IBM and Burning Glass Technologies predicts the

demand for Data Scientists will grow by 28% by 2020<sup>1</sup>. Enrollment in the undergraduate majors “Statistics” and “Statistics and Computer Science,” which provide students access to some of the competencies of data science, have grown by a factor of six in the last ten years.

Data science is emerging as a subject of great importance in many domains of human and scholastic endeavor. National policy documents for data science majors emphasize that engagement with an application domain is an important part of data science education. The University of Illinois’ white paper on data science education recommended the development of “X+Data Science Majors” as an innovative approach to offering broad collaborative opportunities for Illinois students to engage with data science.

### **The ACCY+DS Degree**

The major international accounting firms, the principal employer of Accountancy graduates, have promoted and advocated for data science education for many years. Increased demand for data science education has seen dramatic increases within Accountancy graduate programs. A data science component to the ACCY undergraduate program would provide more options for undergraduate employment and would better prepare students for graduate work. A survey notes that employees with the ability to be business translators—e.g., to combine data savvy with industry and functional expertise—are in rare supply<sup>2</sup>. This degree seeks to develop students precisely at that intersection. The Association to Advance Collegiate Schools of Business (AACSB) mandates in their Accounting Standard A7 that “learning experiences that develop skills and knowledge related to the integration of information technology in accounting and business...[include] the development of skills and knowledge related to data creation, data sharing, data analytics, data mining, data reporting, and storage within and across organizations.”<sup>3</sup> In a 2015 report, PricewaterhouseCoopers LLP, one of our students’ primary employers, recommends that skills such as understanding of structured and unstructured databases, obtaining and cleaning data, univariate and multivariate regression, machine learning, and programming languages such as Python, Java, or R be added to undergraduate accounting education.<sup>4</sup>

Data Science is a broad, far-reaching and encompassing discipline that is embedded in every field. This proposal builds on the University-wide initiative discussed above, which seeks to expand the Data Science vision for Illinois to every department, through a model of “X+DS” programs hosted in the department of the specialization (“X”). This proposal is just one of many, submitted as a group, which has the full support of the Data Science Education Task Force and the Data Science

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<sup>1</sup> Markow, Braganza, Taska, Miller, and Hughes, “The Quant Crunch: How the demand for data science skills is disrupting the job market”, published by IBM, Burning Technologies, and the Business-Higher Education Forum, 2017. Available at <https://www.ibm.com/downloads/cas/3RL3VXGA>.

<sup>2</sup> Bughin, J., J. Manyika, and J. Woetze. 2016. The Age of Analytics: Competing In A Data-Driven World. <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Analytics/Our%20Insights/The%20age%20of%20analytics%20Competing%20in%20a%20data%20driven%20world/MGI-The-Age-of-Analytics-Full-report.ashx>

<sup>3</sup> <https://www.aacsb.edu/~media/aacsb/docs/accreditation/accounting/standards-and-tables/2018-accounting-standards.ashx?la=en&hash=8DCDA6CE3B0CEF6AB82D39CBF53995DA96111196>

<sup>4</sup> PricewaterhouseCoopers LLP. 2015. What students need to succeed in a rapidly changing business world. <https://www.pwc.com/us/en/faculty-resource/assets/pwc-data-driven-paper-feb2015.pdf>; Tschakert, N., J. Kokina, S. Kozlowski, and M. Vasarhelyi. 2017. How Business Schools Can Integrate Data Analytics into the Accounting Curriculum: Certified Public Accountant. The CPA Journal 87 (9):10-12.

Education committee, and integrates a solid core of data science courses from LAS, CS and the iSchool to this “X” major.

### **BUDGETARY AND STAFF IMPLICATIONS:**

#### 1) Resources

- a. How does the unit intend to financially support this proposal?

This is a revision of an existing degree program to partner with a data science component, and for the most part involves merely a shift in enrollments of courses taken within the units already. New courses largely shift enrollments away from existing courses (e.g., STAT 100 and CS 105 → STAT/CS/IS 107; STAT 200 + STAT 212 → STAT 207; MATH 225; etc.). In particular, as the appendix depicts, this new major simply adds a core of data science courses to the existing ACCY major. Three of these courses, STAT/CS/IS 107, STAT 207, and CS 307, will take the place of three existing courses in the Business Core, namely, CS 105, BADM 210, and BADM 211.

- b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

Each affected unit can shift teaching resources to the extent necessary, as discussed above. We expect an increase in ACCY course enrollment and have the capacity to teach and advise students creating this increase. The Departments of Statistics and Computer Science and the iSchool will provide advising for the data science portion of the degree program and will interface with our advisors.

- c. Will the unit need to seek campus or other external resources?

No

- d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

See attached

#### 2) Resource Implications

- a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

No changes in number of faculty outside of the Gies College is needed beyond the faculty increases outlined in the “Data Science” major proposal. No increases in number of faculty within the Gies College is required.

- b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units.

Outside of Gies, the addition of ACCY+DS program will impact only fields involved within the ACCY+DS program. No changes of enrollment impacting departments other than Computer Science, Statistics, Math, and the iSchool are expected.

- c. Please address the impact on the University Library

There is no expected impact.

- d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

There is no expected impact beyond the demand that already arises from enrollments in computer science and statistics courses.

For new degree programs only:

- 3) Briefly describe how this program will support the University's mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program's consistency with and centrality to that mission.

Data science is an increasingly important part of scholarship across multiple fields of inquiry. New tools are enabling new modes of discovery in multiple disciplines. Demand for these jobs is growing rapidly in all sectors of the economy, including agriculture, finance, manufacturing, and marketing, to name just a few. At the same time, the advent of automated tools to suggest conclusions from massive data sets has serious social and ethical implications. The ACCY+DS major will prepare a student for deep engagement with Accounting using the tools of data science.

All business is being transformed by technology and data. Accounting is a discipline charged with organizing, analyzing, auditing, and communicating the "data" of business. As such, the accountant, auditor, and tax consultant of the present and future must increasingly have a native familiarity with data, a natural facility for consuming and analyzing data, and a ready ability to communicate the lessons from that analysis.

The program will serve the University's educational mission by preparing students to collaborate, communicate, and work effectively and ethically in a data-rich and interdisciplinary work environment.

- 4) Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?

In the private sector, the demand for data science professionals is growing at a very rapid pace, with the number of data science job opening expected to grow by 15% to 25% over the next five years, depending on the job description. ACCY+DS graduates will benefit from the same extensive career services and advising services provided to all Gies students.

- 5) If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?

Not applicable

**DESIRED EFFECTIVE DATE:**

Effective beginning in Fall 2021

**STATEMENT FOR PROGRAMS OF STUDY CATALOG:** *(All proposals must include either a new or revised version of the entry in the Programs of Study Catalog, if applicable. Entries will be published as approved by the Senate. Future changes in the statement for Programs of Study Catalog which reflect changes in the curriculum, must go through the normal review process at the appropriate levels.)*

This major is sponsored by the Accountancy Department in the Gies College of Business, in collaboration with the Departments of Statistics, Computer Science, iSchool, and Mathematics. The ACCY+Data Science major is designed for students seeking to supplement their accounting foundation with a strong background in data science. The major prepares students for professional or graduate work in all Accounting fields, but particularly those focused on analytics.

**For the Degree of Bachelor of Science in Accountancy**

**Major in Accountancy + Data Science**

E-mail: [ACCY@illinois.edu](mailto:ACCY@illinois.edu)

General education: Students must complete the Campus General Education requirements including the campus general education language requirement.

Twelve hours of 300 and 400-level courses must be taken on this campus.

Minimum hours required for graduation: 120 hours

Departmental distinction: To graduate with distinction requires a specified minimum grade point average in all Accountancy, Computer Science, Statistics, Information Science, and Mathematics courses listed below. A GPA of 3.25 is required for Distinction, 3.5 for High Distinction, and 3.75 for Highest Distinction.

<b>Course and Title</b>	<b>Hours</b>
<b>Business Core, Total</b>	<b>42</b>
<b>Accounting and Accountancy I: ACCY 201</b>	<b>3</b>

<b>Course and Title</b>	<b>Hours</b>
<b>Accounting and Accountancy II: ACCY 202</b>	<b>3</b>
<b>Business Analytics I: BADM 210</b>	<b>Fulfilled through DS Core below</b>
<b>Business Analytics II: BADM 211</b>	<b>Fulfilled through DS Core below</b>
<b>Fundamentals of Operations Management: BADM 275</b>	<b>3</b>
<b>The Legal Environment of Bus: BADM 300</b>	<b>3</b>
<b>Mgmt and Organizational Beh: BADM 310</b>	<b>3</b>
<b>Principles of Marketing: BADM 320</b>	<b>3</b>
<b>Business Policy and Strategy: BADM 449</b>	<b>3</b>
<b>Professional Responsibility and Business: BUS 101</b>	<b>3</b>
<b>Business Dynamics: BUS 201</b>	<b>3</b>
<b>Business in Action: BUS 301</b>	<b>Listed below</b>
<b>Business in a Global Perspective: BUS 401</b>	<b>3</b>
<b>Public Speaking: CMN 101</b>	<b>3</b>
<b>Intro to Computing: Non-Tech: CS 105</b>	<b>Fulfilled through DS Core below</b>
<b>Microeconomic Principles: ECON 102</b>	<b>3</b>
<b>Macroeconomic Principles: ECON 103</b>	<b>3</b>
<b>Corporate Finance: FIN 221</b>	<b>3</b>
<b>Calculus for Business: MATH 234</b>	<b>Listed below</b>
<b>Accounting Specialization, Total</b>	<b>21</b>
<b>Accounting Measurement and Disclosure: ACCY 301</b>	<b>3</b>
<b>Decision Making for Accounting: ACCY 302</b>	<b>3</b>
<b>Accounting Institutions and Regulation: ACCY 303</b>	<b>3</b>
<b>Accounting Control Systems: ACCY 304</b>	<b>3</b>

<b>Course and Title</b>	<b>Hours</b>
<b>Principles of Taxation: ACCY 312</b>	<b>3</b>
<b>Assurance and Attestation: ACCY 405</b>	<b>3</b>
<b>Advanced Financial Reporting or Advanced Income Tax Problems: ACCY 410 or 451</b>	<b>3</b>
<b>Data Science Core</b>	<b>29</b>
<b>Mathematical Foundations</b>	<b>7</b>
<b>Calculus: MATH 234</b>	<b>4</b>
<b>Linear Algebra: MATH 227 or MATH 257</b>	<b>3</b>
<b>Data Science Fundamentals</b>	<b>12</b>
<b>Data Science Discovery: STAT/CS/IS 107</b>	<b>4</b>
<b>Data Science Exploration: STAT 207</b>	<b>4</b>
<b>Modeling and Learning in Data Science: CS 307</b>	<b>4</b>
<b>Computational Fundamentals</b>	<b>4</b>
<b>Algorithms and Data Structures for Data Science: CS 277</b>	<b>4</b>
<b>Social Impact in Data Science</b>	<b>6</b>
<b>Ethics and Policy for Data Science: IS 467</b>	<b>3</b>
<b>Data Management, Curation &amp; Reproducibility: IS 477</b>	<b>3</b>
<b>Meaningful Research or Discovery Experience</b>	<b>3</b>
<p>One of the most important skills a student will gain in an ACCY+DS degree will be the ability to present data in meaningful ways. A meaningful research and experience is as much a pillar of this degree program as both the core coursework and the area of specialization. This capstone experience can be fulfilled through BUS 301, listed above in the Business Core. This course is an active learning, real-client experience that will allow students to join their data science skills with their business skills.</p>	
<b>Summary of Total Hours</b>	<b>95</b>
<b>Total Business Core Hours</b>	<b>42</b>
<b>Total Accounting Specialization Hours</b>	<b>21</b>
<b>Total Data Science Core Hours</b>	<b>32</b>
<b>Total Hours</b>	<b>95</b>

## Appendix A:

### Coursework Description

The core coursework comprised in the ACCY+DS degree plan prepares students with a strong background in data science, inferential thinking, computational thinking, and real-world relevance.

### Part 1: Data Science Core Coursework Detail

This data science core coursework is divided into the following categories, each described below:

<b>Mathematical Foundations</b>	
<p><b>MATH 234: Calculus</b>  <i>This requirement can be fulfilled by MATH 220 (“Calculus”), MATH 221 (“Calculus I”), or MATH 234 (“Calculus for Business”).</i>  <b>Prerequisites:</b> MATH 112  <b>Proposed Topic Coverage:</b> Integrals and derivatives provides the basic mathematical tools for both optimization and finding extrema, maxima, and minima. Students will be exposed to programming techniques to use this fundamental mathematical background in CS 307.</p>	<p>Credit Hours: 4</p>
<p><b>MATH 227 or MATH 257: Linear Algebra for Data Science</b>  <i>This is a new course developed from MATH 225 with a focus on Data Science.</i>  <b>Prerequisites:</b> MATH 220, MATH 221, or MATH 234 (“Calculus” from above)  <b>Purpose:</b> Linear algebra is the mathematics that underlies most mathematical approaches to analysis of data. This course serves as a prerequisite to CS 307.  <b>Example Description</b> (<i>from Berkeley’s “Data Science for Linear Algebra” course</i>): This connector will cover introductory topics in the mathematics of data science, focusing on discrete probability and linear algebra and the connections between them that are useful in modern theory and practice. We will focus on matrices and graphs as popular mathematical structures with which to model data. For examples, as models for term-document corpora, high-dimensional regression problems, ranking/classification of web data, adjacency properties of social network data, etc.</p>	<p>Credit Hours: 3</p>
<b>Data Science Fundamentals</b>	
<p><b>STAT/CS/IS 107: Data Science Discovery</b>  <i>(This course is being piloted in Spring 2019, on offer starting Fall 2019.)</i>  <b>Prerequisites:</b> None. (This course is designed for first semester freshman.)  <b>Purpose:</b> Provides students with an introduction to data science through hands-on, real-world data with elementary statistical analysis and Python programming. Allows students to continue with advanced topics in STAT 207.</p>	<p>Credit Hours: 4</p>

<p><b>STAT 207: Data Science Exploration</b>  <b>Prerequisites:</b> STAT/CS/IS 107  <i>(This is new course to be developed as a follow-on to STAT/CS/IS 107.)</i>  <b>Proposed Topic Coverage:</b> Students will further explore the data science life cycle, including hypothesis formulation, best practices for data collection and cleaning, exploratory data analysis with visualizations, uncertainty quantification, prediction using multiple regression and machine learning, and reporting. Each topic will be applied computationally with large, real-world datasets that expand on the computational skills learned in STAT/CS/IS 107.</p>	<p>Credit Hours: 4</p>
<p><b>CS 277: Algorithms and Data Structures in Data Science</b>  <b>Prerequisites:</b> STAT 207 + Calculus  <i>(This is new course to be developed as a follow-on to STAT 207.)</i>  <b>Proposed Topic Coverage:</b> Introduction to fundamental concepts in Computer Science including algorithms, data structures, run-time complexity, and object-oriented programming. Includes elementary analysis of arrays, lists, stacks, queues, heaps, binary trees, balanced trees, hash tables, and graphs with a significant component of programming project focused in Data Science using the Python programming language.</p>	<p>Credit Hours: 4</p>
<p><b>CS 307: Modeling and Learning in Data Science</b>  <b>Prerequisites:</b> STAT 207 + Linear Algebra (requires Calculus)  <i>(This is new course to be developed as a follow-on to STAT 207.)</i>  <b>Proposed Topic Coverage:</b> Significant coverage of probability with emphasis on using computation to design solutions to data-centric problems. Inclusion of random variables, Monte Carlo methods, discrete and continuous distributions, conditional probability, Bayes theorem, moment generating functions, central limit theorem, and maximum likelihood estimation. Students will apply these concepts in multiple applications of classical machine learning algorithms using Python and Python libraries.</p>	<p>Credit Hours: 4</p>

<b>Societal Impact in Data Science</b>	
<p><b>IS 467: Ethics &amp; Policy for Data Science</b>  <b>Prerequisites:</b> None  <b>Purpose:</b> This class explores concepts in data ethics and policy using several frameworks from both a theoretical and practical point of view. The aim of the class is to provide students with knowledge and skills needed to address a variety of ethical and policy topics.</p>	<p>Credit Hours: 3</p>
<p><b>IS 477: Data Management, Curation &amp; Reproducibility</b>  <b>Prerequisites:</b> None  <b>Purpose:</b> This course provides an overview of a broad range of theoretical and practical problems in data management and curation examining issues related to appraisal and selection, long lived data collections, research lifecycles, reproducibility, workflows, metadata, and legal and intellectual property issues.</p>	<p>Credit Hours: 3</p>

## Part 2: Coursework in Area of Specialization

The ACCY+DS degree plan has an area of specialization from Accountancy that requires 7 courses. The curriculum in the ACCY area of specialization is unchanged in this new major.

ACCY 301: Accounting Measurement and Disclosure	Credit Hours: 3
ACCY 302: Decision Making for Accounting	Credit Hours: 3
ACCY 303: Accounting Institutions and Regulation	Credit Hours: 3
ACCY 304: Accounting Control Systems	Credit Hours: 3
ACCY 312: Principles of Taxation	Credit Hours: 3
ACCY 405: Assurance and Attestation or Auditing Standards and Practice	Credit Hours: 3
One of ACCY 410 or 451: Advanced Financial Reporting or Advanced Income Tax Problems	Credit Hours: 3

**Part 3: A Meaningful Research or Discovery Experience**

One of the most important skills a student will gain in an ACCY+DS degree will be the ability to present data in meaningful ways. A meaningful research and experience is as much a pillar of this degree program as both the core coursework and the area of specialization. This capstone experience can be fulfilled through BUS 301, listed above in the Business Core. This course is an active learning, real-client experience that will allow students to join their data science skills with their business skills. Credit Hours: 3

**Academic Catalog Entry**  
**Bachelor of Science in Accountancy + Data Science**

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This major is sponsored by the Accountancy Department in the Gies College of Business, in collaboration with the Departments of Statistics, Computer Science, iSchool, and Mathematics. The ACCY+Data Science major is designed for students seeking to supplement their accounting foundation with a strong background in data science. The major prepares students for professional or graduate work in all Accounting fields, but particularly those focused on analytics.

**For the Degree of Bachelor of Science in Accountancy**

**Major in Accountancy + Data Science**

E-mail: [ACCY@illinois.edu](mailto:ACCY@illinois.edu)

General education: Students must complete the Campus General Education requirements including the campus general education language requirement.

Twelve hours of 300 and 400-level courses must be taken on this campus.

Minimum hours required for graduation: 120 hours

Departmental distinction: To graduate with distinction requires a specified minimum grade point average in all Accountancy, Computer Science, Statistics, Information Science, and Mathematics courses listed below. A GPA of 3.25 is required for Distinction, 3.5 for High Distinction, and 3.75 for Highest Distinction.

<b>Course and Title</b>	<b>Hours</b>
<b>Business Core, Total</b>	<b>42</b>
<b>Accounting and Accountancy I: ACCY 201</b>	<b>3</b>

<b>Course and Title</b>	<b>Hours</b>
<b>Accounting and Accountancy II: ACCY 202</b>	<b>3</b>
<b>Business Analytics I: BADM 210</b>	<b>Fulfilled through DS Core below</b>
<b>Business Analytics II: BADM 211</b>	<b>Fulfilled through DS Core below</b>
<b>Fundamentals of Operations Management: BADM 275</b>	<b>3</b>
<b>The Legal Environment of Bus: BADM 300</b>	<b>3</b>
<b>Mgmt and Organizational Beh: BADM 310</b>	<b>3</b>
<b>Principles of Marketing: BADM 320</b>	<b>3</b>
<b>Business Policy and Strategy: BADM 449</b>	<b>3</b>
<b>Professional Responsibility and Business: BUS 101</b>	<b>3</b>
<b>Business Dynamics: BUS 201</b>	<b>3</b>
<b>Business in Action: BUS 301</b>	<b>Listed below</b>
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<b>Public Speaking: CMN 101</b>	<b>3</b>
<b>Intro to Computing: Non-Tech: CS 105</b>	<b>Fulfilled through DS Core below</b>
<b>Microeconomic Principles: ECON 102</b>	<b>3</b>
<b>Macroeconomic Principles: ECON 103</b>	<b>3</b>
<b>Corporate Finance: FIN 221</b>	<b>3</b>
<b>Calculus for Business: MATH 234</b>	<b>Listed below</b>
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<b>Course and Title</b>	<b>Hours</b>
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<b>Data Science Fundamentals</b>	<b>12</b>
<b>Data Science Discovery: STAT/CS/IS 107</b>	<b>4</b>
<b>Data Science Exploration: STAT 207</b>	<b>4</b>
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<b>Computational Fundamentals</b>	<b>4</b>
<b>Algorithms and Data Structures for Data Science: CS 277</b>	<b>4</b>
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<b>Data Management, Curation &amp; Reproducibility: IS 477</b>	<b>3</b>
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<p>One of the most important skills a student will gain in an ACCY+DS degree will be the ability to present data in meaningful ways. A meaningful research and experience is as much a pillar of this degree program as both the core coursework and the area of specialization. This capstone experience can be fulfilled through BUS 301, listed above in the Business Core. This course is an active learning, real-client experience that will allow students to join their data science skills with their business skills.</p>	
<b>Summary of Total Hours</b>	<b>95</b>
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## Appendix A:

### Coursework Description

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<p><b>MATH 227 or MATH 257: Linear Algebra for Data Science</b>  <i>This is a new course developed from MATH 225 with a focus on Data Science.</i>  <b>Prerequisites:</b> MATH 220, MATH 221, or MATH 234 (“Calculus” from above)  <b>Purpose:</b> Linear algebra is the mathematics that underlies most mathematical approaches to analysis of data. This course serves as a prerequisite to CS 307.  <b>Example Description</b> (from Berkeley’s “Data Science for Linear Algebra” course): This connector will cover introductory topics in the mathematics of data science, focusing on discrete probability and linear algebra and the connections between them that are useful in modern theory and practice. We will focus on matrices and graphs as popular mathematical structures with which to model data. For examples, as models for term-document corpora, high-dimensional regression problems, ranking/classification of web data, adjacency properties of social network data, etc.</p>	<p>Credit Hours: 3</p>
<b>Data Science Fundamentals</b>	
<p><b>STAT/CS/IS 107: Data Science Discovery</b>  <i>(This course is being piloted in Spring 2019, on offer starting Fall 2019.)</i>  <b>Prerequisites:</b> None. (This course is designed for first semester freshman.)  <b>Purpose:</b> Provides students with an introduction to data science through hands-on, real-world data with elementary statistical analysis and Python programming. Allows students to continue with advanced topics in STAT 207.</p>	<p>Credit Hours: 4</p>

<p><b>STAT 207: Data Science Exploration</b>  <b>Prerequisites:</b> STAT/CS/IS 107  <i>(This is new course to be developed as a follow-on to STAT/CS/IS 107.)</i>  <b>Proposed Topic Coverage:</b> Students will further explore the data science life cycle, including hypothesis formulation, best practices for data collection and cleaning, exploratory data analysis with visualizations, uncertainty quantification, prediction using multiple regression and machine learning, and reporting. Each topic will be applied computationally with large, real-world datasets that expand on the computational skills learned in STAT/CS/IS 107.</p>	<p>Credit Hours: 4</p>
<p><b>CS 277: Algorithms and Data Structures in Data Science</b>  <b>Prerequisites:</b> STAT 207 + Calculus  <i>(This is new course to be developed as a follow-on to STAT 207.)</i>  <b>Proposed Topic Coverage:</b> Introduction to fundamental concepts in Computer Science including algorithms, data structures, run-time complexity, and object-oriented programming. Includes elementary analysis of arrays, lists, stacks, queues, heaps, binary trees, balanced trees, hash tables, and graphs with a significant component of programming project focused in Data Science using the Python programming language.</p>	<p>Credit Hours: 4</p>
<p><b>CS 307: Modeling and Learning in Data Science</b>  <b>Prerequisites:</b> STAT 207 + Linear Algebra (requires Calculus)  <i>(This is new course to be developed as a follow-on to STAT 207.)</i>  <b>Proposed Topic Coverage:</b> Significant coverage of probability with emphasis on using computation to design solutions to data-centric problems. Inclusion of random variables, Monte Carlo methods, discrete and continuous distributions, conditional probability, Bayes theorem, moment generating functions, central limit theorem, and maximum likelihood estimation. Students will apply these concepts in multiple applications of classical machine learning algorithms using Python and Python libraries.</p>	<p>Credit Hours: 4</p>

<b>Societal Impact in Data Science</b>	
<p><b>IS 467: Ethics &amp; Policy for Data Science</b>  <b>Prerequisites:</b> None  <b>Purpose:</b> This class explores concepts in data ethics and policy using several frameworks from both a theoretical and practical point of view. The aim of the class is to provide students with knowledge and skills needed to address a variety of ethical and policy topics.</p>	<p>Credit Hours: 3</p>
<p><b>IS 477: Data Management, Curation &amp; Reproducibility</b>  <b>Prerequisites:</b> None  <b>Purpose:</b> This course provides an overview of a broad range of theoretical and practical problems in data management and curation examining issues related to appraisal and selection, long lived data collections, research lifecycles, reproducibility, workflows, metadata, and legal and intellectual property issues.</p>	<p>Credit Hours: 3</p>

## Part 2: Coursework in Area of Specialization

The ACCY+DS degree plan has an area of specialization from Accountancy that requires 7 courses. The curriculum in the ACCY area of specialization is unchanged in this new major.

ACCY 301: Accounting Measurement and Disclosure	Credit Hours: 3
ACCY 302: Decision Making for Accounting	Credit Hours: 3
ACCY 303: Accounting Institutions and Regulation	Credit Hours: 3
ACCY 304: Accounting Control Systems	Credit Hours: 3
ACCY 312: Principles of Taxation	Credit Hours: 3
ACCY 405: Assurance and Attestation or Auditing Standards and Practice	Credit Hours: 3
One of ACCY 410 or 451: Advanced Financial Reporting or Advanced Income Tax Problems	Credit Hours: 3

**Part 3: A Meaningful Research or Discovery Experience**

One of the most important skills a student will gain in an ACCY+DS degree will be the ability to present data in meaningful ways. A meaningful research and experience is as much a pillar of this degree program as both the core coursework and the area of specialization. This capstone experience can be fulfilled through BUS 301, listed above in the Business Core. This course is an active learning, real-client experience that will allow students to join their data science skills with their business skills. Credit Hours: 3

March 4, 2021

Members of the Education Policy Committee:

I am writing to indicate our support for the following proposals:

Accountancy + Data Science

Astronomy + Data Science

Finance + Data Science

Information Sciences + Data Science

These programs will provide students across the university with the opportunity to study data science along with a disciplinary specialization. In particular, we support including IS 467 and IS 477. The School of Information Sciences will provide seats for all X + DS students in these courses starting in Fall 2021. Each course will be offered at least once per academic year.

Sincerely,

Dr. Emily Knox  
Interim Associate Dean for Academic Affairs

## MATHEMATICS

College of Liberal Arts & Sciences  
273 Altgeld Hall, MC-382  
1409 W. Green Street  
Urbana, IL 61801 USA

March 8, 2021

To whom it may concern,

I am writing to indicate the support of the Department of Mathematics for the following proposals:

- Accountancy + Data Science
- Astronomy + Data Science
- Finance + Data Science
- Information Sciences + Data Science

These programs will provide students across the university with the opportunity to study data science along with a disciplinary specialization.

The Department of Mathematics supports the inclusion of the following courses in these proposals:

- MATH 220/221
- MATH 234
- MATH 227 or MATH 257

We will provide seats for  $X + DS$  students in these courses starting in Fall 2021. We intend to offer MATH 220 every semester, and MATH 221 and MATH 234 at least once per year. MATH 227 and MATH 257 are new courses, which we anticipate to offer for the first time during the 2021-2022 academic year. We intend to offer at least one of these courses each semester.

Sincerely,



Jeremy Tyson  
Professor and Chair



**DEPARTMENT OF COMPUTER SCIENCE**

Thomas M. Siebel Center for Computer Science  
201 N. Goodwin Ave.  
Urbana, IL 61801-2302 USA

**NANCY M. AMATO**

Abel Bliss Professor and Head  
2248 Siebel Center  
namato@illinois.edu

March 4, 2021

To Whom It May Concern,

I am writing to indicate the support of the Department of Computer Science for the following proposals:

- Accountancy + Data Science
- Astronomy + Data Science
- Finance + Data Science
- Information Sciences + Data Science

These programs will provide students across the university with the opportunity to study data science along with a disciplinary specialization.

The Department of Computer Science supports including STAT/CS/IS 107 (to be co-taught by Statistics and Computer Science), CS 277, and CS/STAT 307 in the data science core curriculum. We will provide seats for X + DS students in these courses starting in Fall 2021. We intend to offer STAT/CS/IS 107 every semester and CS 277 and CS/STAT 307 at least once a year.

Sincerely,

A handwritten signature in black ink that reads 'Nancy Amato'.

**Nancy M. Amato**

Abel Bliss Professor and Head  
Department of Computer Science

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

Department of Statistics  
101 Illini Hall  
725 South Wright Street  
Champaign, IL 61820



October 5, 2020

To Whom It May Concern,

I am writing to indicate the support of the Department of Statistics for the following proposals:

- Accountancy + Data Science
- Astronomy + Data Science
- Finance + Data Science
- Information Sciences + Data Science

These programs will provide students across the university with the opportunity to study data science along with a disciplinary specialization.

The Department of Statistics supports including STAT/CS/IS 107 (to be co-taught by Statistics and Computer Science) and STAT/CS 207 or STAT 212 in the data science core curriculum. We will provide seats for X + DS students in these courses starting in Fall 2021. We intend to offer STAT/CS/IS 107 every semester and other courses at least once a year.

Sincerely,

Bo Li  
Professor and Chair  
Department of Statistics