New Program Proposal

Changes saved but not submitted

Viewing: : Data Engineering

Last edit: 01/12/22 11:53 am

Name of the school or college academic planner who you consulted with on this proposal.

Name
Elaine M Klein - L&S

Proposal Abstract/Summary:

The Department of Computer Sciences is proposing a new thirty credit 131 program MS-Data Engineering (MSDE) to be administratively housed in the department of Computer Sciences. Data Engineering is concerned with the principles and practices of managing data at scale. It emphasizes the valid and efficient collection, storage, management, and processing of datasets to support computation and data driven systems important to data science and data analytics functions. The proposed MS- Data Engineering program will build upon expertise and existing curriculum within Computer Sciences to offer a specialized graduate-level program. The program will include required courses and electives. Required classes will support the program level learning outcomes. Electives might include courses from partner programs in the new School of Computing, Data and Information Sciences (CDIS) (a division within the College of Letters & Science) and other departments on campus. The program assumes prior computing-related and mathematics coursework. The program will not seek ABET accreditation, and is not implicated in the operations of the College of Engineering or its relationship with ABET.

Basic Information

Program State: Active

Type of Program: Degree/Major

Upload the Approved Notice of Intent and UW System Approval Memo.

Placeholder document.docx

Upload completed draft of the full Board of Regents Authorization Proposal for this

program.

Placeholder document.docx

Who is the audience? Graduate or professional

Home Department: Computer Sciences (COMP SCI)

School/College: College of Letters and Science

The program will be governed by the home department/academic unit as specified. Will an additional coordinating or oversight committee be established for the program?

No

Is this in the Graduate School? Yes

Award: Master of Science

SIS Code:

SIS Description:

Transcript Title: Data Engineering

Named Options:

Will this be offered as an additional major as well? No

Is this a non-admitting master's degree? No

Roles by Responsibility: List one person for each role in the drop down list. Use the green + to create additional boxes.

Role Type	Name (Last, First)	Email	Phone	Title
Department Chair	Arpaci-Dusseau, Remzi	rharpaciduss@wisc.edu	608/263-7764	
Primary Contact	Eschenfelder, Kristin	eschenfelder@wisc.edu	608/263-2105	
Faculty Director	Jha, Somesh	sjha@wisc.edu	608/262-9519	
Primary Dean's Office Contact	Milner, Jocelyn	jlmilner@wisc.edu	608/263-5658	Provost's Office Administration

Role Type	Name (Last, First)	Email	Phone	Title
Primary Dean's Office Contact	Klein, Elaine	emklein@wisc.edu	608/265-8484	College-level Administration

List the departments that have a vested interest in this proposal.

Departments
Statistics (STATISTICS)
College of Engineering (ENGINEERG)

Are all program reviews in the home academic unit up to date? Yes

Are all assessment plans in the home academic unit up to date? Yes

Are all assessment reports in the home academic unit up to date? Yes

Mode of Delivery:
Face-to-Face (majority face-to-face courses)

Will this program be part of a consortial or collaborative arrangement with another college or university? No

Will instruction take place at a location geographically separate from UW-Madison? No

Will this program have outside accreditation? No

Will graduates of this program seek licensure or certification after graduation? No

First term of student enrollment: Fall 2022 (1232)

Year of three year check-in to GFEC (3 years after first student enrollment):
2026

Year of first program review (5 years after first student enrollment):
2028

If this proposal is approved, describe the implementation plan and timeline.

February 2022: GFEC Meeting/UAPC
Late-February 2022: submission of documents for Regents meeting
April 2022: approval from Regents for fall start; grad school application open
April 2022: L&S will convene an implementation meeting to coordinate aspects of program administration with representatives from RO, APIR, L&S, Grad School, Department, etc.
May-August 2022: collect applications; CS will convene admissions committee to review applications and admit first incoming cohort
summer: hire program coordinator and other first year staff
September 2022: first cohort begins

Rationale and Justifications

Why is the program being proposed? What is its purpose?

Data Engineering is concerned with the principles and practices of managing data at scale. It emphasizes the valid and efficient collection, storage, management, and processing of datasets to support computation and data driven systems important to data science and data analytics functions. Given the increasing amounts of data being generated and processed on a daily basis, almost all industries need data engineers to build and maintain robust data-handling systems. There is a strong workforce demand for data engineering expertise. The proposed MS-Data Engineering program will build upon expertise and existing curriculum within Computer Sciences to offer a specialized graduate-level program. The program will include required courses and electives. Electives might include courses from partner programs in the new School of Computing, Data and Information Sciences (CDIS) (a division within the College of Letters & Science) and other departments on campus. The program will prepare students with prior computing-related coursework to become specialists in data engineering. The program will not seek ABET accreditation, and is not implicated in the operations of the College of Engineering or its relationship with ABET.

What is its relation to the institution's mission? (Consider the mission broadly as a major research university with missions in teaching, research, service, and the Wisconsin Idea.) How does it contribute to the mission of the sponsoring unit(s)?

The proposed program in Data Engineering will contribute to the UW-Madison 2020-2025 Strategic Priorities of excellence in research and scholarship and ensuring the continued vitality, competitiveness, and strength of their graduate and professional programs; excellence in teaching and educational achievement by expanding educational programming in areas of high student demand; and ensuring a vibrant campus community by enhancing diversity among students, faculty, and staff and creating a welcome, empowered, and inclusive community. Within the School of Computing, Data & Information Science (CDIS), the new program will strive to meet the CDIS mission of contributing to the public good and enriching civil society through researching, teaching and outreach; educating responsible leaders, critical thinkers, and creative innovators; and fostering prosperity in the state, region, and the world.

The program contributes to the mission of the Department of Computer Sciences by contributing to the excellence of the long-standing CS strengths in the areas of databases and systems.

Do current students need or want the program? Provide evidence.

There is strong industry demand for expertise in Data Engineering and ample employment opportunities for MSDE graduates. This program is being created, in part, through the encouragement of the US Army, which has a critical national need for more personnel in the area of Data Engineering. We expect the program will serve a wide variety of students, including those proposed by Army.

What is the market, workforce, and industry need for this program? Provide evidence.

This program is being prepared with the intention of serving a specific audience of students proposed by the US Army, in response to defined critical national needs for more military personnel in the area of Data Engineering. Army graduates of the program will support Army programs through development, deployment and management of defense and intelligence data systems. A similar program at Carnegie Mellon University enrolls approximately 25 students from Army each year. It is expected however, that the program will be attractive to, and enroll, graduate students beyond those proposed by Army.

Given the increasing amounts of data being generated and processed on a daily basis, almost all industries employ data engineers to build and maintain robust data-handling systems. An IBM/Burning Glass report “The Quant Crunch” predicts a 28% increase in data engineering positions with an average salary of $117,000. The report encourages higher education to develop students in data science, but also in related roles including data engineers. (https://www.ibm.com/downloads/cas/3RL3VXGA) According to LinkedIn’s 2020 Emerging Jobs Report, the Data Engineer position is the 8th fastest-growing job in the U.S. with a 33% annual growth rate. (https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions/emerging-jobs-report/Emerging_Jobs_Report_U.S._FINAL.pdf) A 2021 report from hired.com/Vetery, a technology talent marketplace, projects a 45% growth in Data Engineering positions. (https://hired.com/state-of-software-engineers#about-hired)

Looking at Bureau of Labor Statistics data, there is not a specific category labeled "Data Engineer" in the Occupational Outlook Handbook (OOH) from the Bureau of Labor Statistics. The job outlook in the period 2019-29 for the broader category Computer and Information Research Scientists is expected to grow by 15% (classified as "much faster than average"). The “typical entry-level education” for these fields is a Master’s degree. It is reasonable to predict that students graduating from the MS Data Engineering program would be well positioned to meet demand for employees with these skills.

How does the program represent emerging knowledge, or new directions in professions and disciplines?

Data engineering is a new profession stemming from the radical increase in the amount of data produced and analyzed in today’s society. It ensures the valid and efficient collection, storage, management, and processing of datasets to support computation and data driven systems important to data science and data analytics functions, and supporting contemporary interactive information/data systems.

In what ways will the program prepare students through diverse elements in the curriculum for an integrated and multicultural society (may include diversity issues in the curriculum or other approaches)?

Course instructors will practice inclusive teaching, including highlighting the contributions to the field of data engineering by people from diverse backgrounds.
Courses will include modules on ethical issues in data engineering, such as bias in data sets.
Courses will involve group project work, and instructors will emphasize the importance of diversity of opinion and differences in collaborative approaches.
Courses will feature guest speakers from diverse backgrounds to talk about the importance of diversity and representation in data engineering.
Students in the program will be encouraged to attend events, such as the CDIS Red Talk series, which highlights topics at the intersection of technology, data and society. The Red Talk series aims to feature diverse speakers, and the talks often address issues related to social justice, equality, privacy and related concerns.

What gap in the program array is it intended to fill?

Both the Computer Sciences and Statistics Departments offer professional 131 MS programs and the MSDE program is complementary to these existing programs. The proposed MS Data Engineering is distinct from, but related to, the MS-Data Science (at the full proposal stage as of January 2022). The proposed MS Data Engineering serves a particular student audience with specific needs in relation to program name and certain distinctive curricular elements. The MS Data Science is a broader degree that combines both statistical and computational knowledge related to data and data analysis and serves a more general audience of students seeking to enter the Data Science professions. In contrast, the MS Data Engineering will serve a narrower audience of students and will provide a more focused curriculum in data platforms and architectures, data integration and enrichment, data management theory and data uncertainties and pricing. Another related program, the MS Computer Sciences: Professional Master's Program, is a general professional computer science degree that covers a broad range of computer sciences topics. A further related program, the MS Statistics: Data Science, is a data science-oriented program focused on coursework in statistics. This proposed MS Data Engineering program would allow students to have another option that provides specialized data engineering training from the perspective of computer sciences and programs and systems that manage data. There are other programs on the UW-Madison campus that offer strong graduate preparation in data analytics (e.g., MS Systems Engineering and Analytics, MS Engineering Analytics (online), MS Data Science and Human Behavior, MS Business Analytics, MS Learning Analytics (online)). These programs prepare students to be experts in the analysis of data, and in the use of computational analysis tools and techniques, to answer questions and solve problems. In comparison, students in the proposed data engineering program will develop expertise in the systems and frameworks that support transfer and management of data at scale, so that the data are then available for analysis and computational work. The UW System currently does not field another graduate program in Data Engineering. The Collaborative Master of Science in Data Science is offered in partnership between UW Extended Campus and six UW campuses. The Collaborative UW System degree is also a fully online degree program. UW-Milwaukee also had a Notice of Intent approved in Summer 2021 for a MS-Data Science program. The proposed MS-Data Engineering from UW-Madison will be distinct in focus and curriculum from these other UW System offering. The planned tuition tier of $1,600 is also higher than the other current/planned UW System offerings.

Diversity and Inclusion

Describe how the proposed program curriculum and learning outcomes will advance inclusive excellence. Discuss specific components and requirements within the curriculum that will offer students opportunities and learning activities to engage in diversity with respect to perspectives, theories, practices, and populations different from themselves. If internships or clinical, practicum, or experiential learning experiences will be required, discuss how students will have access to diverse practice settings.

The elements of the curriculum that offers students opportunities to engage with diverse perspectives, practices and populations include:

Courses will include modules on ethical issues in data engineering, such as bias in data sets.
Courses will involve group project work, and students will need to navigate the diversity of backgrounds, opinions and approaches employed by their classmates.
Courses will feature guest speakers from diverse backgrounds and class examples will highlight the contributions to the field of data engineering by people from diverse backgrounds.
Students in the program will be encouraged to attend events, such as the CDIS Red Talk series, which highlights topics at the intersection of technology, data and society. The Red Talk series aims to feature diverse speakers, and the talks often address issues related to social justice, equality, privacy and related concerns.

Discuss how the proposed program will actively pursue an equity in student recruitment, access, retention, and degree completion. Describe specific strategies to identify and recruit a diversified student population for programs that do direct admissions. Include evidence-based and effective practices. Provide examples of academic and student support services that will be implemented to support student learning success and completion.

CS plans to hire additional 1.0 FTE Student Services capacity to support this program. Below is a summary of planned activities to recruit and retain a diverse student body:

Pre-application: Engage in a variety of recruitment opportunities such as conferences, especially conferences whose audience includes underrepresented groups. These include SACNAS, the National Diversity in STEM Conference, the Grace Hopper conference (women in technology) and the TAPIA Conference on Diversity in Computing. CS will also explore smaller conferences to have a broader reach where faculty attend to build connections with prospective applicants; create more modern recruitment materials including updating our website to be more student focused and have materials/swag for conferences.

Application: offer fee-waivers to applicants from diverse backgrounds; have a more pro-active communication strategy during the process to provide transparency; revamp the visit program/schedule to better demonstrate our climate and build community

Pre-matriculation: assign “faculty contacts” to each admitted applicant who will be tasked with having regular communication with candidates; explore opportunities to connect applicants with alumni

Post-admission:CS will track how applicants came to us to begin to identify successful pathways; explore additional pipelines and pathways. CS already regularly monitors for differences in course and program completion amongst students of different groups in order to identify and take appropriate action. CS will experiment with enrollment cohorts, where we seek to encourage a group of students from similar backgrounds to apply and enroll together. CS will connect students from underrepresented groups to existing CS support groups (e.g., Women of the ACM student chapter and the emerging “ColorStack” group for students of color), on-campus groups and resources to help build connections, support, and mentoring relationships.

Additionally, CS hopes that a partnership with the US Army will draw a more diverse applicant pool as the US Army has a diverse workforce.

Consider how the proposed program will ensure equity in recruiting and hiring of faculty, instructional staff, and staff who will oversee the program curriculum, professional/career development experiences, and research/scholarship where relevant.

The Department of Computer Sciences will continue with their efforts to diversify the faculty body. On the faculty recruitment front, CS has focused on increasing the number of faculty who come from underrepresented populations, including increasing the number of female faculty in the department. The department has reached out to alumni and colleagues in departments across the country to recruit a diverse population of candidates to apply for our faculty positions. In addition to these recruitment efforts, the department will promote training to raise faculty awareness of diversity and inclusion issues prevalent at UW-Madison.

Note any plans or strategic initiatives at the university that are closely linked with the development of the proposed program. Note how efforts will align with the appropriate and applicable accreditation standards that address diversity where relevant. To the extent that the response to questions related to diversity, equity, and inclusion are connected to plans at the department, school/college or university, make those connections explicit where relevant.

The Computer Sciences department has joined the LEAP initiative to enroll and support students from underrepresented groups in CS graduate programs. This LEAP initiative establishes a group of graduate programs that work collaboratively to recruit and retain minority students by providing a cross-institution cohort of students and enabling cross-institution mentoring for students.(https://cmd-it.org/program/current/leap-alliance/)While CS just started this initiative in Fall 2021, the it will apply the lessons and methods from this effort to the MSDE program.

The Department of Computer Sciences is now in the School of Computing, Data, and Information Sciences (CDIS). CDIS has five focus areas and area three is “Inclusion – Addressing under representation and inclusivity problems in the STEM fields and bringing together diverse populations, points of view and approaches.” Via the CDIS diversity committee CS has begun to see a shared effort across departments to increase diversity, equity, and inclusion efforts by supporting each department’s work and commitment, all of which include the Computer Sciences Department.

Faculty and Staff Resources

List the core program faculty and staff with title and departmental affiliation(s) who are primarily involved and will participate in the delivery and oversight.

Name (Last, First)	Department	Title
Arpaci-Dusseau, Remzi	Computer Sciences (COMP SCI)	Professor

Name (Last, First)	Department	Title
Barford, Paul	Computer Sciences (COMP SCI)	Professor
Banerjee, Suman	Computer Sciences (COMP SCI)	Professor
Doan, An	Computer Sciences (COMP SCI)	Professor
Lee, Yong Jae	Computer Sciences (COMP SCI)	Professor
Koutris, Paris	Computer Sciences (COMP SCI)	Professor
Livny, Miron	Computer Sciences (COMP SCI)	Professor
Patel, Jignesh	Computer Sciences (COMP SCI)	Professor
Venkataraman, Shivaram	Computer Sciences (COMP SCI)	Professor
Wright, Steven	Computer Sciences (COMP SCI)	Professor
Yu, Xiangyao	Computer Sciences (COMP SCI)	Professor
Fendrick, Cindy	Computer Sciences (COMP SCI)	Department Administrator for Academic Services
Boehm, Janna	Computer Sciences (COMP SCI)	Professional Programs Coordinator

What resources are available to support faculty, staff, labs, equipment, etc.?

The CS department is well resourced in terms of equipment and labs to support this program.

Program advisor(s) with title and departmental affiliation(s).

Name (Last, First)	Department	Title
Boehm, Janna	Computer Sciences (COMP SCI)	Professional Programs Coordinator

Describe how student services and advising will be supported.

CS plans to add 1 FTE student services to support the program and its students through a program coordinator position. The program coordinator will assist with program inquiries, admissions, general program advising and degree progress. Students will also be assigned faculty advisors to assist with questions about electives choices. CS plans to hire a career services staff member who would work with students in all CS professional programs. In addition CS plans to hire a 1.0 FTE Professional Programs Director who will work with faculty program leads and provide leadership and administrative support in planning, assessment and cross program coordination.

Confirm that the program advisor(s) or coordinator(s) have been consulted and reviewed this proposal. Yes

Select the Graduate Research Scholars Community for this program.

Letters & Sciences Community of Graduate Research Scholars

Resources, Budget, and Finance

Is this a revenue program? Yes

Upload the 131 spreadsheet.

What is the tuition structure for this program?

Market-based tuition - separate proposal to be submitted

Select a tuition increment:

$1,600/credit

What is the rationale for selecting this tuition increment?

peer comparison

Upload Market-based tuition proposal here: DE_Market-BasedTuitionPolicyRequestFormMDS-11-22 (002).docx

Provide an overview of plans for funding the program including but not limited to program administration, instructional/curricular delivery, technology needs and program assessment.

The program will be funded by revenues based on tuition paid by students enrolled in the program. This program will build upon existing 131 program expertise within Computer Sciences. Program revenues will support all program costs including program administration, academic advising, career advising, technology needs, curricular governance, program review, and program assessment. Approved courses taken by program students outside of the Computer Sciences will be compensated using the College of Letters & Sciences standard (currently $600 per credit for 131 programs).

What is the marketing plan?

The proposed MS Data Engineering degree will be promoted broadly and benefit from the marketing expertise and capacity provided by CDIS's Director of Marketing and Inclusion and the CDIS's Manager of Business Engagement. Planned marketing strategies will include creating a program website, promoting the program with industry partners through business engagement communications, notifying alumni through CS and broader CDIS alumni communications, announcements and updates through CS, and other CDIS social media platforms. In addition, information will be shared with campus advisors who may work with undergraduates who might be appropriate candidates looking for post-graduation plans. These efforts will be in addition to the typical exposure that all degrees receive from UW-Madison admissions.

The promotion of the MS Data Engineering will also benefit from the current and planned CS outreach strategy which includes attending both the TAPIA and Grace Hopper conferences that focus on underrepresented students. CS is hoping to increase recruitment efforts by offering more online information sessions, and targeted marketing to mid-west regional comprehensive institutions through collaboration with DCS regional marketing efforts for professional programs, the MS Data Engineering would be promoted as a part of this effort.

Given the high demand on "Data Engineering", it is anticipated that the target enrollment level can be easily met with the marketing plan.

Describe resource and fiscal considerations - A. Provide an overview of plans for funding the program including program administration, instructional/curricular delivery, academic and career advising, technology needs, marketing (if relevant), financial aid and scholarships (if relevant), capacity for student learning outcomes assessment and program review.

The program will be funded by revenues based on tuition paid by students enrolled in the program. The program will be administered through the standing CS Professional Programs committee. Program revenues will support all program costs. CS plans to add 1.0 FTE for academic advising, and .5 FTE for career services for this program. Program revenue will pay for any additional courses needed to deliver the curriculum. Marketing assistance will be provided by the CDIS marketing staff who will coordinate with the CS communications staff.

Describe resource and fiscal considerations - B. Are the faculty, instructional staff and key personnel existing or new faculty and staff? If they already serve existing programs, how are they able to add this workload? If new faculty and staff will be added, how will they be funded?

The program's courses will be fielded by existing CS faculty and academic staff as most courses in the curriculum are already offered regularly. As revenue is generated, the program plans to hire additional instructors to expand class capacity. The program will be administered through the standing CS Professional Programs committee. CS plans to add 1.0 FTE for academic advising, planning, assessment and review. CS plans to add .5 FTE career services support. New staff and faculty/instructors will be funded through program revenue.

Describe resource and fiscal considerations - C. What impacts will the program have on staffing needs beyond the immediate program? How are those needs being met?

Additional administrative and support needs can be immediately accommodated by existing administrative staff, and technology support groups. The program plans to add 1.0 FTE additional administrative capacity over the first few years.

Describe resource and fiscal considerations - D. For graduate programs, describe plans for funding students including but not limited to funding sources and how funding decisions will be made.

As this is a 131 revenue generating project, all students will be self funded or employer funded. CS will use departmental scholarship funds to help recruit a diverse student population with partial funding. The department has scholarship funds available from existing 131 program revenue.

UW System Administration and the Board of Regents require submission of budget information in a specific format. These forms will be completed in collaboration with APIR after school/college approval and before submission to UWSA for Board consideration. These forms are uploaded here by APIR.

Does the program or change require substantial new resources other than those just described? Describe the needs. Confirm that the dean is committed to providing the resources.

No additional resources are needed.

Are new Library resources needed to support this program?

No

Describe plans for funding students including but not limited to funding sources and how funding decisions are made.

This is a 131 revenue generating program and most students are expected to pay tuition.

Curriculum and Requirements

Guide Admissions/How to Get In tab

Approved Shared Content from /shared/graduate-school-admissions/

Last Approved: Apr 15, 2021 12:15pm

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.
Graduate admissions is a two-step process between academic programs and the Graduate School. ***Applicants must meet the minimum requirements of the Graduate School as well as the program(s).*** Once you have researched the graduate program(s) you are interested in, apply online.

REQUISITES FOR ADMISSION

Applicants to the MS Data Engineering program should have completed a prior degree in Computer Sciences, Computer Engineering, or a related field.

Degree Requirements

Students are required to have completed their BS/BA degree prior to the first semester as an MS Data Engineering student.

Describe plans for recruiting students to this program.

Recruitment for the proposed MS Data Engineering degree will be promoted broadly and benefit from the marketing expertise and capacity provided by CDIS's Director of Marketing and Inclusion and the CDIS's Manager of Business Engagement. Planned marketing strategies will include creating a program website, promoting the program with industry partners through business engagement communications, notifying alumni through CS and broader CDIS alumni communications, announcements and updates through CS, and other CDIS social media platforms. In addition, information will be shared with campus advisors who may work with undergraduates who might be appropriate candidates looking for post-graduation plans. These efforts will be in addition to the typical exposure that all degrees receive from UW-Madison admissions. In addition, the US Army is expected to send students to apply to the program each year.

The promotion of the MS Data Engineering will also benefit from the current and planned CS outreach strategy which includes attending both the TAPIA and Grace Hopper conferences that focus on underrepresented students. CS is hoping to increase recruitment efforts by offering more online information sessions, and targeted marketing to mid-west regional comprehensive institutions through collaboration with DCS regional marketing efforts for professional programs, the MS Data Engineering would be promoted as a part of this effort. Given the high demand on "Data Engineering", it is anticipated that the target enrollment level can be easily met with the marketing plan.

What is the recruiting and admissions strategy for underrepresented students?

Pre-application: Engage in a variety of recruitment opportunities such as conferences, especially conferences whose audience includes underrepresented groups. These include SACNAS, the National Diversity in STEM Conference, the Grace Hopper conference (women in technology) and the TAPIA Conference on Diversity in Computing. CS will also explore smaller conferences to have a broader reach where faculty attend to build connections with prospective applicants; create more modern recruitment materials including updating our website to be more student focused and have materials/swag for conferences.

Application: offer fee-waivers to applicants from diverse backgrounds; have a more pro-active communication strategy during the process to provide transparency; revamp the visit program/schedule to better demonstrate our climate and build community

Pre-matriculation: assign “faculty contacts” to each admitted applicant who will be tasked with having regular communication with candidates; explore opportunities to connect applicants with alumni

Post-admission:CS will track how applicants came to us to begin to identify successful pathways; explore additional pipelines and pathways. CS already regularly monitors for differences in course and program completion amongst students of different groups in order to identify and take appropriate action. CS will experiment with enrollment cohorts, where we seek to encourage a group of students from similar backgrounds to apply and enroll together. CS will connect students from underrepresented groups to existing CS support groups (e.g., Women of the ACM student chapter and the emerging “ColorStack” group for students of color), on-campus groups and resources to help build connections, support, and mentoring relationships

Projected Annual Enrollment:

Year	Projected Enrollment
Year 1	25
Year 2	35
Year 3	45
Year 4	55
Year 5	55

Describe plans for supporting enrollments that are much higher or much lower than the anticipated enrollment.

It is expected that the program will be on high demand, and we plan to cap the enrollment by the target level to ensure program quality and sufficient instructors. If enrollments are lower than the anticipated enrollment, there is little impact on the program instructions, as most of students are enrolled in existing classes.

Those who are not familiar with using the html editor fields may upload a document with information about the curriculum for use by those who will format and edit the content that will appear in the Guide.

Guide Requirements tab

CURRICULAR REQUIREMENTS

Data Engineering Foundations: complete all classes		**12**
COMP SCI 739	Distributed Systems	
COMP SCI 744	Big Data Systems	
COMP SCI 764	Topics in Database Management Systems	
COMP SCI 838	Topics in Computing	
Machine Learning Requirement: select a minimum of 2 courses from the list below		**6**
COMP SCI 540	Introduction to Artificial Intelligence	
COMP SCI 760	Machine Learning	
COMP SCI 762	Advanced Deep Learning	
STAT 451	Introduction to Machine Learning and Statistical Pattern Classification	
STAT 453	Introduction to Deep Learning and Generative Models	
STAT 615	Statistical Learning	
Algorithms Requirement: select a minimum of one class from below		**3**
COMP SCI/ E C E/I SY E 524	Introduction to Optimization	
COMP SCI 577	Introduction to Algorithms	
COMP SCI/ I SY E/MATH/ STAT 726	Nonlinear Optimization I	

Systems Requirement: select a minimum of one class from below		**3**
COMP SCI 407	Foundations of Mobile Systems and Applications	3
COMP SCI 537	Introduction to Operating Systems	
COMP SCI 564	Database Management Systems: Design and Implementation	
COMP SCI 640	Introduction to Computer Networks	
COMP SCI/ E C E 707	Mobile and Wireless Networking	3
COMP SCI 740	Advanced Computer Networks	
Humans and Data Requirement: select a minimum of one class from below		**3**
COMP SCI 765	Data Visualization	
COMP SCI/ ED PSYCH/ PSYCH 770	Human-Computer Interaction	
Approved Electives: Select any course from above or from the list below		**3**
COMP SCI 642	Introduction to Information Security	
COMP SCI 702	Graduate Cooperative Education	
COMP SCI 790	Master's Thesis	
COMP SCI 799	Master's Research	
COMP SCI 900	Advanced Seminar in Computer Science	
STAT 611	Statistical Models for Data Science	
STAT 612	Statistical Inference for Data Science	
STAT 613	Statistical Methods for Data Science	

Specific offerings of COMP SCI 838 are counted as fulfilling the Data Engineering Core requirement only with approval of the Graduate Advising Committee.

Courses used as an elective cannot also be used to fulfill data engineering fundamentals requirements or breadth requirements for machine learning, algorithms, systems, and humans and data

As per Graduate School rules, at least fifteen credits must be received for graduate-level courses. These courses are numbered 700-889 or have the "Grad 50% - Counts toward 50% graduate coursework requirement" designation. COMP SCI 799 Master's Research, COMP SCI 790 Master's Thesis, COMP SCI 702 Graduate Cooperative Education and COMP SCI 900 Advanced Seminar in Computer Sciences can be taken for a combined total of at most three elective credits.

Total credits required:

30

Guide Graduate Policies tab

Approved Shared Content from /shared/graduate-school-policies/
Last Approved: Apr 15, 2021 12:16pm

Graduate School Policies

The Graduate School's Academic Policies and Procedures provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

Program Policies

PRIOR COURSEWORK

Graduate Work from Other Institutions

With program approval, students are allowed to count no more than 9 credits of graduate coursework from other institutions toward the graduate degree credit and graduate coursework (50%) requirements. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

UW–Madison Undergraduate

With program approval, up to 7 statistics credits from a UW–Madison undergraduate degree are allowed to count toward minimum graduate degree credits. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

UW–Madison University Special

With program approval, up to 15 statistics credits completed at UW–Madison while a University Special student at the 300 level or above are allowed to count toward minimum graduate degree and graduate residence credit requirements. Of these credits, those at the 700 level or above may also count toward the minimum graduate coursework (50%) requirement. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

PROBATION

Students are required to follow all of the requirements listed in the program handbook (INSERT LINK) for maintaining satisfactory academic program. Students who do not make satisfactory academic progress for multiple semesters may be dismissed from the program.

ADVISOR / COMMITTEE

Students are required to communicate with their advisor near the beginning of each semester to discuss course selection and progress.

CREDITS PER TERM ALLOWED

15 credits

TIME CONSTRAINTS

Students are expected to complete the program in 3-4 semesters. Students who wish to pursue the program part time must receive permission from the program chair.

GRIEVANCES AND APPEALS

Approved Shared Content from /shared/graduate-school-grievance-policy/
Last Approved: Apr 15, 2021 12:17pm
These resources may be helpful in addressing your concerns:
Bias or Hate Reporting
Graduate Assistantship Policies and Procedures
Hostile and Intimidating Behavior Policies and Procedures
Office of the Provost for Faculty and Staff Affairs
Dean of Students Office (for all students to seek grievance assistance and support)
Employee Assistance (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
Employee Disability Resource Office (for qualified employees or applicants with disabilities to have equal employment opportunities)
Graduate School (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
Office of Compliance (for class harassment and discrimination, including sexual harassment and sexual violence)
Office of Student Conduct and Community Standards (for conflicts involving students)
Ombuds Office for Faculty and Staff (for employed graduate students and post-docs, as well as faculty and staff)
Title IX (for concerns about discrimination)
Approved Shared Content from /shared/letters-science-grievance-policy/
Last Approved: Apr 22, 2021 10:10am
Students should contact the department chair or program director with questions about grievances. They may also contact the L&S Academic Divisional Associate Deans, the L&S Associate Dean for Teaching and Learning Administration, or the L&S Director of Human Resources.

OTHER

The MS Data Engineering does not allow students to accept a tuition remitting assistantship, hold multiple positions that would result in tuition remission, or to be concurrently enrolled in another university program or enrolled in courses outside of the MS Data Engineering curriculum—see here (LINK TO HANDBOOK PAGE) for more details.

Discuss expected progress to degree and time to degree. For undergraduate programs discuss considerations for supporting students to complete the degree in four academic years.

The MS Data Engineering program is designed to be completed in two academic years.

Program Learning Outcomes and Assessment

List the program learning outcomes.

	Outcomes – enter one learning outcome per box. Use the green + to create additional boxes.
1	Design, implement and evaluate the use of analytic algorithms on sample datasets.
2	Explain how a machine-learning model is developed for and evaluated on real world datasets.
3	Design and execute experimental data collection and processing, and present resulting analyses using best practices in human-centered data communications.
4	Apply and customize analytics, systems and human-centered techniques to application-specific data engineering requirements and objectives.
5	Identify tradeoffs among data engineering techniques (analytics, systems and/or human-centered) and contrast design alternatives, within the context of specific data engineering application domains.
6	Survey, interpret and comparatively criticize state of the art data engineering research talks and papers,with emphasis on constructive improvements.
7	Organize, execute, report on, and present a real world data engineering project in collaboration with other researchers/programmers.

When learning outcomes are changed, a new assessment plan must be uploaded.

Summarize the assessment plan.

The assessment plan for this program complies with UW-Madison assessment requirements that programs engage “in at least one assessment activity each year, which should include at least one direct assessment within a 3 year period.” The assessment strategy will rely on evidence provided by students, faculty and staff with direct and indirect relevance to learning objectives.
The MSDE program director will prepare an annual assessment report that includes data summaries on all learning outcomes, and student satisfaction with academic advising, orientation activities, student services, climate and other elements of the student experience. The report will also point out areas for improvement and make recommendations for changes to the program. The department executive committee and chair will review the report at the annual planning meetings and decide on recommended changes. The report will be submitted to the UW-Madison Provost’s office the fall of each year as required by campus. Data collected will also be used as to prepare 2 and 5 year reports for the Letters & Science college level review and Graduate School reviews which assess programs on the degree to which they meet admissions, retention and graduation rates among different subsets of students, the degree to which revenue programs meet financial goals and overall student and staff satisfaction with programs. The MSDE program is not accredited by any external organization.

Department Approved Assessment Plan: ke_MSDE_Assessment_Plan.docx

Related Programs

Provide information in related programs offered by other UW System institutions and explain the extent to which the proposed program is distinct and how it overlaps or duplicates those programs.

There is no Data Engineering program offered within the UW System currently. There is currently only one other MS "Data Engineering" program available at the UW System level. This is a collaborative online MS program involving Eau Claire, Green Bay, La Crosse, Oshkosh, Stevens Point, and Superior. The UW-Madison proposal to offer an in-person, focused program is not expected to complete with the existing UW System program.

Commitments

Courses in the curriculum are numbered 300 or higher.

Yes

The program faculty/staff will ensure the program website, Advance Your Career materials if applicable, and other presentations are consistent with the Guide information for this program.

Yes

Credential will not be awarded retroactively to students who completed all of the requirements before the credential was approved.

Yes

Supporting Information

List name and department of those who are in support of this proposal.

Name (Last, First)	Date of contact/support letter received	School,College, or Department	Comment by contact person	On behalf of
Wang, Yazhen	2021/12/13	Statistics (STATISTICS)	Support of program	
Berridge, Craig	2021/12/13	Psychology (PSYCH)	Support for inclusion of PSYCH cross-listed course	
Wollack, James	2021/12/06	Educational Psychology (ED PSYCH)	Support for inclusion of ED PSYCH cross-listed course	
Albert, Laura	2021/12/06	Industrial and Systems Engr (IND SY EGR)	Support for inclusion of ISYE cross-listed course	
Seppalainen, Timo	2021/12/08	Mathematics (MATH)	Support for inclusion of MATH cross-listed course	

If those supporting the proposal provided a letter or email of support upload here. A letter is NOT required. Upload any other explanatory information about support from other UW-Madison units.

Stat Letter Support for Data Engineering-2021-12-13.pdf
math cross listed classes.pdf
ISYE cross list classes.pdf
Ed psych cross listed classes.pdf
Psychology support - courses.pdf

Additional Information:

Approvals

Department Approval - This proposal has been approved by the faculty at the department/academic unit level. The program faculty confirm that the unit has the capacity and resources (financial, physical, instructional, and administrative) to meet the responsibilities associated with offering the program, including offering the necessary courses, advising students, maintaining accurate information about the program in the Guide and elsewhere, conducting student learning assessment and program review, and otherwise attend to all responsibilities related to offering this program.

Enter any notes
about approval
here:

Entered by:
Date entered:

School/College Approval - This proposal has been approved at the school/college level and it is submitted with the Dean's support. The Dean and program faculty confirm that the unit has the capacity and resources (financial, physical, instructional, and administrative) to meet the responsibilities associated with offering the program, including offering the necessary courses, advising students, maintaining accurate information about the program in the Guide and elsewhere, conducting student learning assessment and program review, and otherwise attend to all responsibilities related to offering this program.

Enter any notes
about approval
here:

Entered by and
date: Date entered:

GFEC Approval - This proposal has been approved by the Graduate Faculty Executive Committee and the Dean of the Graduate School.

Enter any notes
about the approval
here:

Entered by:
Date entered:

UAPC Approval - This proposal has been approved by the University Academic Planning Council and the Provost.

Enter any notes
about approval
here:

Entered by:
Date entered:

For Administrative Use

Admin Notes:

Guide URL:

SIS effective date:

Guide publish date/type:

Tuition start term:

Career:

SIS Program Code:

SIS Short Description:

SIS code for additional major:

Other plan codes associated with this program:

Diploma Text:

Diploma Text 2:

Degree:

Field of Study:

Program Length:

National Student Clearing House Classification:

Plan Group:

Educational Level:

Award Category:

Enrollment Category:

CIP Code:

STEMOPT

UWSTEM:

HEALTH:

NSF STEM:

Educational Innovation Program:

Distance Education Program:

Non Traditional Program:

Special Plan Type:

Added to UW System Crosswalk:

Scan this proposal:

Upload documents that should be scanned:

Reviewer Comments

Regina Lowery (lowery3) (12/02/21 12:28 pm): Learning outcomes: Format accepted.

Regina Lowery (lowery3) (12/02/21 12:31 pm): Assessment plan: Format accepted.

Regina Lowery (lowery3) (12/02/21 12:34 pm): Assessment reporting: Computer Sciences-Up to date

Kimbrin Cornelius (klcornelius) (01/05/22 11:08 am): Rollback: On request of Kristin Eschenfelder

Kimbrin Cornelius (klcornelius) (01/05/22 12:04 pm): Rollback: On request of Kristin Eschefelder

Key: 1282