New Proposal

Date Submitted: 01/21/21 2:24 pm

Viewing: : Digital Agriculture, M.Eng. in Engineering

Last edit: 02/21/22 12:57 pm

Changes proposed by: Keri Pipkins

In Workflow

1. U Program Review
2. 1227 Head
3. 1741 Committee Chair
4. 1741 Head
5. 1802 Committee Chair
6. 1802 Head
7. KL Committee Chair
8. KL Dean
9. 1434 Head
10. KP Committee Chair
11. KP Dean
12. University Librarian
13. Grad_College
14. Provost
15. Senate EPC
16. Senate
17. U Senate Conf
18. Board of Trustees
19. IBHE
20. DMI

Approval Path

1. 01/21/21 4:45 pm Deb Forgacs (dforgacs): Approved for U Program Review
2. 02/01/21 1:15 pm Keri Pipkins (kcp): Approved for 1227 Head
3. 02/01/21 5:12 pm Kent Rausch (krausch): Approved for 1741 Committee Chair

4. 02/09/21 3:45 pm
   Ronaldo Maghirang (ronaldom): Approved for 1741 Head
5. 02/09/21 9:15 pm
   Lane Rayburn (arayburn): Approved for 1802 Committee Chair
6. 02/10/21 10:18 am
   Adam Davis (asdavis1): Approved for 1802 Head
7. 03/09/21 3:20 pm
   Brianna Gregg (bjgray2): Rollback to 1802 Committee Chair for KL Committee Chair
8. 03/15/21 12:09 pm
   Lane Rayburn (arayburn): Approved for 1802 Committee Chair
9. 03/15/21 1:20 pm
   Adam Davis (asdavis1): Approved for 1802 Head
10. 03/29/21 1:01 pm
    Nick Paulson (npaulson): Approved for KL Committee Chair
11. 03/31/21 10:14 am
    Anna Ball (aball): Approved for KL Dean
12. 04/04/21 11:17 pm
    Elsa Gunter

(egunter): Approved for 1434 Head
13. 12/13/21 9:18 am Keri Pipkins (kcp): Rollback to 1741 Committee Chair for KP Committee Chair
14. 12/13/21 4:39 pm Kent Rausch (krausch): Approved for 1741 Committee Chair
15. 12/13/21 4:42 pm Ronaldo Maghirang (ronaldom): Approved for 1741 Head
16. 12/13/21 5:42 pm Lane Rayburn (arayburn): Approved for 1802 Committee Chair
17. 12/14/21 12:40 pm Adam Davis (asdavis1): Approved for 1802 Head
18. 12/16/21 9:28 am Anna Dilger (adilger2): Approved for KL Committee Chair
19. 12/16/21 9:43 am Anna Ball (aball): Approved for KL Dean
20. 12/16/21 1:30 pm Mahesh Viswanathan (vmahesh): Approved for 1434 Head
21. 01/25/22 12:53 pm

Keri Pipkins (kcp): Approved for KP Committee Chair
22. 01/25/22 12:58 pm Candy Deaville (candyd): Approved for KP Dean
23. 01/25/22 1:05 pm John Wilkin (jpwilkin): Approved for University Librarian
24. 02/03/22 2:08 pm Allison McKinney (agrindly): Approved for Grad_College
25. 02/03/22 2:10 pm Deb Forgacs (dforgacs): Rollback to Grad_College for Provost
26. 02/03/22 2:29 pm Allison McKinney (agrindly): Approved for Grad_College
27. 02/03/22 4:18 pm Kathy Martensen (kmartens): Approved for Provost
28. 02/07/22 11:40 am Kathy Martensen (kmartens): Rollback to Provost for Senate EPC
29. 02/07/22 3:30 pm Kathy Martensen (kmartens): Approved for Provost

Proposal Type

Proposal Type:
Concentration (ex. Dietetics)

Administration Details

Official Program Name	Digital Agriculture, M.Eng. in Engineering		
Sponsor College	Agr, Consumer, & Env Sciences		
Sponsor Department	Agricultural & Biological Engr		
Sponsor Name	Ronaldo Maghirang, Department Head, ABE		
Sponsor Email	ronaldom@illinois.edu		
College Contact	Keri Carter 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.*

Keri Pipkins, Christina Tucker (lyvers@illinois.edu), Heather Crump (hcrump@illinois.edu)

Does this program have inter-departmental administration?

Yes

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

Please describe the oversight/governance for this program, e.g., traditional departmental/college governance. Inclusion of/roles of elected faculty committees? Inclusion of/roles of any advisory committees.

This Program intends to be a fully online program that would have no on-campus presence requirements, envisioned to be enabled by a combination of synchronous and asynchronous online course offerings that are already available through participating departments. Therefore, we do not propose any caps on the maximum number of candidates for admission within the range of anticipated enrollment rates for this Program. This approach simplifies the management of admissions.

To manage the admissions, we propose to form a joint admission committee across the contributing units' (CDA, ABE, C.S., and CPSC) faculty and/or staff, with contributions from the GCoE Dean’s office for coordination of the Professional Training requirements.

We nominate Christina Tucker, currently CDA's Director of Educational Programs, to Chair this committee with the members to be determined in due course.

The admission process envisioned is as follows: Administrative staff will pre-screen the incoming applications for basic qualifications like grades, test scores, and eligibility. As long as these requirements are met, and the number of applications is below the proposed 100, applicants will be admitted with no further screening.

The committee review will be reserved for cases where applicants have irregularities in their applications, and for whence the anticipated increase in the number of applications to above 100 is realized.

The admission review will then be performed by an admissions committee of 3-5 members consisting of one faculty member or staff from each department and the CDA - Educational Programs Director. The students will be admitted on a merit-based ranking of their applications.

To manage student advising, we propose to form a joint student advising committee across the contributing units’ faculty and or staff, chaired by CDA’s Director of Educational Programs. The primary contact for advising for these online students will be the Chair of the Advising committee- who will receive and address non-curriculum related advising issues as they arise. He/she will also collect, compile, and direct advising requests that are curriculum related to the appropriate department's member in the advising committee.
Each of the participating units will nominate a staff or faculty member to be designated for this advising committee.

College Agr, Consumer, & Env Sciences

Department Agricultural & Biological Engr

Is there an additional department involved in governance?
Yes

College Agr, Consumer, & Env Sciences

Department Crop Sciences

Is there an additional department involved in governance?
Yes

College Grainger College of Engineering

Department Computer Science

Is there an additional department involved in governance?
No

Proposal Title

Effective Catalog Term Fall 2021

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

Establish a Graduate Concentration in Digital Agriculture within the Master of Engineering in Engineering Degree

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).*

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.

This concentration proposal in Digital Agriculture is for Master of Engineering in Engineering program. It is mainly designed for continuing advanced education in an interdisciplinary field of digital agriculture. The degree will be offered as an online program, building on current online Masters-level offerings from ABE, Crop Sciences, and Computer Science. It is differentiated from the exiting offerings of PSM (Professional Science Master) with the advanced math and computer science focus, reflected in the admission requirements. The primary target of the Program are candidates who currently hold a professional position in the agriculture industry related to fields of technology, automation, computing infrastructure, data handling, management, and genomics. The secondary target demographic is recent graduates of engineering and cs+x programs who plan to pursue careers in the agricultural industry in the areas mentioned above. A tertiary target is international candidates who are professionals already employed by the agricultural industry, whose prior degrees may not be sufficient for career advancement opportunities. Lastly, any graduate who completed the iCAN program planning to pursue a food and agricultural sciences career would be eligible for admission to this Program.

This degree will not only prepare students for immediate entry into the workforce for the rapidly growing area of Digital Agriculture but will also address the needs around workforce retraining due to the surge of digital technologies in the agriculture industry.

Justification
This proposed Program is in response to the growing demand from agricultural technology industries. A surplus of jobs awaits students with a distinctive interdisciplinary combination of skills and backgrounds from agriculture and computer science. Some job opportunities that have increased in recent years include agricultural data science, precision agriculture, agricultural robotics and automation, bioinformatics, computational biology, and programming for web and mobile applications for agriculture-related industries. These career opportunities are projected to continue growing as the agriculture companies continue to advance and bring more technology into their practices.

According to a survey conducted by the Center for Digital Agriculture (CDA) as a follow-up to the First Annual CDA Industry Conference, a conservative estimate for enrollment rate will be between 50-100 students per year.

Data from other sources support this estimate; according to projections from the U.S. Department of Agriculture, there will be 60,000 job openings annually in the agriculture industry through 2020, with only 35,000 students graduating each year to fill these positions. Of these available job opportunities, it is estimated that 27% will be in the technology, science, engineering, and mathematics areas of agriculture. "Agriculture is going through a transformation itself into more of that digital space," said Melissa Harper, Senior Vice President of Human Resources and Innovations at Bayer. "Many of the roles that we need- and agriculture needs - did not exist just five years ago."

As there are no other master's degree programs in Digital Agriculture available in the U.S. currently, and the University of Illinois rankings in related disciplines are strong, we expect graduates to be in high demand.

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).

Student learning will be assessed through direct and indirect assessments. For direct assessment, performance metrics such as students' performance on capstone or professional development projects and average GPA across the Program at each assessment will be leveraged.

For each cohort of students admitted, a three-stage assessment process is proposed: At admission, after completing the core courses, and after completion of the degree requirements. Students will be asked to fill out a self-assessment questionnaire summarizing their cognitive, performance, and affective skills relevant to a capability model developed for the Program. The capability model will be updated annually to track the changes in the field and provide a baseline for assessments. The assessments' results will be compiled and analyzed annually- to update learning objectives for the next academic year.

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	MEngDA-Academic Catalog POS Attachment for Graduate Concentration_updated 2021-12-10.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.

See Attached.

Statement for Programs of Study Catalog

Concentration Requirements

Course List

Code	Title	Hours
Core Coursework		16
Choose two of the following:		
ABE 440	Applied Statistical Methods I	
ABE 425	Engrg Measurement Systems	
ABE 426	Principles of Mobile Robotics	
ABE 526	Autonomous Systems and Robots	
Choose one of the following:		
CS 411	Database Systems	
CS 437	Topics in Internet of Things	
CS 441	Applied Machine Learning	
Choose one of the following:		
CPSC 444	Introduction to Spatial Analytics	
CPSC 505	Research Methods in Crop Sciences	
Professional Development Coursework		4
Choose one of the following:		
ENG 573	Capstone Project	
ENG 572	Professional Practicum	
Other business and/or leadership course(s), with advisor approval		
Additional Coursework		12
Choose from an approved list of elective courses. Courses not on the approved list require advisor approval.		
Total Hours		32

Other Requirements and Conditions (may overlap)

Grad Other Degree Requirements Single Column

Requirement

A minimum of 20 credit hours must be taken from the University of Illinois Urbana-Champaign campus.
A minimum of 12 credit hours of 500-level course credit is required.
No courses used to fulfill any degree requirements may be taken using the “Credit/Not Credit” option.
The minimum program GPA required for the degree is 3.0.

Program Relationships

Corresponding Program(s):

Corresponding Program(s)
Engineering, MEng

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.)

The recommended undergraduate GPA for applicants applying is a 3.2/4.0 for the last two years of undergraduate study.

Applicants are not required to provide GRE scores; however, as per UIUC Graduate College Requirements, all applicants whose native language is not English are required to submit the TOEFL or IELTS results as evidence of English proficiency. TOEFL or IELTS scores must be less than two years old from the first day of class at the proposed term of entry to be valid.
Applications for this Program do not require letters of recommendation. However, they will be considered if included, especially if used to justify experience in place of required coursework or other irregularities.
To succeed in graduate-level C.S. courses required for this Program, candidates must have prerequisite coursework or commensurate experience in object-oriented programming, data structures, algorithms, linear algebra, and statistics/probability. Applicants interested in pursuing automation and data science- related themes in this Program are strongly encouraged to complete courses in these areas at a local university, via the iCAN Program, or as non-degree online courses from Campus Graduate Certificate Programs before enrolling to this Program. Applicants who can not present transcripted grades for the courses mentioned above would be required to pass the Data Structures Proficiency exam to be eligible for admission.
Applicants who are uncertain if their prior skills would be sufficient to succeed in the themes mentioned earlier of this concentration are also encouraged to take the Data Structures Proficiency Exam.

Data Structures Proficiency Exam Details
● The exam is hosted on PrairieLearn (a University of Illinois online assessment platform) and is proctored by ProctorU (an online third-party proctoring service).
● The exam is 3 hours long.
● A grade of B+ on the exam (in addition to a minimum 3.0/4.0 GPA in the last two years of the undergraduate degree) is required for the application to be considered in the admission process.
● A minimum of 30 calendar days' learning period is required between any two consecutive exam attempts.

To manage the admissions, we propose to form a joint advising committee between Agricultural and Biological Engineering (ABE), Crop Sciences (CPCS), Computer Science (C.S.) and the Center for Digital Agriculture (CDA) faculty and staff, with contributions from the GCoE Dean’s office for coordination of the Professional Training requirements. We nominate Christina Tucker, currently CDA’s Director of Educational Programs, as the Chair of this committee, and members to be determined in due course.

The admission process envisioned is as follows: Administrative staff will pre-screen the incoming applications for basic qualifications like grades, test scores, and eligibility. As long as these requirements are met, and the number of applications is below the proposed 100, applicants will be admitted with no further screening.

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Delivery Method

This program is available:

Online Only - The entire program is delivered online, students are not required to come to campus.

Describe the use of this delivery method:

The offering's priority targets are professionals holding full-time appointments in industry, in the U.S. and abroad. We would like to enable continuing education for these busy professionals without interrupting their current life and career obligations by this fully online offering.

This Program intends to be a fully online program that would have no on-campus presence requirements, envisioned to be enabled by a combination of synchronous and asynchronous online course offerings that are already available through participating departments.

The Coursera platform will be leveraged for delivery of the asynchronous offerings. UIUC agreement between Coursera and UIUC stipulates an enrollment fee of $200 per Coursera class per student. Early registration allows a 50% discount off the Coursera enrollment fee to $100. We anticipate the same agreement and costs will apply to the Digital Agriculture offerings through the Coursera platform.

These charges will not apply to synchronous online classes available through other UIUC online platforms such as Blackboard. However, we anticipate gradually transitioning to more offerings for this Program to the Coursera platform, and into an asynchronous delivery format.

Enrollment

Number of Students in Program (estimate)

Year One Estimate	20	5th Year Estimate (or when fully implemented)
99		

Budget

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

No

Additional Budget Information

The Program will require no additional staffing requirements beyond currently available staff and faculty at the participating units.

Additional support for curriculum development is already available from the Office of the Provost as the Investment for Growth in the Center for Digital Agriculture. No further need for support is anticipated. Letters of support from the Departments of Agricultural and Biological Engineering, Computer Science, Crop Sciences, and the Center for Digital Agriculture are included.

Attach File(s)

Financial Resources

How does the unit intend to financially support this proposal?

The Center for Digital Agriculture has received financial resources from Investment for Growth funds from the Office of the Provost to be utilized for curriculum development, faculty incentives for course development, or expenses related to CITL production costs related to the asynchronous conversion of existing courses. In addition to the collaborating departments' Departmental financial resources, these resources will be used to support the proposal during the establishment phase.

Past the establishment phase, the Program will be self-supporting via tuitions and fees based on the Office of the Registrar's guidelines https://registrar.illinois.edu/tuition-fees/tuition-fee-rates/g-tuition-rates-1920/ and http://online.illinois.edu/student-services/online-course-tuition-and-fees/graduate-online-courses for UIUC online programs.

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

No

Attach letters of support

CS-Letter-of-Support_MEngDigitalAg_2020-12-18v1.pdf
LOS_MEngDigital Ag_Davis.pdf
2022-2-3-22 CDA MEng Program Designation form.pdf

Is this program requesting self-supporting status?

Yes

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.

Attach File(s)

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 graduate program will be supported by the instructional unit funds received by the Departments of Agricultural and Biological Engineering, Computer Science, and Crop Sciences.

The need for new resources is not anticipated. All of the participating departments already have relevant course offerings and degree programs, both online and on-campus. All departments are prepared with the resources needed for the regular growth of their existing programs.

The proposed program core courses are currently available online through the collaborating department's respective online programs. These offerings will be expanded gradually as new faculty experts develop new classes and update existing classes to online formats. Further, the compilation of courses offered through this Program into themes will allow the development of Campus Graduate Certificate Programs on several Digital Agriculture areas for non-degree seeking students.

The course cost recovery structure will be such that the tuition revenue from the Program will flow back to contributing units as agreed under the terms of existing MOUs between these units.

The Departments do not believe that additional online students in the degree program are likely to exceed capacity in courses included in Digital Agriculture curricula.

The students enrolled in this degree program will be primarily advised by an advisory committee of faculty and/or staff members across participating units, as described previously.

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.

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No impact is expected since all three contributing educational units have already established programs that this Program will draw on, and the degree will be provided online.

EP Documentation

EP Control Number	EP.22.103
Attach Rollback/Approval Notices	ep22103_questions to and response from sponsor_20220218.pdf

This proposal requires HLC inquiry	No

DMI Documentation

Attach Final Approval Notices	
Banner/Codebook Name	
Program Code:	

Minor Code	Conc Code	Degree Code	Major Code

Senate Approval Date	
Senate Conference Approval Date	
BOT Approval Date	
IBHE Approval Date	
HLC Approval Date	
Effective Date:	
Attached Document Justification for this request	

Program Reviewer Comments

Deb Forgacs (dforgacs) (01/21/21 1:32 pm): Rollback: requested
Kent Rausch (krausch) (02/01/21 5:11 pm): This program was previously reviewed by the ABE CnC committee and approved before being submitted to the Grad College.
Brianna Gregg (bjgray2) (03/09/21 3:20 pm): Rollback: See comments. Need to remove ANSC lingo and CPSC course updates.
Keri Pipkins (kcp) (12/13/21 9:18 am): Rollback: Rolling back for Final Approval
Deb Forgacs (dforgacs) (02/03/22 2:10 pm): Rollback: requested.
Kathy Martensen (kmartens) (02/07/22 11:40 am): Rollback: Budget Office review.

Digital Agriculture, MEng

for the degree of Master of Computer Science in Computer Science (online)

Overview

department head: Ronaldo G Maghirang
director of graduate studies: Xinlei Wang

overview of admissions & requirements: https://abe.illinois.edu/apply#graduate
overview of grad college admissions & requirements: https://grad.illinois.edu/admissions/apply

department website: https://abe.illinois.edu/
department faculty: https://abe.illinois.edu/directory/faculty

college websites: https://grainger.illinois.edu/ and https://aces.illinois.edu/

program contact: Christina Tucker
program website: https://digitalag.illinois.edu/education
department office: NCSA 3122B, 1205 W. Clark St. Urbana, IL 61801
email: lyvers2@illinois.edu

Admission Requirements

The University of Illinois Urbana-Champaign policy requires applicants to hold at least a 3.0/4.0 or higher GPA inthe last two years of their undergraduate study to be eligible for graduate studies. Applicants are not required to provide GRE scores; however, as per UIUC Graduate College Requirements, all applicants whose native language is not English are required to submit the TOEFL or IELTS results as evidence of English proficiency.
TOEFL or IELTS scores must be less than two years old from the first day of class at the proposed term of entryto be valid.

Applicants should hold a 4-year bachelor's degree (or equivalent). Applicants whose undergraduate degree is athree-year program may not be eligible for graduate-level admissions consideration at the University of Illinois.Eligibility depends on the country where the applicant received their degree -- please see the Graduate College's list of eligible degrees. The recommended undergraduate GPA for applicants applying is a 3.2/4.0 for the last two years of undergraduate study.

Applications for this Program do not require letters of recommendation. However, they will be considered ifincluded, especially if used to justify experience in place of required coursework or other irregularities.
To succeed in graduate-level C.S. courses required for this Program, candidates must have prerequisite coursework or commensurate experience in object-oriented programming, data structures, algorithms, linear algebra, and statistics/probability. Applicants interested in pursuing automation and data science-related themes in this Program are strongly encouraged to complete courses in these areas at a local university, or via iCAN program, or as non-degree online courses from Campus Graduate Certificate Programs before enrolling tothis Program. Applicants who can not present transcripted grades for the courses mentioned above would be required to pass the Data Structures Proficiency exam to be eligible for admission.

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- The exam is hosted on PrairieLearn (a University of Illinois online assessment platform) and is proctoredby ProctorU (an online third-party proctoring service).
- The exam is 3 hours long.
- A grade of B+ on the exam (in addition to a minimum 3.0/4.0 GPA in the last two years of the undergraduate degree) is required for the application to be considered in the admission process.
- A minimum of 30 calendar days' learning period is required between any two consecutive exam attempts.

Digital agriculture or digitization in agriculture presents a current challenge area in agriculture drawing uponpractices such as Precision Agriculture, Digital farming, and advances in biotechnology and genomics, that delivers high-throughput complex data that requires processing and interpretation to become actionable.
Four main activity areas are commonly recognized:

1. Automation: Use of autonomous or semi-autonomous ground and aerial machinery and robots toperform agricultural operations.
2. *Data Science in Agriculture*: Extracting knowledge from complex agricultural data.
3. *Spatial Agriculture :*
    a. *Precision agriculture*: Use of high-resolution aerial imaging and ground sensors to optimize field management in real-time, with our without autonomy.
    b. *Agricultural intelligence*: Using long term climatic, environmental, and performance data formodeling and characterization of locations with geographic information systems.
4. *Genomics, Breeding, and Biotechnology*: Use of high-throughput molecular and physical analysis, such assequencing and genotyping technologies, and image-analytics for crop improvement and management.

The common denominator for all these activity areas is *collection(sensors)*, *transmission(networks)*, *storage & access (databases)*, *integration & analysis (data science)* of large volumes of data from various sources, including rural areas with low bandwidth for data transmission capacity. As the density of data sources and the frequency of data transmissions increase, it becomes increasingly challenging to perform these tasks without advanced computerization.

The Digital Agriculture core curriculum was tailored such that a generalist in digital agriculture would be able tooperate in all of these activity areas at a level of basic competence.
Students who wish to be trained as specialists in a targeted digital agriculture activity area can choose collections of themes courses from the approved course list towards their degree completion requirements.

Degree Requirements

Core Coursework (16 hours)

Choose two of the following (8 hours)
ABE 440 Applied Statistical Methods I (4 hrs)
ABE 425 Engineering Measurement Systems (4 hrs)
ABE 426 Principles of Mobile Robotics (4 hrs)
ABE 526 Autonomous Decision Making (4 hrs)

Choose one of the following (4 hours)
CS 411 Database Systems (4 hrs)
CS 437 Topics in Internet of Things (4 hrs)
CS 441 Applied Machine Learning (4 hrs)

Choose one of the following (4 hours)
CPSC 444 Introduction to Spatial Analytics (4 hrs)
CPSC 505 Research Methods in Crop Science (4hrs)

Professional Development (4 hours)

ENG 572 Professional Practicum (4hrs)
ENG 573 Capstone Project (4hrs)
Other business and/or leadership course(s), with advisor approval

Additional Coursework (12 hours):
Choose from an approved list of elective courses. Courses not on the approved list require advisor approval.

TOTAL HOURS: 32

Other Requirements and Conditions (may overlap)

- A minimum of 20 credit hours must be taken from the University of Illinois Urbana-Champaign campus.
- No courses used to fulfill any degree requirements may be taken using the "Credit/Not Credit" option.
- A minimum of 12 credit hours of 500-level course credit is required.
- The minimum program GPA required for the degree is 3.0.

Approved Elective Courses

Choose 4hrs of Agricultural and Biological Engineering Courses for electives
(classes do not double count as both core andelective)

ABE 426	Principles of Mobile Robotics (4 hrs)
ABE 425	Engineering Measurement Systems (4 hrs)
ABE 440	Applied Statistical Methods I (4 hrs)
ABE 526	Autonomous Decision Making (4 hrs)
ABE 598	Agro-ecosystem Complexity and Modeling (4 hrs)
ABE 498	Machine Vision for Agricultural and Industrial Applications (4 hrs)
ABE 498	Precision Agriculture Engineering (4 hrs)
ABE 498	Convergence of Data and Science (4 hrs)
ABE 498	Understanding Human Impact of A.I. (2 hrs)

Choose 4hrs of Crop Sciences for electives (classes do not double count as both core and elective):

CPSC 594	Professional Orientation (1 hr)
CPSC 505	Research Methods in Plant Sciences (4 hrs)
CPSC 563	Chromosomes (3 hrs)
CPSC 588	Plant Biochemistry (4 hrs)
CPSC 415	Bioenergy Crops (3 hrs)
CPSC 466	Genomics for Plant Improvement (2 hrs)
CPSC 413	Agriculture, Food and The Environment (2 hrs)
CPSC 416	Native Plants and Agroecosystems (4 hrs)
CPSC 412	Principles of Crop Production (3 hrs)
CPSC 444	Introduction to Spatial Analytics (4 hrs)
CPSC 541	Regression Analysis (4 hrs)
CPSC 540	Applied Statistical Methods II (4 hrs)
CPSC 543	Applied Multivariate Statistics (4 hrs)
CPSC 486	Plant Growth and Development (3 hrs)
CPSC 527	Weed Science and Management (3 hrs)
CPSC 555	Crop Germplasm Resources (2 hrs)
CPSC 466	Genomics for Plant Improvement (2 hrs)
CPSC 565	Perl & UNIX for Bioinformatics (2 hrs)

Choose 4hrs of Computer Science Courses for electives (classes do not double count as both core and elective):

CS 410	Text Information Systems (4 hrs)
CS 418	Interactive Computer Graphics (4 hrs)
CS 445	Computational Photography (4 hrs)
CS 411	Database Systems (4 hrs)
CS 412	Introduction to Data Mining (4 hrs)
CS 425	Cloud Computing Concepts (4 hrs)
CS 484	Parallel Computing (4 hrs)
CS 441	Applied Machine Learning (4 hrs)
CS 498	Cloud Computing Applications (4 hrs)
CS 498	Data Visualization (4 hrs)
CS 437	Topics in Internet of Things (4 hrs)
CS 435	Cloud Networking (4 hrs)
CS 421	Programming Languages and Compilers (4 hrs)
CS 427	Software Engineering I (4 hrs)

ILLINOIS

COLLEGE OF AGRICULTURAL, CONSUMER AND ENVIRONMENTAL SCIENCES

Department of Crop Sciences
AW-101 Turner Hall, MC-046
1102 S. Goodwin Ave.
Urbana, IL 61801-4730

November 13, 2020

Matthew Hudson,
Co-director, Center for Digital Agriculture
Professor of Bioinformatics, Department of Crop Sciences
4029 NCSA, M/C 257
Urbana, IL 61801

Dear Prof. Hudson ,

Thank you for developing the proposal for a Digital Agriculture Concentration within the Master of Engineering degree in the Grainger College of Engineering.

Your proposed Digital Agriculture Concentration will leverage existing instructional resources in the Department of Crop Sciences, as well as Computer Science and Agricultural and Biological Engineering, to accelerate workforce training in this rapidly burgeoning field.

This proposal is perfectly aligned with our objectives for repurposing and repackaging course content to expand our reach to new demographic groups.

The Department of Crop Sciences is in strong support of this initiative to move forward.

Sincerely,

Adam Davis

Professor and Head, Department of Crop Sciences
1102 S. Goodwin Ave.
AW-101 Turner Hall, MC-046

ILLINOIS

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

December 18, 2020

Matthew Hudson,
Co-director, Center for Digital Agriculture
Professor of Bioinformatics, Department of Crop Sciences
4029 NCSA, M/C 257
Urbana, IL 61801

Dear Prof. Hudson,

Thank you for developing the proposal for a Digital Agriculture Concentration within the Master of Engineering degree in the Grainger College of Engineering.

The Department of Computer Science enthusiastically endorses the proposed *M.Eng. in Engineering with a Concentration in Digital Agriculture*.

Your proposed Digital Agriculture Concentration will leverage existing instructional resources in the Department of Computer Science, as well as Crop Sciences and Agricultural and Biological Engineering, to accelerate workforce training in this rapidly burgeoning field.

This proposal is perfectly aligned with our objectives for leveraging existing online CS courses to expand our reach to additional disciplinary groups for integration of computer science in all disciplines.

The Department of Computer Science is in strong support of this initiative to move forward under the assumption that the financial arrangements will be acceptable to the department.

Sincerely,

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

ILLINOIS

GRADUATE COLLEGE
110 Coble Hall, MC-322
801 S. Wright St.
Champaign, IL 61820

PROGRAM TUITION WAIVER POLICY PROPOSAL

Proposals to establish or revise tuition waiver policy for a graduate program will follow a shared governance approval process (Department, School, College, Graduate College).

Definitions of Tuition Waiver Policy Designations:

Traditional Programs. Programs either designated as generating **full or base-rate** tuition waivers. Base rate waivers waives only the Resident Graduate Base tuition amount. Non-Residents or students in a program with an additional tuition differential will be responsible for the remaining portion of tuition.

Reimbursable Programs. Programs identified as programs that would be reimbursed from an appointing unit outside their academic college.

Cost-recovery and self-supporting programs. Students in approved cost-recovery and self-supporting programs are not eligible to receive tuition and fee waivers except statutory waivers. Students in these programs are not eligible to hold a waiver generating graduate appointment (Assistantship or Fellowship). Full time employees may be admitted to these programs, but their employee waiver is not eligible for use towards a program with this designation.

Additional information related to these tuition waiver designations can be found here: http://www.grad.illinois.edu/gradhandbook/2/chapter7/tuition-waivers#otherprovisions.

PROGRAM INFORMATION

COLLEGE OR SCHOOL: The Grainger College of Engineering

PROGRAM(s) (Include Program Codes if applicable):
Digital Agriculture, M.Eng. in Engineering

REQUESTED DESIGNATION (Select desired designation type):

Self-Supporting

Comments:

JUSTIFICATION: On a separate sheet, please address the following.

1. Describe the reasons for this request and explain: (a) the pros and cons of the classification requested, and (b) how the requested classification will benefit and not adversely affect the academic quality of the program.

2. What type of financial assistance will be offered to students in the program?

3. Has this program had past practice of offering graduate assistantships? If so, please describe.

4. What provisions will be made to communicate the new classification to prospective and newly admitted students?

APPROVALS: (May use Adobe Signature or print and sign the document)

Department Executive Officer Signature and Date: _____

Disciplinary College Signature and Date: Jan 13, 2022 _____

Graduate College Signature and Date:_____

1) Describe the reasons for this request and explain: (a) the pros and cons of the classification requested, and (b) how the requested classification will benefit and not adversely affect the academic quality of the program.
    a. This is a request to establish a concentration (digital agriculture) within the MEng in Engineering. It is self-supporting and also not a research-oriented program. It is designed to be completed online in three semesters and will provide relevant and rigorous technical training in digital agriculture. It is mainly designed for continuing advanced education in the interdisciplinary field of digital agriculture. This degree will not only prepare students for immediate entry into the workforce for the rapidly growing area of digital agriculture but will also address the needs around workforce retraining due to the surge of digital technologies in the agriculture industry. The degree is fully online to accommodate candidates who currently hold a professional position in the agriculture industry and recent graduates of engineering and CS+X programs who plan to pursue careers in the agricultural industry. This training will make the graduates of the program highly sought after from industry and other research organizations. The interdisciplinary focus of this program sets it apart from other degrees, bringing benefits to both the students and the departments involved. The requested classification will not adversely affect the quality of the program in any way. The curriculum has been carefully designed to provide a high value to students. The program is built using the current curriculum that is also made available to certain advanced undergraduate and other graduate students in the respective degree programs. The new courses that have been developed are innovative and address topics of great interest to UIUC students.
2) Describe the expected impact of the requested classification to new students. How will these measures affect the affordability of the program? What type of financial aid, if any, will be offered? Note: Continuing students will not be affected as they are subject to the rules in effect at the time of their admission.
    a. This is a new program within the MEng in Engineering. All students entering the program will need to pay tuition. No financial aid will be offered to students that involve state funds.
3) What provisions will be made to communicate the implications of the classification to prospective and newly admitted students?
    a. The self-supporting nature of the program will be clearly explained on the program's website and in any and all communications to prospective students.
4) Name the college and program contact persons in charge of implementing and communicating the classification and its consequences to students.
    a. Assistant Director of Programs for ABE and CDA – Christina Tucker
    b. Xinlei Wang – ABE Graduate Coordinator

c. The Grainger College of Engineering contacts for this program is Daniel Bodony, Associate Dean for Graduate, Professional and Online Programs, and the Executive Director of Engineering Graduate Programs (?)

From:	Pahre, Jennie
To:	Maghirang, Ronaldo G
Cc:	Moorhouse, Linda; Martensen, Kathy; Lehman, Barbara J
Subject:	Re: EP 22.103 -- Proposal to Establish a Graduate Concentration in Digital Agriculture within the Engineering M.Eng. Degree
Date:	Friday, February 18, 2022 3:26:56 PM

Ronaldo,
Thank you for your prompt response to my subcommittee's questions. I believe, based on this information, that we're all set.

With appreciation,
Jennie

JENNIFER N. PAHRE
Teaching Associate Professor and Director of Undergraduate Studies
College of Law
University of Illinois Urbana-Champaign
202 Law Building | M/C 594
Champaign, IL 61820
217.333.0712 | jpahre@illinois.edu
www.law.illinois.edu

From: Maghirang, Ronaldo G <ronaldom@illinois.edu>
Sent: Friday, February 18, 2022 10:33 AM
To: Pahre, Jennie <jpahre@illinois.edu>
Cc: Moorhouse, Linda <moorhouz@illinois.edu>; Martensen, Kathy <kmartens@illinois.edu>; Lehman, Barbara J <bjlehman@illinois.edu>
Subject: RE: EP 22.103 -- Proposal to Establish a Graduate Concentration in Digital Agriculture within the Engineering M.Eng. Degree

Dear Professor Pahre,

Thank you for your work in chairing the subcommittee and for the questions. Please see responses below. Let me know if you have any questions or need additional information.

Sincerely,
Ronaldo

From: Pahre, Jennie <jpahre@illinois.edu>
Sent: Friday, February 11, 2022 10:08 AM
To: Maghirang, Ronaldo G <ronaldom@illinois.edu>
Cc: Moorhouse, Linda <moorhouz@illinois.edu>; Martensen, Kathy <kmartens@illinois.edu>; Lehman, Barbara J <bjlehman@illinois.edu>
Subject: EP 22.103 -- Proposal to Establish a Graduate Concentration in Digital Agriculture within the Engineering M.Eng. Degree

Dear Professor Maghirang,

I hope that your week is winding down well.

This year, I am the chair of subcommittee A of the University's Senate Educational Policy Committee. Your proposal to Establish a Graduate Concentration in Digital Agriculture within the Master of Engineering Degree has come to my subcommittee for review.

Your proposal looks to be in good order. The subcommittee enjoyed learning about Digital Agriculture. The field is clearly important, and we think the online concentration is timely and very appropriate for the targeted market.

The subcommittee has just a few questions.

1) We see that the admissions process changes if there are more than 100 applicants. This change (and essentially the different standards for admission) suggests that there is an admission cap, although the proposal says that there is not. Could you please explain a bit more about the admissions process? Does it matter how many applicants meet the basic requirements for admission?

R: This program is taking advantage of existing classes in all of the departments. The CS classes in particular are part of a very popular online MCS program. All the students would have to meet the same requirements for admission regardless of the number of applicants. The admissions staff will screen the applicants to make sure they meet the requirements. If we received beyond 100 applicants in an admission period, we would then have the admission committee review the admissions process to act as a safeguard against overloading existing courses. The admissions committee will be composed of one representative from CDA, ABE, CS, and CPSC.

2) Will ENG 572 (Professional Practicum) and ENG 573 (Capstone Project) be taught out of the CS department? If not, is there a letter of support from Engineering?

R: This proposal is for a concentration under the MEng in Engineering program. The MEng is the umbrella major for our interdisciplinary concentrations, such as Digital Agriculture. The Grainger College of Engineering sets up an ENG 572 or 573 sections for each MEng program, including the concentrations under the MEng major, as well as the stand-alone programs in ECE, MechSE, and BIOE. The instructor will be provided by the host department ABE.

I thank you for your assistance, and look forward to presenting your proposal to the Educational Policy Committee.

Kind regards,

Jennie

JENNIFER N. PAHRE
Teaching Associate Professor and Director of Undergraduate Studies
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