: DATA SCIENCE AND ENGINEERING - FLOATING

In Workflow

1. U Program Review (dforgacs@illinois.edu; eastuby@illinois.edu; aledward@illinois.edu; mhazen@illinois.edu)
2. 1246 Head (lukeO@illinois.edu)
3. KP Committee Chair (bsnewell@illinois.edu; kcp@illinois.edu; jmakela@illinois.edu; amccul2@illinois.edu; bodony@illinois.edu)
4. KP Dean (candyd@illinois.edu)
5. University Librarian (jpwilkin@illinois.edu)
6. Grad_College (agrindly@illinois.edu; lowry@illinois.edu)
7. Provost (kmartens@illinois.edu; mhazen@illinois.edu)
8. Senate EPC (bjlehman@illinois.edu; moorhouz@illinois.edu; kmartens@illinois.edu)
9. Senate (jtempel@illinois.edu)
10. U Senate Conf (none)
11. Board of Trustees (none)
12. IBHE (none)
13. DMI (eastuby@illinois.edu; aledward@illinois.edu; dforgacs@illinois.edu)

Approval Path

1. Thu, 25 Mar 2021 21:16:22 GMT
   Deb Forgacs (dforgacs): Approved for U Program Review
2. Thu, 25 Mar 2021 21:18:03 GMT
   Luke Olson (lukeO): Approved for 1246 Head
3. Wed, 31 Mar 2021 15:33:44 GMT
   Keri Pipkins (kcp): Approved for KP Committee Chair
4. Wed, 31 Mar 2021 15:46:32 GMT
   Candy Deaville (candyd): Rollback to KP Committee Chair for KP Dean
5. Tue, 07 Sep 2021 14:05:24 GMT
   Keri Pipkins (kcp): Approved for KP Committee Chair
6. Tue, 07 Sep 2021 14:09:11 GMT
   Candy Deaville (candyd): Approved for KP Dean
7. Tue, 07 Sep 2021 14:15:33 GMT
   John Wilkin (jpwilkin): Approved for University Librarian
8. Wed, 10 Nov 2021 20:46:26 GMT
   Allison McKinney (agrindly): Approved for Grad_College
9. Wed, 10 Nov 2021 21:22:05 GMT
   Kathy Martensen (kmartens): Approved for Provost

New Proposal

Date Submitted:Thu, 25 Mar 2021 18:33:38 GMT

Viewing:: Data Science and Engineering - floating

Changes proposed by: Luke Olson

Proposal Type

Proposal Type:

Concentration (ex. Dietetics)

Administration Details

Official Program Name

Data Science and Engineering - floating

Sponsor College

Grainger College of Engineering

Sponsor Department

Computational Science and Engineering

Sponsor Name

Luke Olson

Sponsor Email

lukeo@illinois.edu

College Contact

Keri Pipkins

College Contact Email

kcp@illinois.edu

College Budget Officer

Tessa Hile

College Budget Officer Email

tmhile@illinois.edu

List the role for rollbacks (which role will edit the proposal on questions from EPC, e.g., Dept Head or Initiator) and/or any additional stakeholders. *Purpose: List here who will do the editing work if proposal needs rolled back. And any other stakeholders.*

Please rollback to KP Committee.

Does this program have inter-departmental administration?

No

Proposal Title

Effective Catalog Term

Spring 2022

Provide a brief, concise description (not justification) of your proposal.

Establish a Graduate Concentration in Data Science and Engineering in the College of Engineering

List here any related proposals/revisions and their keys. *Example: This BS proposal (key 567) is related to the Concentration A proposal (key 145) and the Concentration B proposal (key 203).*

Computational Science & Engineering Concentration - Floating concentration (key 547) will be revised to add requirement: "For students enrolled in both the Data Science & Engineering concentration and the Computational Science & Engineering (CSE) concentration, at least, 12 hours of coursework earned for the CSE concentration must be distinct from credit earned for the DSE concentration."

Program Justification

Provide a *brief* **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.**

The growth of data science in recent years is indisputable. From the social sciences to the physical sciences to engineering, data science is quickly becoming a key component. As a result there is an increased demand for graduate students in domain sciences with expertise and experience in incorporating complex data into their research and education. The goal of this proposed concentration is to provide an emphasis in the graduate curriculum toward data science.

The recent report from the Strategic Plan Task Force on Data Science Education [2] at the University of Illinois at Urbana-Champaign underscores the need for a multi-faceted approach to data science education. Undergraduate tracks and minors that span departments, introductory courses across the curriculum, and masters degrees in Data Science, are all part of the campus recipe to improve the data literacy in the education and research of our students. There is still, however, a significant opportunity at the graduate level, and specifically in PhD programs, to accelerate research by adding a data component to the degree. A recent, national report on Research and Education in Computational Science and Engineering [3] foresees data as an emerging element of computational science and engineering (as a discipline), accompanying applied mathematics, high performance computing, and application areas, as the base for a broad education in the computational sciences.

The objectives for this concentration are threefold. One primary goal is to provide an emphasis for PhD students in the domain sciences and to add breadth in the direction of data science in their studies. A secondary goal or outcome of the concentration is to broadly promote data science at the graduate level, both in research and in the classroom. As a result, a goal is to increase competitiveness and to widen the opportunities for graduating PhD students as they enter a data driven economy.

The motivation for this concentration is also rooted in the success of the Computational Science and Engineering concentration, where national laboratories and related industries have long supported this interdisciplinary model. With the recent growth in data science, there is renewed interest to see similar programs that span areas of mathematics, computing, and data, thus offering a track for a different crosscut of students. In many ways, the proposed concentration complements existing programs in computational science, computer science, information science, and even data science (at the masters level) across campus.

[1] Curriculum Guidelines for Undergraduate Programs in Data Science
https://www.amstat.org/asa/files/pdfs/EDU-DataScienceGuidelines.pdf
[2] Strategic Plan Task Force on Data Science Education
https://blogs.illinois.edu/files/7831/599574/133040.pdf
[3] Research and Education in Computational Science and Engineering
https://epubs.siam.org/doi/pdf/10.1137/16M1096840

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 this new program/proposed change result in the replacement of another program?

No

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

No

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).

The learning objectives of the concentration include satisfactory completion of the core coursework along with completion of the electives component. These are selected in consultation with the unit and based on the Strategic Plan Task Force report on Data Science Education at the University of Illinois at Urbana-Champaign, which highlights key areas of data science in the curriculum, namely mathematical foundations, computational thinking, statistical thinking, data management, data description and curation, and data modeling.

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

DSE-courses-electives.pdf
DSE-courses-core.pdf

Catalog Page Text - Overview Tab

Text for Overview tab on the Catalog Page. This is not official content, it is used to help build the new catalog page for the program. Can be edited in the catalog by the college or department.

The Data Science & Engineering (DSE) Transcriptable Graduate Concentration is designed primarily for graduate students at the Ph.D. levels with an interest in data intensive computing. Data science plays a major role in many areas of computational science and engineering (CSE) — the DSE Concentration is open to domain scientists working in this area. This concentration requires students to complete 16 graduate credit hours spanning data science, from topics in mathematical foundations (MF), computational thinking (CT), statistical thinking (ST), as well as data management, description, and modeling (DX). Courses taken toward this concentration will count towards the student's graduate degree if permitted by the curriculum of their major, and the concentration will be listed on their transcript upon graduation.

Note: A graduate concentration is only available for students enrolled in participating graduate degree programs.

To fulfill the requirements of the graduate concentration, students will take courses selected from an established list of core courses, along with a courses from a selection of elective courses that span a range of domain areas. Students may select any course in the list of electives, regardless of their enrolled degree program.

Additionally, understanding the ethical and societal implications of the application of data science is paramount, and CSE will integrate the latest topics to help educate
future data scientists on appropriately developing and applying data science algorithms that impact society. To ensure that students in the Data Science & Engineering Graduate Concentration are exposed to current topics in this area and to highlight the how data science decisions can have real-world significance, CSE will (1) require that all DSE-seeking students attend at least one seminar on data science and social justice and (2) complete the self-paced Practical Data Ethics course developed by the UCSF Center for Applied Data Ethics. Students must affirm that they completed the course and will be required to report on their experience in order to receive the DSE Concentration. CSE will annually evaluate this requirement as additional on- and off-campus resources become available.

Statement for Programs of Study Catalog

For more information regarding the Data Science & Engineering (DSE) Graduate Concentration, visit the Computational Science and Engineering website (http://cse.illinois.edu/), or contact the CSE Office at 217-333-3247 or cse@cse.illinois.edu.

Code	Title	Hours
Core Coursework		**8**
Select at least one course from two of the three groups below.		
Mathematical Foundations (MF) &Statistical Thinking (ST)		
STAT 425	Statistical Modeling I	
STAT 432	Basics of Statistical Learning	
CSE 448	Advanced Data Analysis	
CS 441	Applied Machine Learning	
CS 446	Machine Learning	
Mathematical Foundations (MF) & Computational Thinking (CT)		
CS 450	Numerical Analysis	
CS 484	Parallel Programming	
STAT 448	Advanced Data Analysis	
Data Description and Curation (DX) & Data Modeling (DX)		
STAT 480	Data Science Foundations	
CS 412	Introduction to Data Mining	
Elective Coursework		**8**
Complete two additional courses from the approved list.		
Total Hours		16

Requirement
Other Requirements
At least 4 hours of coursework for the DSE concentration should be advanced (500-level courses)
For students enrolled in both the DSE concentration and the CSE concentration, at least 12 hours of coursework earned for the DSE concentration must be distinct from credit earned for the CSE concentration.

Program Relationships

Corresponding Program(s):

Corresponding Program(s)
Aerospace Engineering, PhD
Bioengineering, PhD
Civil Engineering, PhD
Computer Science, PhD
Industrial Engineering, PhD
Materials Science and Engineering, PhD
Mechanical Engineering, PhD
Nuclear, Plasma, and Radiological Engineering, PhD
Physics, PhD
Statistics, PhD
Agricultural Biological Engineering, PhD
Electrical and Computer Engineering, PhD

Program Features

Academic Level

Graduate

Is This a Teacher Certification Program?

No

Will specialized accreditation be sought for this program?

No

Additional concentration notes (e.g., estimated enrollment, advising plans, etc.)

This estimated enrollment is expected at around 25 students for the first year, and growing as course capacities are assessed. This is based on an estimated five students per participating department, which is initially five. Based on the Computational Science and Engineering (CSE) concentration, we anticipate strong interest and that this concentration could grow well into the hundreds.

The Education Coordinator in CSE currently oversees curriculum change and guidance for the unit. This coordinator will also take on the role of

advising and curriculum changes for DSE\@. There is natural overlap with the two programs and for the first years we anticipate absorbing this additional advising capacity without issue. As the program scales, some advising will naturally fall with the home unit (e.g.\ during graduate student recruitment), however as with the CSE concentration we do not foresee these demands to be significant.

Delivery Method

This program is available:

On Campus - Students are required to be on campus, they may take some online courses.

Enrollment

Number of Students in Program (estimate)

Year One Estimate

25

5th Year Estimate (or when fully implemented)

125

Budget

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

No

Additional Budget Information

Advising will be handled by existing staff.

Financial Resources

How does the unit intend to financially support this proposal?

The education coordinator for Computational Science and Engineering will take on the majority of the advising, curriculum changes and coordination, and promotional materials for the concentration. Recurring state funds that support the unit will be used to continue to support the staffing of this position.

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

No

Attach letters of support

AE-letter.pdf
STAT-letter.pdf
BIOE-letter.pdf
CEE-letter.pdf
ISE-letter.pdf
Physics-letter.pdf
NPRE-letter.pdf
MechSE-letter.pdf
MatSE-letter.pdf
CS-letter.pdf
ABE Letter of Support for DSE.pdf
DS&E concentration.pdf

Is this program requesting self-supporting status?

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.

The proposed concentration consists of both core courses and electives in the curriculum. Each of these are existing courses and are offered by participating departments. In addition, the courses are regularly offered (and staffed) by the participating departments. The core courses in particular are selected in consultation with the departments to ensure capacity as well as technical fit with the concentration.

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.

The impact on the University Library resources is expected to be low to none.

EP Documentation

EP Control Number

EP.22.058

This proposal requires HLC inquiry

No

DMI Documentation

Program Reviewer Comments

Candy Deaville (candyd) (Wed, 31 Mar 2021 15:46:32 GMT): Rollback: Per request

Key: 1045

ILLINOIS

THE GRAINGER COLLEGE OF ENGINEERING

Department of Aerospace Engineering
306 Talbot Laboratory, MC-236
104 S. Wright St.
Urbana, IL 61801

November 11, 2020

Prof. Olson,

Aerospace Engineering offers it support to your planned Data Science & Engineering Concentration. Like nearly every discipline, Aerospace Engineering is data rich, and becoming more so. I anticipate growth in interest from many faculty in the near-future: Saxton-Fox for data analysis of turbulence, Siegfried Eggl for observations of near-earth objects, Marco Panesi for mapping quantum databases onto predictions for hypersonic flow, myself for uncertainty quantification in predictive science, and others. Our graduate students are just as aware of the opportunities to harness data to advance understanding and impact engineering. I believe that a Concentration would provide a foundation for progress in this area by unifying efforts around GCOE, and likely beyond, and I look forward to seeing the Concentration develop.

Sincerely,

Jonathan Freund
Willett Professor and Head
Department of Aerospace Engineering

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

October 5, 2020

Luke Olson
Director, Computational Science and Engineering

Dear Luke:

Thank you for sharing your proposal for Data Science and Engineering (DSE) concentrations for graduate students at the PhD level. We have studied this and would be glad to support your proposal of DSE concentrations for doctor degrees. The Department of Statistics would reserve 3 seats per section of the Statistics courses in the proposal (STAT 425, 428, 432, 448, 480 and 542) for the DSE doctoral students, in addition to whatever the students can get when we lift major restrictions.

Our commitment is only for the students in the PhD program aiming for the doctoral degree with DSE concentration.

Sincerely,

Bo Li
Professor and Chair
Department of Statistics

ILLINOIS

THE GRAINGER COLLEGE OF ENGINEERING

Department of Bioengineering
1102 Everitt Laboratory, MC-278
1406 W. Green St.
Urbana, IL 61801

November 10, 2020

Re: Letter of support for the Data Science & Engineering (DSE) concentration

Dear Professor Olson,

The Department of Bioengineering is pleased to support the DSE concentration by making the following courses available as electives:

BIOE 484 : Statistical Learning for Biomedical Image Analysis
BIOE 486 : Applied Deep Learning for Biomedical Imaging
BIOE 485 : Computational Mathematics for Machine Learning and Imaging
BIOE 505 : Computational Bioengineering
BIOE 586 : Deep Generative Models in Bioimaging

As these courses are required by some of our existing programs, first priority for enrollment will be given to students in the Department of Bioengineering.

Sincerely,

Mark A. Anastasio, Ph.D.
Donald Biggar Willett Professor in Engineering
Head, Department of Bioengineering
University of Illinois at Urbana-Champaign
(Voice) 217-244-0100
Lab Website: https://anastasio.bioengineering.illinois.edu/

ILLINOIS

THE GRAINGER COLLEGE OF ENGINEERING
Department of Civil & Environmental Engineering
Newmark Civil Engineering Laboratory, MC-250
205 N. Mathews Ave.
Urbana, IL 61801

MEMORANDUM

TO: Luke Olson, Professor and Director of Computational Science and Engineering Program, Department of Computer Science

FROM: Albert J. Valocchi
Abel Bliss Professor and Interim Head, Department of Civil and Environmental Engineering

DATE: October 15, 2020

SUBJECT: Department Support for Ph.D. Concentration in Data Science and Engineering (DSE)

The Department of Civil and Environmental Engineering enthusiastically supports the Data Science and Engineering (DSE) Graduate Concentration for our two Ph.D. degree programs in Civil Engineering and Environmental Engineering. Our faculty and graduate students are at the forefront of research that uses the latest developments in data science and new data streams enabled by novel monitoring and sensing systems. The Transcriptable Graduate Concentration in DSE will not only be a valuable credential for our graduates, but it will also enable us to more effectively recruit top applicants to our Ph.D. program.

March 2, 2021

Professor Luke Olson
Department of Computer Science
University of Illinois at Urbana-Champaign

Dear Luke,

The Department of Industrial and Enterprise Systems Engineering (ISE) is glad to support the proposed Data Science and Engineering Concentration. Topics such as data analytics and optimization have been core areas of ISE. Accordingly, we expect that there are a few courses offered by ISE that can be a good fit as electives for the proposed program.

Sincerely,

Jeff S. Shamma
Department Head
Professor and Jerry S. Dobrovolny Chair
Department of Industrial and Enterprise Systems Engineering

October 5, 2021

Luke Olson
Director, Computational Science and Engineering
Professor, Department of Computer Science
University of Illinois at Urbana-Champaign

Dear Luke,

   The Department of Electrical and Computer Engineering would be happy to see a Data Science & Engineering concentration be made available to its Ph. D. students, as you have proposed. Some ECE courses we suggest be considered for elective courses within the concentration are the following.

ECE 513 Vector Space Signal Processing
ECE 534 Random Processes
ECE 543 Statistical Learning Theory
ECE 544 Pattern Recognition and Machine Learning
ECE 547 (CSE 543) Topics in Image Processing
ECE 549 = CS543 Computer vision
ECE 561 Statistical Inference for Engineers and Data Scientists
ECE 563 Information Theory
ECE 566 Computational Inference and Learning
ECE 598RKI Dependable AI Systems

Thank you!

Sincerely,

Bruce Hajek
Head, Department of Electrical and Computer Engineering
Center for Advanced Study Professor of Electrical and Computer Engineering
Hoeft Endowed Chair in Engineering
Professor, Coordinated Science Laboratory

Cc: Michael Oelze, Deming Chen

COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

THE GRAINGER COLLEGE OF ENGINEERING

Department of Agricultural & Biological Engineering
338 Agricultural Engineering Sciences Building, MC-644
1304 W. Pennsylvania Ave.
Urbana, IL 61801

August 30, 2021

Prof. Luke Olson
Siebel Center for Computer Science
University of Illinois at Urbana-Champaign
201 N. Goodwin Avenue
Urbana, IL 61801

Dear Prof. Olson,

The Department of Agricultural and Biological Engineering strongly supports the proposal for the Data Science & Engineering (DSE) Concentration. This concentration will be of interest to PhD students in ABE.

We look forward to participating in the DSE program.

Sincerely,

Ronaldo G. Maghirang
Professor and Head

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 29, 2021

Dear Professor Olson,

On behalf of the Department of Computer Science, I am happy to support the establishment of the Data Science & Engineering (DSE) Transcriptable Graduate Concentration, designed for graduate students with an interest in data intensive computing.

In particular, we support the inclusion of the following CS courses as electives in this program.
1. CS 412: Data Mining
2. CS 416: Data Visualization
3. CS 441: Applied Machine Learning
4. CS 446: Machine Learning
5. CS 450: Numerical Analysis
6. CS 484: Parallel Computing
7. CS 511: Advanced Data Management

The CS department should be able to absorb the anticipated addition of 5 students per year in these classes. We are very happy to support this exciting new degree program and wish it success.

Sincerely,

Nancy M. Amato
Abel Bliss Professor and Head
Department of Computer Science

From: **Sottos, Nancy R** n-sottos@illinois.edu
Subject: Re: Data Science and Engineering Concentration
Date: March 24, 2021 at 1:39 PM
To: Olson, Luke lukeo@illinois.edu
Cc: Trinkle, Dallas dtrinkle@illinois.edu

Dear Luke,

The Materials Science and Engineering department enthusiastically supports the establishment of the DSE concentration. This certificate program is well aligned with our future educational directions in the department and we believe it will be popular with our students. The department looks forward to participating.

Regards,

Nancy

> On Oct 22, 2020, at 2:22 PM, Olson, Luke <lukeo@illinois.edu> wrote:
>
> Dear Nancy,
>
> I'm writing to request your support for an upcoming Data Science & Engineering Concentration (DSE), open to PhD students in specific departments. An overview of the proposed concentration is attached, and similar to the CSE Concentration consists of both core and elective courses. I have discussed this with many across campus (including Dallas Trinkle in your department, cc'd, who serves on the CSE Steering Committee). There's wide support to move forward, and I'm hoping MatSE will be interested in formally joining with support.
>
> Let me know if you have any questions about the goals or any details within the overview.
>
> Best.
>
> Luke Olson
>
>
> —
> Luke Olson
> Director, Computational Science and Engineering
> Professor, Department of Computer Science
> University of Illinois at Urbana-Champaign
> http://lukeo.cs.illinois.edu
> http://cse.illinois.edu
> <DSE-overview.pdf>

THE GRAINGER COLLEGE OF ENGINEERING

Department of Mechanical Science & Engineering
Office of the Department Head
144 Sidney Lu Mechanical Engineering Building, MC-244
1206 W. Green St.
Urbana, IL 61801

February 25, 2021

To Whom it May Concern:

Mechanical Science and Engineering strongly supports the proposal for a Data Science & Engineering Concentration (DSE). We anticipate this concentration will be of interest to doctoral students in MechSE and look forward to it being available to them.

Sincerely,

Anthony Jacobi
Richard W. Kritzer Distinguished Professor
Department Head
Mechanical Science and Engineering

THE GRAINGER COLLEGE OF ENGINEERING

Department of Nuclear, Plasma, & Radiological Engineering
216 Talbot Laboratory, MC-234
104 S. Wright St.
Urbana, IL 61801

I ILLINOIS

February 22, 2021

Prof. Luke Olson
Siebel Center for Computer Science
University of Illinois at Urbana-Champaign
201 N. Goodwin Avenue
Urbana, IL 61801

Dear Prof. Olson,

We in NPRE are excited and looking forward to the establishment of the DSE Program. This certificate program is very timely and will serve the NPRE students well. We in NPRE are looking forward to participating in the DSE program.

Thanks for your efforts in setting it up.

Regards,

Rizwan Uddin
Professor and Head

Data Science & Engineering Concentration

To fulfill the requirements of the graduate concentration, students will take courses selected from an established list of *core* courses, along with a courses from a selection of *elective* courses that span a range of domain areas. Students may select any course in the list of electives, regardless of their enrolled degree program.

Hours	Courses
8	Core course work (two from core list)
8	Elective course work (additional, distinct two courses from list)
16	**Total**

(MF) Mathematical foundations

(CT) Computational thinking

(ST) Statistical thinking

(DX) Data management

(DX) Data description and curation

(DX) Data modeling

A student must select at least one course from two of these groups.

(MF)(ST)	STAT 425: Applied Regression and Design
	STAT 432: Basics of Statistical Learning
	STAT 448: Advanced Data Analysis
	CS 441: Applied Machine Learning
	CS 446: Machine Learning
(MF)(CT)	CS 450: Numerical Analysis
	CS 484: Parallel Computing
	STAT 428: Statistical Computing
(DX)	STAT 480: Data Science Foundations
	CS 412: Intro to Data Mining

ILLINOIS

THE GRAINGER COLLEGE OF ENGINEERING

Department of Physics
211 Loomis Lab, MC-704
1110 W. Green St.
Urbana, IL 61801-3003

February 18, 2021

Professor Luke Olson
Director, Computational Science and Engineering

Dear Professor Olson,

I write in response to your request for support from the Department of Physics in establishing a new concentration in Data Science & Engineering.

Physics supports the creation of the proposed concentration and students enrolled in the concentration will be able to take PHYS 598 as an elective.

Best Wishes for the success of the new concentration,

Matthias Grosse Perdekamp
Head, Department of Physics

Data Science & Engineering Concentration

General Electives

MATH 555: Applied Stochastic Processes

STAT 542: Statistical Learning

CEE 598: Uncertainty Quantification

CS 511: Advanced Data Management

CS 416: Data Visualization

AE 598: Uncertainty Quantification

Mechanical Science and Engineering

ME 498: Mfg Data and Quality Systems

TAM 537: Experimental Fluid Mechanics

TAM 538: Turbulence

TAM 598: Atomistic Solid Mechanics

Civil and Environmental Engineering

CEE 598: Globalization of Water

CEE 598: Stochastic Hydrology

CEE 590: Geotechnical Field Measurement

CEE 528: Construction Data Modeling

CEE 573: Structural Dynamics II

Materials

MSE 598: Intro to Digital Materials

ME 498: Mfg Data and Quality Systems

ME 458: Additive Manufacturing and Product Design

Industrial & Enterprise Systems Engineering

IE 531: Algorithms for Data Analytics

IE 514: Optimization Methods for Large Scale Networks

Physics

PHYS 598: Statistical Data Analysis and Stochastic Processes in Physics

Bioengineering

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

BIOE 505: Computational Bioengineering

BIOE 486: Applied Deep Learning for Biomedical Imaging