New Proposal

Date Submitted: 10/17/23 1:34 pm

Viewing: **: Materials Science & Engineering + Data Science, BS**

Last edit: 08/19/24 4:36 pm

Changes proposed by: Dallas Trinkle

In Workflow

1. **U Program Review**
2. **1919 Head**
3. **1434 Head**
4. **1992 Head**
5. **1257 Head**
6. **1583 Head**
7. **LP Committee Chair**
8. **KP Committee Chair**
9. **LP Dean**
10. **KV Dean**
11. **KP Dean**
12. **University Librarian**
13. **COTE Programs**
14. **Provost**
15. **Senate EPC**
16. Senate
17. U Senate Conf
18. Board of Trustees
19. IBHE
20. HLC
21. DMI

Approval Path

1. 10/20/23 3:44 pm Emily Stuby (eastuby): Approved for U Program Review
2. 10/22/23 1:15 pm Nancy Sottos (n-sottos): Approved for 1919 Head
3. 10/31/23 11:38 pm Elsa Gunter (egunter): Approved for 1434 Head

4. 11/07/23 4:38 pm Amber Holmes (aflowers): Approved for 1992 Head
5. 11/08/23 5:49 am Lee DeVille (rdeville): Approved for 1257 Head
6. 11/08/23 9:03 am Bo Li (libo): Approved for 1583 Head
7. 11/17/23 9:23 am Lisa Bievenue (bievenue): Approved for LP Committee Chair
8. 04/12/24 8:39 am Ashley Hallock (ahallock): Approved for KP Committee Chair
9. 04/12/24 9:36 am Amber Holmes (aflowers): Approved for LP Dean
10. 05/07/24 12:06 pm Stephen Downie (sdownie): Approved for KV Dean
11. 05/07/24 12:12 pm Cindy Pruitt (cpruitt): Approved for KP Dean
12. 05/17/24 9:40 am Claire Stewart (clairest): Approved for University Librarian
13. 05/17/24 9:58 am

Suzanne Lee (suzannel): Approved for COTE Programs

14. 05/17/24 12:04 pm
    Brooke Newell (bsnewell): Rollback to KP Committee Chair for Provost
15. 05/23/24 9:40 am
    Ashley Hallock (ahallock): Approved for KP Committee Chair
16. 05/23/24 1:14 pm
    Amber Holmes (aflowers): Approved for LP Dean
17. 05/24/24 9:35 am
    Stephen Downie (sdownie): Approved for KV Dean
18. 05/24/24 10:20 am
    Cindy Pruitt (cpruitt): Approved for KP Dean
19. 06/06/24 9:21 am
    Claire Stewart (clairest): Approved for University Librarian
20. 06/06/24 9:59 am
    Suzanne Lee (suzannel): Approved for COTE Programs
21. 08/15/24 11:46 am
    Brooke Newell (bsnewell): Approved for

Provost

Proposal Type

Proposal Type:
Major (ex. Special Education)

Administration Details

Official Program Name	Materials Science & Engineering + Data Science, BS
Diploma Title	Bachelor of Science in Materials Science and Engineering plus Data Science
Sponsor College	Grainger College of Engineering
Sponsor Department	Materials Science & Engineering
Sponsor Name	Dallas R. Trinkle
Sponsor Email	dtrinkle@illinois.edu
College Contact	Jonathan Makela
College Contact Email	jmakela@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.

Ashley Hallock, ahallock@illinois.edu, GCOE; Dallas Trinkle, dtrinkle@illinois.edu and Laura Nagel, ljnagel@illinois.edu, MatSE

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.

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

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

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

1) A set of core competencies and common features which will be expected of X+Data science majors, together with a reference standard set of courses and activities that fulfills the data science portion of those expectations.

2) Each college can propose its own X+Data Science majors, which will be majors of that college. They may differ from the reference standard approach. When they do so, they should explain how the proposed major provides the expected competencies and features of an X+Data Science major in a manner that is appropriate for their students.

3) The deans will engage with the campus leadership to establish a Data Science Education committee. The committee will:
• Keep track of offerings related to data science to facilitate collaboration and reduce redundancy
• Facilitate the development of data science programs by connecting undergraduate data science education resources across the university
• Advise colleges on matters related to undergraduate data science education
• Review X+Data Science major proposals, commenting on how they meet the expectations for X+Data Science majors and engage collaboratively and strategically with the university's resources in data science education

The Materials Science & Engineering + Data Science program is a degree involving the study of data science in the context of Materials Science and Engineering. It will be offered as a collaboration of the Department of Materials Science and Engineering with the Departments of Computer Science, Mathematics, Statistics, and the School of Information Sciences.

College	Grainger College of Engineering
Department	Siebel School Comp & Data Sci

Is there an additional department involved in governance?
Yes

College	Information Science, School of

Department	Information Sciences

Is there an additional department involved in governance?
Yes

College	Liberal Arts & Sciences
Department	Mathematics

Is there an additional department involved in governance?
Yes

College	Liberal Arts & Sciences
Department	Statistics

Proposal Title

Effective Catalog Term: Fall 2024

Proposal Title (either Establish/Revise/Eliminate the Degree Name in Program Name in the College of XXXX, i.e., Establish the Bachelor of Science in Entomology in the College of Liberals Art and Sciences, include the Graduate College for Grad Programs)

Establish the Bachelor of Science in Materials Science & Engineering plus Data Science in the Grainger College of Engineering

Does this proposal have any related proposals that will also be revised during the next 6 weeks? Consider Majors, Minors, Concentrations & Joint Programs in your department. Please know that this information is used administratively to move related proposals through workflow efficiently. Example: If you are revising the BS proposal and one related concentration within the next 6 weeks, "This BS proposal (key 567) is related to the Concentration A proposal (key 145)."

No

Program Justification

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

The Materials Science and Engineering with Data Science (MatSE+DS) degree plan incorporates a strong foundation in data science with a program of study in Materials Science and Engineering. The degree is comprised of three different components:

1. The data science core coursework (29 hours), comprised of:
i. Two (2) courses from Statistics (Stat/CS 107 and 207)
ii. Two (2) courses from Computer Science (CS 277 and 307)
iii. Two (2) courses from the I-School (IS 467 and 477)
iv. Two (2) courses from Mathematics (Math 221 and 257)
2. The materials science and engineering coursework (69 hours)
i. Orientation and Professional Development (1 hour + 1 recommended hour)
ii. Courses in Foundation Mathematics and Science beyond DS (28 hours)
iii. Courses in Materials Science and Engineering Technical core (42 hours)
3. The design experience for Materials Science and Engineering (MSE 494+495, 3 hours) as a meaningful research/discovery experience.

In addition to the 101 credit hours above, all students will complete the Campus General Education requirements including the campus general education language requirement. Free Electives are included as additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. There are a minimum 128 hours required for graduation, in line with other undergraduate programs in the Grainger College of Engineering. This includes more than the minimum of 40 hours of upper-division coursework, required for graduation. A student can obtain the 40 hours of upper-division coursework through: CS 307 (4), MSE 307 (3), MSE 308 (3), MSE 304/MSE 405 (3), MSE 401 (3), MSE 406 (3), MSE 402 (3), MSE 404 (6), IS 467 (3), IS 477 (3), MSE 494 (1), MSE 495 (2), and six hours of topical lectures.

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

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

Data science is emerging as a subject of great importance in many domains of human and scholastic endeavor. This is especially true in Materials Science & Engineering, where multiple national policy documents have called for an integration of data science

with materials science to accelerate the discovery and development of new materials. Educating the next generation workforce is a key element of this. The University of Illinois' white paper on data science education recommended the development of "X+Data Science Majors" as an approach to offering broad collaborative opportunities for Illinois students to engage with data science.

The structure of the proposed Materials Science & Engineering + Data Science program follows the precedent "X+DS programs" that were approved thus far by IBHE (Astronomy + DS, Accountancy + DS, Business + DS, Finance + DS, and Information Sciences + DS).

The major meets the minimum 40 credit hours in upper division courses at 43 hours of 300 and 400 level courses in the curriculum.

The Materials Science & Engineering + Data Science program is a degree involving the study of data science in the context of materials science and engineering. It is offered as a collaboration of the Department of Materials Science and Engineering and the Departments of Computer Science, Mathematics, Statistics, and the School of Information Sciences.

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 outside of the sponsoring department impacted by the creation/revision of this program?

Yes

Courses outside of the sponsoring department/interdisciplinary departments

ENG 100 - Engineering Orientation
CHEM 102 - General Chemistry I
CHEM 103 - General Chemistry Lab I
CHEM 104 - General Chemistry II
CHEM 105 - General Chemistry Lab II
MATH 221 - Calculus I
MATH 231 - Calculus II
MATH 257 - Linear Algebra w Computat Appl
MATH 285 - Intro Differential Equations
PHYS 211 - University Physics: Mechanics

PHYS 212 - University Physics: Elec & Mag
PHYS 214 - Univ Physics: Quantum Physics
CS 107 - Data Science Discovery
ECE 205 - Electrical & Electronic Ckts
STAT 207 - Data Science Exploration
CS 277 - Algo & Data Stru for Data Sci
CS 307 - Model & Learning in Data Sci
IS 467 - Ethics & Policy for Data Scien
IS 477 - Data Mgmt, Curation, & Reprodu
ECE 340 - Semiconductor Electronics
ABE 446 - Biological Nanoengineering
ABE 482 - Package Engineering
ABE 483 - Engr Props Food Materials
BIOE 476 - Tissue Engineering
BIOE 479 - Cancer Nanotechnology
CEE 401 - Concrete Materials
CEE 460 - Steel Structures I
CHBE 458 - Synthetic Nanomaterials
CHBE 472 - Techniques in Biomolecular Eng
CHBE 473 - Biomolecular Engineering
CHBE 475 - Tissue Engineering
ECE 380 - Biomedical Imaging
ECE 441 - Physcs & Modeling Semicond Dev
ECE 443 - LEDs and Solar Cells
ECE 444 - IC Device Theory & Fabrication
ECE 472 - Biomedical Ultrasound Imaging
ECE 481 - Nanotechnology
ECE 487 - Intro Quantum Electr for EEs
ECE 488 - Compound Semicond & Devices
ECE 495 - Photonic Device Laboratory
IE 431 - Design for Six Sigma
ME 431 - Mechanical Component Failure
ME 432 - Fundamentals of Photovoltaics
ME 472 - Introduction to Tribology
ME 482 - Musculoskel Tissue Mechanics
ME 483 - Mechanobiology
ME 487 - MEMS-NEMS Theory & Fabrication
NPRE 470 - Fuel Cells & Hydrogen Sources
SE 412 - Nondestructive Evaluation
TAM 451 - Intermediate Solid Mechanics
TAM 456 - Experimental Stress Analysis
BIOC 446 - Physical Biochemistry
BIOP 401 - Introduction to Biophysics
CHEM 436 - Fundamental Organic Chem II
CHEM 483 - Solid State Structural Anlys
PHYS 485 - Atomic Phys & Quantum Theory
PHYS 486 - Quantum Physics I
PHYS 487 - Quantum Physics II

MATH 241 - Calculus III

Please attach any letters of support/acknowledgement for any Instructional Resources consider faculty, students, and/or other impacted units as appropriate.	support-letters.pdf

Program Regulation and Assessment

Plan to Assess and Improve Student Learning

Illinois Administrative Code: 1050.30(b)(1)(D) Provision is made for guidance and counseling of students, evaluations of student performance, continuous monitoring of progress of students toward their degree objectives and appropriate academic record keeping.

List the program's student learning outcomes. Each outcome should identify what students are expected to know and/or be able to do upon completing this program.

The program educational objectives of the MatSE Department and its faculty at the undergraduate level are:

1. Our graduates will attain the foundational knowledge to be successful in their chosen career.
2. Our graduates will be skilled at teamwork, communication and individual professionalism, including ethics and environmental awareness.
3. Our graduates will provide valuable service to their chosen profession and to society.
4. Our graduates will have the ability to achieve their personal goals and advance in their chosen profession through life-long learning.

The curriculum is designed to guarantee a certain breadth of knowledge in materials science and engineering through a set of core courses, ensure depth and focus in specialties with materials science, and provide a breadth of knowledge in data science. In accordance with the ABET educational criteria and the Data Science learning objectives, the program has been developed so that graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, mathematics, and computational analysis of data
2. an ability to apply engineering design with data science skills to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences, including accurate and informative visualizations of data
4. an ability to recognize ethical and professional responsibilities in engineering situations and data science and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, build and evaluate data-based models and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
8. an ability to describe, curate, and manage data.

Describe how, when, and where these learning outcomes will be assessed.

Describe here:

The department of Materials Science and Engineering, as part of our ABET accredited assessment process, collects data in alternating years on students achievement, which is reviewed by the curriculum committee, with feedback to the faculty in the required courses. The faculty document changes made to their courses in response to the review of assessment data. The first seven learning outcomes closely mirror the learning outcomes our the MatSE BS degree, with additional components related to data science, while the eighth learning outcome is entirely specific to the DS component. We expect to use a similar approach for assessing the MatSE specific elements of the learning outcomes. For the data science specific outcomes, we will work with instructors in the corresponding CS, STAT, and IS courses to collect assessment information about our MatSE+DS students. In addition, our capstone MSE 494 and 495 courses will provide additional data science specific assessment for our MatSE+DS students. This approach is intended to leverage the existing learning objective assessment program we have in place for the ABET accredited MatSE BS program.

Identify faculty expectations for students' achievement of each of the stated student learning outcomes. What score, rating, or level of expertise will signify that students have met each outcome? Provide rating rubrics as necessary.

Overall, each student must maintain a minimum GPA of 2.0 each semester to avoid being placed on academic probation, and furthermore must not be placed on academic probation for more than 2 consecutive semesters to avoid being considered for dismissal from the program. A student who earns a GPA less than 1.0 during any semester is dismissed from the program. A student must maintain a minimum cumulative GPA of 2.0 to graduate.

Regarding achievements related to the learning objectives, MatSE faculty in each class will identify their own problem sets, exam questions, or other assignments that relate meaningfully to specific individual outcomes. The level of mastery is determined by each instructor, generally work products require levels of mastery at 75% or higher.

Explain the process that will be implemented to ensure that assessment results are used to improve student learning.

The Chief Undergraduate Advisor in the MatSE department will monitor individual students for academic performance, and notify, engage with, and support those who land on academic probation. In addition, the Associate Head of Undergraduate Programs, working together with the MatSE Curriculum subcommittee, will review the course outcomes satisfaction result metrics that each faculty provides in order to assure satisfactory performance and will follow up in specific cases where performance is less than satisfactory.

Program Description and Requirements Attach Documents

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/PublicAdminRules2017.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.

Attach Program of Study-related information such as sample sequences (for undergraduate programs) or college-level forms.	SampleSequence-MatSE+DS-proposed.docx

Catalog Page Text - Overview Tab

Description of program for 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.

Materials Science and Engineering plus Data Science
for the Degree of Bachelor of Science in Materials Science & Engineering + Data Science

Materials science and engineering is the basis for all engineering. Improvements in the quality of life require knowledge of the processing and properties of current materials and the design, development and application of new materials. At the same time, data science is revolutionizing all areas of science and engineering. The Materials Science and Engineering (MatSE+DS) curriculum provides an understanding of the underlying principles of synthesis and processing of materials and of the interrelationships between structure, properties, and processing, while also addressing the unique data science challenges in materials science and engineering. Students learn how to create advanced materials and systems required, e.g., for flexible electronic displays and photonics that will change communications technologies, for site specific drug delivery, for self-healing materials, for enabling the transition to a hydrogen-based economy, and for more efficient photovoltaics and nuclear systems for energy production. The curriculum uses concepts from both basic physics and chemistry combined with statistics and data science and provides a detailed knowledge of what makes the materials we use every day behave as they do.

Students in the first two years take courses in general areas of science and engineering and data science as well as courses introducing the concepts in MatSE. In the third year, students study the common, central issues related to MatSE while learning more advanced data science methods. In the senior year, students focus on an area of MatSE of their greatest interest, providing them with the detailed knowledge to be immediately useful to corporations, become entrepreneurs, or to provide the underpinning knowledge for graduate study, and complete a design project involving data science.

Statement for Programs of Study Catalog

Graduation Requirements

Minimum hours required for graduation: 128 hours.

Minimum Overall GPA: 2.0

University Requirements

Minimum of 40 hours of upper-division coursework, generally at the 300- or 400-level. These hours can be drawn from all elements of the degree. Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (§ 3-801) and in the Academic Catalog.

General Education Requirements

Follows the campus General Education (Gen Ed) requirements. Some Gen Ed requirements may be met by courses required and/or electives in the program.

Course List

Code	Title	Hours
Composition I		4-6
Advanced Composition		3
fulfilled by MSE 307 and MSE 308		
Humanities & the Arts (6 hours)		6
Natural Sciences & Technology (6 hours)		6
fulfilled by CHEM 102, CHEM 104, PHYS 211, PHYS 212		
Social & Behavioral Sciences (6 hours)		6
Cultural Studies: Non-Western Cultures (1 course)		3
Cultural Studies: US Minority Cultures (1 course)		3
Cultural Studies: Western/Comparative Cultures (1 course)		3
Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)		6-10
fulfilled by MATH 221 or MATH 220; MATH 231, MATH 241, MATH 285, CS 107, PHYS 211, PHYS 212, STAT 207		
Language Requirement (Completion of the third semester or equivalent of a language other than English is required)		0-15

Materials Science and Engineering plus Data Science Graduation Requirements

Orientation and Professional Development

Course List

Code	Title	Hours
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
Recommended, optional 1 credit course, MSE 183 Introductory MatSE Laboratory. Credit hour counts toward free electives.		
Total Hours		1

Foundational Mathematics and Science

Course List

Code	Title	Hours
CHEM 102	General Chemistry I	3
Recommended, optional 1 credit course, CHEM 103 General Chemistry Lab I. Credit hour counts toward free electives.		
CHEM 104	General Chemistry II	3
Recommended, optional 1 credit course, CHEM 105 General Chemistry Lab II. Credit hour counts toward free electives.		

Code	Title	Hours
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		33

Materials Science and Engineering with Data Science Technical Core

Course List

Code	Title	Hours
CS 107	Data Science Discovery	4
MSE 182	Introduction to MatSE	2
ECE 205	Electrical and Electronic Circuits	3
MSE 201	Phases and Phase Relations	3
MSE 206	Mechanics for MatSE	4
STAT 207	Data Science Exploration	4
CS 277	Algorithms and Data Structures for Data Science	4
CS 307	Modeling and Learning in Data Science	4
MSE 307	Materials Laboratory I	3
MSE 308	Materials Laboratory II	3
MSE 304	Electronic Properties of Matls	3
or MSE 405	Microstructure Determination	
MSE 401	Thermodynamics of Materials	3
MSE 402	Kinetic Processes in Materials	3
MSE 406	Thermal-Mech Behavior of Matls	3
IS 467	Ethics and Policy for Data Science	3
IS 477	Data Management, Curation & Reproducibility	3
MSE 494	Materials Design Thinking	1
MSE 495	Materials Design	2
Total Hours		55

Technical Electives

Course List

Code	Title	Hours
MSE 404	Laboratory Studies in Materials Science and Engineering (Each section of MSE 404 is 1.5 hours. Students take 4 unique sections of MSE 404 for 6 hours.)	6
Topical lecture courses. See Topical Lecture list below.		6
Total Hours		12

Topical Lectures

Course List

Code	Title	Hours
Introductory		
MSE 420	Ceramic Materials & Properties	3
MSE 441	Metals Processing	3

Code	Title	Hours
MSE 450	Polymer Science & Engineering	3 or 4
MSE 470	Design and Use of Biomaterials	3
ECE 340	Semiconductor Electronics	3
All Areas		
MSE 403	Synthesis of Materials	3
MSE 421	Ceramic Processing	3 or 4
MSE 422	Electrical Ceramics	3
MSE 440	Mechanical Behavior of Metals	3
MSE 443	Design of Engineering Alloys	3
MSE 453	Plastics Engineering	3
MSE 455	Macromolecular Solids	3
MSE 456	Mechanics of Composites	3
MSE 457	Polymer Chemistry	3 or 4
MSE 458	Polymer Physics	3 or 4
MSE 460	Electronic Materials I	3
MSE 461	Electronic Materials II	3
MSE 464	Magnetic Materials and their Applications	3 or 4
MSE 466	Electrochemical Energy Conversion	3
MSE 473	Biomolecular Materials Science	3
MSE 474	Biomaterials and Nanomedicine	3
MSE 480	Surfaces and Colloids	3 or 4
MSE 481	Electron Microscopy	3 or 4
MSE 485	Atomic Scale Simulations	3 or 4
MSE 487	Materials for Nanotechnology	3 or 4
MSE 488	Optical Materials	3 or 4
MSE 489	Matl Select for Sustainability	3 or 4
MSE 498	Special Topics (Modern Methods in Materials Characterization)	1 to 4
ABE 446	Biological Nanoengineering	3 or 4
ABE 482	Package Engineering	3
ABE 483	Engineering Properties of Food Materials	3
BIOE 476	Tissue Engineering	3
BIOE 479	Cancer Nanotechnology	3
CEE 401	Concrete Materials	4
CEE 460	Steel Structures I	3
CHBE 458	Synthetic Nanomaterials	3
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 475	Tissue Engineering	3
ECE 380	Biomedical Imaging	3
ECE 441	Physcs & Modeling Semicond Dev	3
ECE 443	LEDs and Solar Cells	4
ECE 444	IC Device Theory & Fabrication	4
ECE 472	Biomedical Ultrasound Imaging	3
ECE 481	Nanotechnology	4
ECE 487	Intro Quantum Electr for EEs	3
ECE 488	Compound Semicond & Devices	3
ECE 495	Photonic Device Laboratory	3

Code	Title	Hours
IE 431	Design for Six Sigma	3
ME 432	Fundamentals of Photovoltaics	3 or 4
ME 431	Mechanical Component Failure	3 or 4
ME 472	Introduction to Tribology	3 or 4
ME 482	Musculoskel Tissue Mechanics	3 or 4
ME 483	Mechanobiology	4
ME 487	MEMS-NEMS Theory & Fabrication	4
NPRE 470	Fuel Cells & Hydrogen Sources	3
SE 412	Nondestructive Evaluation	3 or 4
TAM 451	Intermediate Solid Mechanics	4
TAM 456	Experimental Stress Analysis	3
Science - Can only count one science course for Topical Lecture		
BIOC 446	Physical Biochemistry	3
BIOP 401	Introduction to Biophysics	3
CHEM 436	Fundamental Organic Chem II	3
CHEM 483	Solid State Structural Anlys	4
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
PHYS 487	Quantum Physics II	4

Free Electives

Course List

Code	Title	Hours
Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree.		11
Total Hours of Curriculum to Graduate		128

Corresponding Degree	BS Bachelor of Science

Program Features

Academic Level	Undergraduate
Does this major have transcripted concentrations?	No

What is the typical time to completion of this program?
4 years

What are the minimum Total Credit Hours required for this program?
128

CIP Code	141801 - Materials Engineering.

Is This a Teacher Certification Program?
No

Will specialized accreditation be sought for this program?

Yes

Describe the plans for seeking specialized accreditation:

The MatSE Department at UIUC will seek to receive accreditation for the proposed BS in Materials Science and Engineering + Data Science program under the Materials Engineering program category of ABET, the Accreditation Board for Engineering and Technology. When mapped to the Materials Engineering BS ABET criteria, the proposed curriculum satisfies requirements including engineering course hours.

ABET accreditation will provide assurance that the MatSE core of the MatSE + DS program is in line with the quality standards for which the program prepares graduates to enter the profession. This review will be provided every six years. The BS in Materials Science and Engineering has been accredited since 1989 (formed from a merger of Metallurgy and Ceramics in 1986). The Department is due for its next ABET review in 2025.

Delivery Method

This program is available:

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

Admission Requirements

Desired Effective Admissions Term	Fall 2024

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

Application processing at the freshman level will be administered by the Office of Undergraduate Admissions, with requirements commensurate with standards of Grainger College of Engineering.
Admission Requirements for Freshmen:
a) The general admission requirements of the University apply.
b) Application fee.
c) Self-reported academic record (SRAR).
d) Official test scores - Standardized test scores are considered if provided for admission review: either ACT (code 1154) or SAT I (code 1836) scores are accepted.
e) English proficiency.
International students must score at least 100 on the iBT version of the English as a Foreign Language test (TOEFL); or 7 on each section of the IELTS.
Transfer requirements
a) participate in the Engineering Undeclared Program to be reviewed for transfer into Materials Science & Engineering.
b) Engineering Undeclared and current University students should demonstrate interest in the major by:
i. Earning grades of "B" or better in introductory courses such as CHEM 102, 103; CHEM 104, 105; MATH 221, 231; PHYS 211; and CS 101.
ii. Maintain a cumulative and specialized GPA of 3.00 or higher
iii. Successfully complete the ICT or IDT transfer application

Number of Students in Program (estimate)

Year One Estimate	10	5th Year Estimate (or when fully implemented)	40

Estimated Annual Number of Degrees Awarded

Year One Estimate	0	5th Year Estimate (or when fully implemented)	10

What is the matriculation term for this program? Fall

Budget

Will the program or revision require staffing (faculty, advisors, etc.) beyond what is currently available?
No

Additional Budget Information
Departments of Mathematics, Statistics, Computer Science and the I-School are coordinating to provide support for advising in data science.

Attach File(s)

Financial Resources

How does the unit intend to financially support this proposal?

No additional financial resources are expected to be needed.

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

No

Attach letters of support

What tuition rate do you expect to charge for this program? e.g, Undergraduate Base Tuition, or Engineering Differential, or Social Work Online (no dollar amounts necessary)

Engineering Differential

IBHE

Degree Program Title and Overview

What is the specific title of the proposed degree program as it would be listed in the IBHE Program Inventory? The name should be what typically is used for similar programs nationally. Provide a short description of the program, including highlights of the program objectives, and the careers, occupations, or further educational opportunities for which the program will prepare graduates.

Bachelor of Science in Materials Science and Engineering + Data Science

Program Description: The Bachelor of Science in Materials Science & Engineering + Data Science at the University of Illinois, Urbana-Champaign simultaneously incorporates a strong foundation in data science with a program of study in materials science and engineering. The degree program is expected to be completed in eight semesters of full time study and will be offered by the Materials Science and Engineering department (MatSE) in the Grainger College of Engineering (GCOE) in collaboration with the Computer Science Department in GCOE, Information Sciences Department in the School of Information Sciences, Mathematics Department in the College of Liberal Arts and Sciences (LAS), and Statistics Department in LAS. The proposed program will be distinguished by attributes that are not available together in any individual degree program in the UI System, in the state of Illinois, or in the nation, specifically:

1) coursework from the Data Science core including Mathematics, Statistics, Computer Science, Information Sciences (29 credit hours),

2) coursework from the area of Materials Science and Engineering discipline including Orientation and Professional Development, Foundational Mathematics and Science, and MatSE Technical Core (69 credit hours),

3) A capstone senior design course which provides a meaningful research/discovery experience involving the basic design principles of definition, organization, constraints, modeling, and optimization of system design using case studies and class design projects (3 credit hours).

In addition to the above, all students complete the Campus General Education requirements including the campus general education language requirement. Free Electives are included as additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. There are a minimum 128 hours required for graduation, in line with other undergraduate programs in the Grainger College of Engineering. This includes more than the minimum of 40 hours of upper-division coursework, required for graduation. A student can obtain the 40 hours of upper-division coursework through: CS 307 (4), MSE 307 (3), MSE 308 (3), MSE 304/MSE 405 (3), MSE 401 (3), MSE 406 (3), MSE 402 (3), MSE 404 (6), IS 467 (3), IS 477 (3), MSE 494 (1), MSE 495 (2), and six hours of topical lectures.

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

students to lead society's digital transformation.

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

MatSE + DS Relationship: Data science is emerging as a subject of great importance in many domains of human and scholastic endeavor. This is especially true in Materials Science & Engineering, where multiple national policy documents have called for an integration of data science with materials science to accelerate the discovery and development of new materials. Educating the next generation workforce is a key element of this. The Materials Science & Engineering + Data Science program is a degree involving the study of data science in the context of materials science and engineering. It is offered as a collaboration of the Department of Materials Science and Engineering and the Departments of Computer Science, Mathematics, Statistics, and the School of Information Sciences.

Alignment with University Initiatives: UIUC has developed the "X+Data Science Majors" (X+DS) framework as a systematic way to offer its students the opportunity to study data science while engaging with an application domain. The X+DS degrees at UIUC (where five have already been approved) are comprised of three different components:

- The data science core coursework in Mathematics, Statistics, Computer Science, and Information Sciences.

- The coursework in the X major (in this case Materials Science and Engineering).

- A meaningful research discovery experience (at least 3 credit hours).

The structure of the proposed Materials Science & Engineering + Data Science program follows the precedent "X+DS programs" that were approved thus far by IBHE (Astronomy + DS, Accountancy + DS, Business + DS, Finance + DS, and Information Sciences + DS).

Illinois Administrative Code: 1050.30(a)(1): A) The objectives of the unit of instruction, research or public service are consistent with the mission of the college or university; B) The objectives of the unit of instruction, research or public service are consistent with what the unit title implies.

Institutional Context

University of Illinois at Urbana-Champaign

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

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

Institutional Context

The Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign offers the undergraduate degree of Bachelor of Science in Materials Science and Engineering. The Department was formed as a merger of the former Metallurgy and Ceramics departments in 1986. The Metallurgical Engineering and Ceramic Engineering degrees were eventually phased out in favor of the current Materials Science and Engineering degree. In 2016, the department changed the undergraduate curriculum to eliminate degree concentrations for increased flexibility in the degree.

The U.S. Bureau of Labor Statistics (BLS) has projected a 36% growth in Data Science occupations during the period of 2021 to 2031 driven by the demand for workers who can handle big data. BLS projects that occupations in Data Science and Mathematical Science will far outpace the average growth rate for all occupations. To address this projected demand, the University of Illinois Urbana-Champaign has launched an initiative to develop a series of undergraduate degrees that combine Data Science with other disciplines, X + DS. These X + DS programs are intended to be interdisciplinary, with students taking core coursework in their domain discipline alongside their Data Science coursework. These X + DS programs are also intended to be inclusive, with core Data Science coursework having fewer technical prerequisites and requirements than most programs in computer science, mathematics, or statistics which in turn will make them more accessible to students from various backgrounds. There are currently four X + DS programs offered at the University of Illinois Urbana-Champaign: Accountancy + Data Science, Astronomy + Data Science, Finance + Data Science, and Information Sciences + Data Science, with a fifth Business + Data Science recently having been approved, therefore there is precedent for such programs on the University of Illinois Urbana-Champaign campus.

There has been a growth of data science in recent years across all disciplines including that of engineering, and specifically here as it pertains to the fields of materials science and engineering (MatSE). The areas of study and research in MatSE increasingly involve modeling, simulation, analysis of materials informatics, and use of computational methods. Being able to gather, organize, interpret, and analyze the large amount of data that is produced from these efforts is becoming an increasingly in-demand skill set of employers and graduate programs.

The MatSE department currently has 24.6 FTE faculty members along with 3.8 lecturers. The FTE faculty support research in a variety of material types. In all of the areas of research, data science is an in-demand and applicable skill set.

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

The university continually examines its educational programs to respond to emerging student demand, societal need, and economic opportunity. Data science has rapidly emerged as a field for which there is broad-based demand across many areas of economic activity and across many fields of scholarship. The university recognized this in its 2018 - 2023 Strategic Plan The Next 150" which included among its goals to "Establish Illinois as the global leader in digital transformation at the service of society" through in part bolstering our strength in among other related areas data science. The plan called on to "Provide all Illinois students the opportunity to have a meaningful exposure to data science". The degree program proposed here is part of that response.

Discuss projected future employment and/or additional educational opportunities for graduates of this program. Compare estimated demand with the estimated supply of graduates from this program and existing similar programs in the state. Where appropriate, provide documentation by citing data from such sources as employer surveys, current labor market analyses, and future workforce projections. (Whenever possible, use state and national labor data, such as that from the Illinois Department of Employment Security at http://lmi.ides.state.il.us/ and/or the U.S. Bureau for Labor Statistics at http://www.bls.gov/).

With regard to employment outlook, one of the main motivators for the development of this B.S. in Materials Science and Engineering + Data Sciences degree is the market demand for students trained in collecting, cataloging, analyzing, and interpreting large quantities of data and applying in the context of the MatSE fields of study.

The ubiquity of massive data sets has created enormous demand for data scientists across many domains, including that of Engineering. As a supportive example, enrollment in the Statistics major has increased seven-fold in the last ten years, and other majors that involve data science have seen similar explosion in interest. But there is tremendous demand not only for coding-intensive data scientists but also for data scientists who can work collaboratively in application domains, including that of Engineering, and here specifically in the MatSE application areas (optimization of current materials, design and discovery of new material systems, improved reliability estimates including uncertainty quantification).

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

To support job placement, students will have access to the Grainger College of Engineering Career Services (ECS). ECS hosts two major career fairs per year which are very well attended by recruiters searching for Illinois talent for internships, co-ops, and permanent positions. In addition, ECS offers advising and support resources on various related topics such as career exploration, networking, the job search process, cover letters, resumes, interviewing, salary and offer negotiation, etc. In an effort of transparency, ECS publishes a Illini Success Annual Report along with a Three Year Trend Report, and they administer a Salary and Hiring Data Portal. At the department level, MatSE has a large network of alumni and industry and national lab constituents who are invested in our student success. This network serves as a further support for student placement that is separate from ECS efforts. Many graduates and our constituents come to campus specifically to recruit from MatSE as they know the caliber of the program and our graduates.

If letters of support are

available attach
them here:

Comparable Programs in Illinois

Illinois Administrative Code: 1050.30(a)(6): B) The unit of instruction, research or public service meets a need that is not currently met by existing institutions and units of instruction, research or public service. For additional information about similar programs, check the Degree Program Inventory on the IBHE website (https://www.ibhe.org/ProgInv_Prog.aspx) and review the Notice of Intent website for programs being planned (https://legacy2.ibhe.org/ODA/tracking/NOI/NOISearch.asp).

Identify similar programs and sponsoring institutions in the state, at both public and private colleges and universities. Compare the proposed program with these programs, and discuss its potential impact upon them. Provide complete responses, do not reference website links.

The Department of Materials Science and Engineering offers the highest ranked Materials Science and Engineering program at the bachelors, masters, or doctoral level in the State of Illinois, public or private, and is currently the second ranked program in the nation.

Under the Data Science, General category UIUC is the only public university offering bachelors degrees through our X + DS programs. The other institutions listed in the IBHE database - Dominican University, Olivet Nazarene University (BS Data Science);Trinity Christian College (BA Data Analytics); and Lake Forest College (BA DS - Finance & Economics) are offered though comparatively, smaller, independent institutions.

It follows that the Materials Science and Engineering + Data Science BS program, being from the top Materials Engineering program in the State of Illinois, would fulfill a unique niche.

Comparable Programs in Illinois Attach Documents

A Thriving Illinois: Higher Education Paths to Equity, Sustainability, and Growth

IBHE is charged to develop a strategic plan to address the present and future aims and needs and requirements of higher education in Illinois (110 ILCS 205/6) (from Ch. 144, par. 186) Sec. 6). Illinois Administrative Code:

1050.30(a)(6): A) The unit of instruction, research or public service is educationally and economically justified based on the educational priorities and needs of the citizens of Illinois Respond to the following questions about how the proposed program will support the three goals of A Thriving Illinois: Higher Education Paths to Equity, Sustainability, and Growth Strategic Plan.

Equity

Describe institutional-level plans to close equity gaps in access, progression, completion, and attainment and the implications for the proposed program. More specifically, provide institutional-level plans for attracting, recruiting, retaining, and completing a diverse group of students including working adults, students of color, transfer and low-income students and implications for the proposed program. Explain how progress will be monitored.

Institution-level plans: Access, progression, completion, and attainment

At the System level, the University of Illinois prioritizes closing equity gaps among the citizens across Illinois, within our urban and rural communities, and beyond. While the fundamental needs that will drive greater economic vitality vary greatly across zip codes in the state, it is clear that closing equity gaps among our citizens remains crucial to achieving the mission of the University of Illinois System.

Supportive of IBHE's A Thriving Illinois plan and aligning its Equity Strategy #2, the UI System's Access 2030 Strategic Plan is a comprehensive initiative designed to increase the number of graduates from underrepresented groups by 50 percent by the end of the decade. This will include students from disadvantaged backgrounds – ethnic and racial, rural, and urban. This initiative will strengthen the University of Illinois' bedrock commitment to the public good, ensuring that as we work to improve life in our state, we are not leaving communities behind. It will build on ongoing efforts to create more opportunities for Illinoisans of all backgrounds. The initiative is being tooled to close equity gaps throughout the pipeline, working from K-12 through college, including our community colleges. Access 2030 embodies Equity Goal 2 of A Thriving Illinois, providing a framework for and supporting the three institutions' equity plans.

In addition to Access 2030, the University of Illinois System is engaged in various programs and supports aimed at student recruitment and retention. One such program is Salute to Academic Achievement (SAA). SAA has run for almost 40 years, with students from underrepresented minority groups and low-sending counties invited either by academic performance GPA and test or by GPA and high school nomination to attend a college-fair type event. Participants are recognized for academic achievements, and have the opportunity to meet with college, admissions, financial aid, and housing representatives from all three UI System universities. Participants also receive fee waivers for future admissions applications for each university along with an individualized Certificate of Academic Achievement. In Fall 2021, 4,585 students were invited, 640 RSVP-ed, and 548 attended.

The President's Award Program (PAP) and PAP Honors provide financial support for students admitted to one of the UI Systems three institutions from historically underrepresented groups. The PAP award is $5,000 per year available for a maximum of four years while the PAP Honors Program awards $10,000 per year for four years. Over $244 million has been distributed between 2006 and 2020.

A third example of System level support is the UI System Transfer Guarantee Program, which aligns with Growth Strategy #8. Cognizant that many underrepresented minority students begin their higher education journeys at community colleges, this program guarantees admission to students who apply to any of the three campuses if they graduated from an Illinois high school, attended an Illinois community college, and

attained 36 graded credit hours and a minimum 3.0 GPA.

At the institution level, the University of Illinois Urbana-Champaign's (UIUC) diversity, equity, and inclusion work is led by the Office of the Vice Chancellor for Diversity, Equity, and Inclusion (OVCDEI). The OVCDEI's goals, ongoing assessments, and initiatives impact students as well as faculty and staff, and student-focused programming sets the tone for the institution's efforts as they relate to all of A Thriving Illinois' equity strategies. In the 2022-2023 academic year, the institution will be launching a campus-wide climate assessment instrument to understand the degree to which students feel safe, accepted, and valued. The goal is to provide a quantitative sense of how individuals feel about their campus experiences. This assessment will include students' perceptions of the quality of their interactions with peers, faculty members, and administrators, including their sense of the campus as a place where they belong and are treated with respect. The university is partnering with the Association of American Universities (AAU), external organizations, and peer institutions to ensure the survey instrument is state of the art, has questions that shed light on multiple axes of diversity, and generates data that can be shared and benchmarked against peer institutions to tease out challenges that are unique to the UIUC campus as well as those that are common to peer universities.

In keeping with the institutional framework led by the OVCDEI, the University of Illinois Urbana-Champaign is engaged with a number of efforts to strategically support and bolster equity on campus. For example, in July, 2020, the university pledged $2 million annually for the Chancellor's Call to Action to Address Racism and Social Injustice to focus the intellectual and scholarly talent of the university to examine two of the greatest challenges facing society and seek new solutions. The 2021 submitted proposals underwent a vigorous and scholarly review that included pre-proposal submission, evaluation, a request to prepare a fully proposal, further assessment from both internal and external evaluators, and funding notification. Ninety-two proposals were submitted and 22 were funded, for a total of $1,630,373. The remainder of the funds will support a symposium and other programmatic operations. Principle Investigators leading the funded proposals represent eight colleges and two administrative units across 17 departments.

Critical efforts on the UIUC campus surround activities related to closing the graduation gap and increasing student success. UIUC is an active participant in the American Talent Initiative, with Chancellor Robert Jones serving on ATI's steering committee. ATI is focused on expanding student access to high graduation-rate institutions, with the goal of enrolling and graduating 50,000 additional high-achieving, low-and moderate-income students from these institutions by the year 2025. The University of Illinois Urbana-Champaign has targeted the following goals: 1. Target a six-year graduation rate for Pell students; 2. increase targeted opportunities for incoming students to participate in summer scholar/bridge programming in an attempt to increase the number of Pell students enrolling, improve retention rates, and reduce graduate rate gaps for this population.

Additionally, the university is a leader in the Association of Public and Land Grant Universities Powered by Publics (APLU PxP) initiative. The goals of APLU PxP are to produce several hundred thousand more degrees by 2025; to eliminate the

produce several hundred thousand more degrees by 2025; to eliminate the achievement gap for low-income, minority, and first-generation students; and to expand access to higher education for students from all backgrounds. One hundred thirty (130) universities and state systems participate in 16 transformation "clusters." UIUC is the lead in the Big Ten Academic Alliance (BTAA) Cluster, which is studying retention and persistence starting with a focus on foundational course "DFW" rates to determine barriers faced by students pursuing degree advancement and align best practices to address those challenges. BTAA Cluster institutions identified courses common across institutions and looked at the total enrollment on census date, number of D grades, number of F grades, and number of course withdrawals from the Fall 2016, Spring 2017, Fall 2017, Spring 2018, Fall 2018, and Spring 2019 terms. To illustrate the connection between DFW and progress to degree, BTAA institutions exchanged metrics based on DF grades in the first semester. Sub-cohorts of the 2014 new freshman entrance cohort were sorted based on the number of D/F grades in the first term. The graduation gap between students who had one D/F grade and those without any was 19.9%; the gap for those with more than one D/F grade was 47.3%. UIUC has begun to use these data to examine foundational course curriculum and determine additional supports needed for students in these courses.

Aligned with the goals of the ATI and APLU work is the campus' Student Success Initiative (SSI). Goals of the SSI are to: 1. increase access (reduce cost of attendance, increase aid, consider time to degree); 2. eliminate equity gaps (increase retention and graduation rates for underrepresented and minoritized students); 3. improve the Illinois experience (abandon "sink or swim" mentality, identify and broaden campus programs, support services, and opportunities for engagement). In February 2022, SSI hosted the inaugural Student Success Symposium, which engaged over 200 faculty, staff, and students. A variety of other projects emerged from SSI that have enabled the university to provide greater focus on recruitment efforts. United with the university's Mental Health Working Group, a comprehensive wellness website was implemented, the Faculty and Staff Mental Health Ambassador Program was piloted, and a Mental Health statement for syllabi was implemented. SSI members contributed to the planning of a UI System-wide Mental Health Symposium and received a $5,000 grant to create Wellness Spaces on campus. Working toward a more streamlined Learning Management System (LMS) experience for students, SSI team members helped faculty migrate materials to Canvas. Additionally, in response to COVID-related learning loss, the Provost's office funded $750,000 in grants for instructional support and innovative programs, as recommended by an SSI first-year experience task force. Through recommendations from SSI task groups to reduce classroom materials costs, the Provost's office provided grant funding for faculty to adopt, adapt, and create Open Educational Resources. An SSI implementation team reviewed Article 3 of the Student Code on Academic Policies and Regulations with an equity lens, provided findings to the Provost's office, and recommended policy changes to be implemented in the 2022-2023 Student Code. Building on the work of the APLU PxP BTAA Cluster, another SSI Implementation team examined DFW information in University of Illinois Urbana-Champaign courses. In the upcoming academic year, the SSI will focus on: 1. better understanding and improving the first-year student experience broadly and the transfer student experience specifically; increasing access to the institution for underrepresented students; and providing professional development for faculty to ensure excellent student experiences and outcomes regardless of where a student is located.

located.

Finally, the university's recruitment plan and programming aligns with A Thriving Illinois and with the Office of Undergraduate Admissions' statement on their Diversity Site. The university offers a number of outreach and recruitment programs geared toward historically underrepresented minority students such as Discover Illinois and Días de Visita en Español geared toward underrepresented populations. The University of Illinois Urbana-Champaign moved to test-optional, with ACT/SAT scores optional for all first-year applicants. Test scores are not required to be considered for merit-based or honors programs. In alignment with A Thriving Illinois Growth Strategy 8 to strengthen the statewide, coordinated transfer system to ensure students have seamless paths to build on previous academic learning and earn postsecondary credentials, the University of Illinois Urbana-Champaign has multiple transfer pathway programs. The Parkland Pathway program allows students to dual enroll at Parkland College and UIUC while living in UIUC residence halls. There are also intensive advising partnerships with City Colleges of Chicago, Danville Area Community College, Illinois Central College, and Rock Valley College. UIUC recently implemented Public Act 102-0187, the Public University Uniform Admission Pilot, which guarantees transfer students admission to the university if they meet minimum requirements.

College, Department, and Program-level plans: Access, progression, completion, and attainment

Within The Grainger College of Engineering, the Morrill Engineering Program (MEP), Women in Engineering (WIE) program, and the Academic Redshirt in Science and Engineering (ARISE) program support students from underserved and underrepresented backgrounds in engineering. These programs facilitate successful student engagement and retention through peer mentoring, community building, proactive advising, and academic support. Each program offers opportunities for students to experience the onset of their adjustment to the university with others from similar backgrounds. Peer mentors assist in welcoming students to campus by sharing best practices on how to navigate the social, academic, and professional opportunities for development. MEP engages first-year students from underrepresented backgrounds in its MEP Mentoring Course (ENG 111). This course promotes academic skill-building, professional development, and campus engagement while using peer mentors as role models for best practices. From the onset of the student's experience on campus, the ARISE program helps develop academic study skills and career/curricular exploration in students who often arrive to campus without the exposure and resources that most students have available. The overall annual operating budget to support these programs is approximately $670,000, with the financial resources allocated to support recruitment, retention, programming, and assessment efforts.

Illinois recently adopted the Common App, which aligns with the recommendation in Equity Strategy 5 of A Thriving Illinois (consider implementation of a direct admissions program) and Growth Strategy 4 (encourage high school graduates to enroll in our higher education system and keep talent in Illinois). While the admissions process is handled at the University level, recruitment and retention activities are undertaken collaboratively between the College and each academic program. The goal is to enroll a class that is representative of the State of Illinois and the United States, more broadly. Obtaining this goal is, unfortunately, still years off and will require an increase in the

Obtaining this goal is, unfortunately, still years off and will require an increase in the diversity of student applications and those who successfully matriculate into Grainger Engineering programs, as well as continued efforts in increasing retention to graduation. Significant effort has gone into recruiting students from backgrounds underrepresented in the current population. These efforts include development of public outreach and engagement opportunities in high schools as well as programs such as summer camps and high school research experiences aimed at overcoming opportunity gaps. Grainger Engineering offers 19 distinct summer camp programs to provide pre-college students early engagement opportunities and serve as recruitment tools for the college. By providing students from underrepresented populations with opportunities to experience success we aim to help pre-college students see themselves as future engineers, programmers, mathematicians, and scientists who can succeed in the College.

The Engineering Pathways program aligns with A Thriving Illinois Growth Strategy 8 (strengthen the statewide, coordinated transfer system to ensure students have seamless paths to build on previous academic learning and earn postsecondary credentials) in providing 2+2 agreements and guaranteed transfer for students in the Pathways. Engineering Pathways offers students interested in beginning their college education at a partner community college a streamlined transfer experience and guaranteed admission to The Grainger College of Engineering upon successful completion of program requirements. As a best practice, the program utilizes a cohort-based model and supports students with an array of services including academic advising, tutoring, and mentoring; orientations and events; opportunities for major exploration and professional development; early engagement with Grainger Engineering and the University of Illinois; and an 8-week summer transition program (GearUP) designed to reduce transfer shock, shorten time to degree completion, and increase post-transfer retention.

To increase program accessibility, Engineering Pathways has expanded entry points beyond the traditional high school to college transition. The program works in close collaboration with community college partners on funding and access initiatives such as the Bridges into Engineering and Computer Science summer experience offered at Wilbur Wright College, which focuses on increasing the number of underrepresented students entering engineering and computer science through math preparation for calculus. The cost savings for students who pursue admission via Engineering Pathways is substantial, providing increased access to engineering degree programs.

Between summer and fall terms of 2019 and 2020, 230 transfer students entered the Grainger College of Engineering. The program breakdown for these students are: 141 non-Engineering Pathways, 64 general Engineering Pathways, and 25 GearUP Engineering Pathways participants. 64% of GearUP Engineering Pathways participants graduated within 2-years, compared to only 36% of Engineering Pathways students who did not participate in GearUP and 23% of non-Engineering Pathways students that did not participate in GearUP (these statistics are affected by the COVID-19 pandemic, which has generally increased time-to-degree for many students). This preliminary data suggests that the GearUP program is achieving the intended function to bridge technical course gaps and keep students on track to timely graduation. In addition, $194,000 has been provided in scholarship support to program participants from

Engineering Pathways, made possible through generous support from private and corporate sponsors. Grainger Engineering continues to develop and grow this program in response to A Thriving Illinois Growth Strategy 1: Scale summer bridge programs, extend learning opportunities to mitigate learning loss and accelerate time to degree, and provide proactive and comprehensive advising and Strategy 2: Establish and implement institution-level equity plans, practices to close access, progression, completion and attainment gaps.

Enrollment of all qualified students attending partner community colleges is encouraged but the program places emphasis on the recruitment and retention of Illinois residents from historically underrepresented race and ethnic groups, women, individuals from low-income and/or first-generation households, and veterans. Fifty-three students are expected to transfer through Pathways in the Fall 2022 cohort, 64% of which are considered underrepresented in engineering: 26% underrepresented racial/ethnic minority, 13% women, 4% veteran, 21% first-generation student or low socioeconomic status. Recruitment efforts for transfer programs include online information sessions, student meet and greets, mailing campaigns, and on-site recruitment hosted in the evenings for K-12 students and families to attend.

Once enrolled, we have developed a robust system to aid in monitoring and retaining students. In addition to the MEP, WIE, and ARISE programs mentioned above, the Grainger College maintains the Center for Academic Resources in Engineering (CARE), which is available to all Grainger students, to enhance the learning experience through academic support, to set up collaborative learning opportunities, and to provide positive influence through peer mentoring and tutoring. Furthermore, the Department of Nuclear, Plasma, and Radiological Engineering actively monitors students' progress throughout the semester and proactively reaches out to students who are struggling. The Department Chief Advisor leads this effort, and also is available for advising appointments for all students. The Department Associate Head of Undergraduate Programs works with instructors to identify and appropriately act on concerns they may have regarding students. Mental health services are readily available to our students including an embedded counselor with the Grainger College of Engineering and Concern for student website maintained by the Dean of Students office; a student can be easily referred to either of these resources by a concerned faculty member or advisor. This broad and multi-layered outreach approach helps ensure that all of our students are supported administratively, academically, and emotionally. Through monitoring with early interventions and course corrections when needed, this system allows us to ensure overall student well being and progress towards degree completion.

Describe program and institution-based high-impact practices and wrap-around student support services ensuring equitable access and success for students enrolled in the proposed program.

Institution-level high-impact and wraparound support services

Access 2030 demonstrates the University of Illinois’ commitment to supporting “the ongoing learning renewal of students and systemic implementation of evidence-informed student support practices.” This equity-focused plan includes emphasis on the three universities’ summer bridge programs, proactive advising, and high-impact practices to support retention and to ensure equitable access and success.

In addition to Access 2030, the System supports students through the President's Research in Diversity Travel Assistance award. This competitive program, primarily for graduate students, has been established for the purpose of promoting diversity and the understanding of diversity within the University. Recipients are provided a certificate and funding up to $600 to travel to a professional conference related to diversity or identity (such as those conferences involving race, gender, ethnicity, sexual orientation, disability, and national origin) to present papers, posters, or creative work in service to the University's interest in a diverse learning community.

At the institution level, the University of Illinois Urbana-Champaign prides itself on the array of high-impact practices and services offered to students. These student support practices support the ongoing learning renewal of students and systemic implementation of evidence-informed student practices, which align with Equity Strategy 1 of A Thriving Illinois. The Counseling Center, Office of the Dean of Students, McKinley Health Center, and Student Assistance Center are accessible to all students via in-person or remote options to facilitate student wellness and retention. All students are encouraged to participate in workshops hosted by the university's Writer's Workshop and are eligible to receive assistance on writing projects through their writing assistants. For students with disabilities, Disability Resources & Educational Services (DRES) has helped thousands of students earn college degrees and Urbana-Champaign has been recognized as a national leader in the area of post-secondary education for persons with disabilities. Indeed, as the oldest post-secondary disability support program in the world, DRES has been associated with many programmatic innovations including:

• The seminal research which led to the development of the first architectural accessibility standards that would become the American National Standards Institute Standards;
• The first wheelchair-accessible fixed route bus system;
• The first accessible university residence halls;
• The first university service fraternity and advocacy group comprised of students with disabilities, Delta Sigma Omicron; and
• The first university to receive the Barrier-Free America Award from the Paralyzed Veterans of America (2012).

Additionally, poised at the crossroads of academic and student affairs, the Office of Minority Student Affairs (OMSA) is one of the oldest and most comprehensive student support programs in the nation. The OMSA has embodied the University of Illinois Urbana-Champaign's land-grant mission by championing access for all students and providing a comprehensive array of college preparatory and support services to bolster students' success since its inception. Programs such as AMPS (Academic Mentoring, Programs, and Services) through OMSA also align with A Thriving Illinois Equity Strategy 8 with the use of near-peer mentoring and staff as mentors/coaches. OMSA currently houses six departments. A more comprehensive list of OMSA programs is provided in Appendix B.

The Office of Student Affairs, particularly through their Office of Inclusion and Intercultural Relations (OIIR), supports numerous programs aimed at supporting diverse groups of students including working adults, students of color, and transfer and

diverse groups of students including working adults, students of color, and transfer and low-income students (just a sampling of which are provided in this document. OIIR houses UIUC's cultural and resource centers (see Appendix C) and a variety of high-impact programs; to name just three examples: 100 STRONG Program, I-Connect Diversity & Inclusion Workshops, and Housing Division Social Justice and Leadership Education. A more comprehensive list of programs is detailed in Appendix C and more specifically programming, support, and services geared toward African American students, Latino/a students. Veteran support is provided through the Chez Veterans Center out of our College of Applied Health Sciences, which includes individualized academic and career coaching to support progress and address barriers, peer and professional mentoring to foster community and networking, and health and wellness services to promote psychosocial adjustments and well-being.

The Career Center offers coaching and support students and connects them to opportunities, as they make career decisions and learns lifelong career management skills. They serve as leaders of the UIUC career services community. The Career Center sponsors the FOCUS program, an intensive year-long program created to eliminate the gap in post-graduation outcomes and starting salaries between underrepresented, first-generation students and their peers. Its aim is to positively impact their career trajectory, earnings potential, and economic security for years to come. Through a series of workshops, this program provides transformative learning experiences for students in and out of the classroom. Those selected to participate receive a $2,500 scholarship over two semesters.

Finally, the university continues to develop and grow the Illinois Scholars Program (ISP). Designed to serve residents of the state of Illinois from historically underserved populations and low-sending counties, ISP guides undergraduate students' transition to the University of Illinois Urbana-Champaign by providing a wide range of educational, personal, social, and cultural opportunities. ISP aims to combine opportunity and access, experiential learning, and support to position students for academic success and personal growth throughout their time at Illinois. ISP begins with a four-week intensive summer bridge experience for incoming first-year students, and ISP continues to provide support and community for Illinois Scholars during their undergraduate years. Since the program's inception, 106 students have completed their summer bridge experience, with a 93.9% retention rate from their freshman to sophomore years, compared to a 91.5% campus retention rate for underrepresented minority students during the same period.

College, department, and program-level high-impact and wraparound support services

Mentoring and Advising Programs. The Grainger College of Engineering prides itself on its well-established organizations and supports to help promote a sense of identity and belonging for students. Student chapters of prominent national organizations have been in existence for decades with the goals of connecting students to student support services, professional organizations, and the community. More specifically, through the Women in Engineering (WIE) program, women students are invited and encouraged to form connections in community with other women as well as the overall student population. At the recruitment stage, women students are recruited strategically through mailings that feature handwritten notes from women students in the admitted student's major. Admitted students and parents are invited to luncheons and meet

student's major. Admitted students and parents are invited to luncheons and meet-and-greets to learn more about each engineering major, the successes and experiences of current students, and how the specific admitted student's experiences and interests can be leveraged and pursued toward their success at Illinois. Transitioning to campus life, women students are invited to the WIE First-Year Orientation, in which staff from the Center for Academic Resources in Engineering (CARE), faculty and staff from academic departments, and other resources speak directly to women students. Through this experience, they form critical first connections with other first-year students, upper-class students, and college faculty and staff. Current women students are supported academically, socially, and professionally toward their success through the following avenues: monthly Newsletters highlighting successful alumnae (especially women of color) and noting relevant scholarship and professional development activities, social engagement events, and celebrations (birthdays and Deans List). Through these recruiting and support activities, the college fosters an inclusive community of belonging for women students.

The Morrill Engineering Program (MEP) fosters a community of students of different levels that promotes peer networking and mentoring. Throughout the term, MEP communicates with students via newsletters and individual contacts. Through the SOS (System of Success) Retreats held each semester, MEP staff and alumni develop and implement workshops that provide guidance and insight to professional and personal development, often pointing to campus services that were useful to them when they were students. Alumni are also involved in the ENG 111 course by providing keynote addresses as role models and endorse students for opportunities within their organizations. Efforts such as WIE, CARE, MEP, and ENG 111 align with A Thriving Illinois Equity Strategy 1 in that they provide proactive and comprehensive advising and involve learning communities – a high-impact practice. They also align with Equity Strategy 8 through their near-peer mentoring and use of staff and alumni as mentors/coaches.

MEP supports and influences student chapters of nationally affiliated professional organizations that support underrepresented minorities in STEM. Through these organizations including the National Society of Black Engineers (NSBE), the American Indian Science and Engineering Society (AISES), and the Society of Hispanic Professional Engineers (SHPE), MEP informs and promotes engagement of academic and professional development opportunities on campus. Each organization holds regional and national conventions that bring together collegiate and professional members throughout the United States. These conventions provide the opportunity for students to present academic research, engage in professional development workshops, and participate in career fairs. These conventions promote engagement with other professional organizations related to specific areas of engineering and serve as a source of motivation and belonging to students. Through gift funding, MEP and ARISE (Academic Redshirt in Science and Engineering) provide financial support to supplement departmental support of students who wish to attend professional development conferences.

Internships. Engineering Career Services (ECS) hosts several opportunities for students to engage in internship exploration and experiences.

ECS offers walk-in and scheduled advising opportunities for students to discuss their internship, job shadow, and co-op searches. Nuclear, Plasma, and Radiological Engineering advises students each term to also meet with ECS to discuss their resume, internship search, and graduate or medical school preparation process alongside meeting with bioengineering department academic advisors. A co-curricular opportunity search engine, Handshake, is also available to all Illinois students, including students in the Environmental Engineering program. Nuclear, Plasma, and Radiological Engineering will work one-on-one with underrepresented students via department academic advising to ensure underrepresented students are comfortable accessing and navigating the platform and have a clear understanding of how to set search and notification parameters for opportunities relevant to their interests and major.

Engineering 100 (ENG 100), required of all Grainger Engineering students, also incorporates advising for professional development, including internship searches and resume preparation. Prior to the fall career fair, all engineering first year students are required to submit resumes as an assignment in ENG 100, which are then reviewed by their course instructor. Course instructors provide feedback to students in order to prepare them for the career fair, where they will meet several employers and begin the experience of networking and sharing their interests with industry contacts. ECS also offers the opportunity for students to participate in wEtrek, which is a program designed for first and second-year students to explore different industries via in-person and virtual job shadow days with our industry partners.

All of these efforts are tracked by program staff and usage statistics are collected via Engineering Career Services and reported to the Associate Dean of Undergraduate Programs in Engineering; statistics are broken out by demographics, including race/ethnicity, gender, first-generation status, and major. An annual review of this data informs the College's efforts and services, allowing them to tailor presentations and recruitment efforts to engage underrepresented populations via targeted information sessions, presentations in courses underrepresented students enroll in through the WIE, ARISE, and MEP programs. Ultimately, student placement data upon graduation is collected under the Illini Success survey, a campus-wide effort supported by the Provost's office to collect graduation data outcomes beginning in August 2014. Additionally, the College of Engineering hosts two career fairs per year.

Undergraduate Research. Undergraduate research opportunities support students' professional development in a meaningful way, thus our Department encourages and supports such activities with our students. Undergraduate research opportunities are available at multiple different levels. The Illinois Scholars Undergraduate Research (ISUR) Program facilitates two-semester, structured, mentored research experiences for undergraduate students, especially students from underrepresented groups.

Explain institutional strategies being implemented to increase and retain faculty, staff, and administrators of color and the implications for the proposed program. Explain how progress will be monitored.

Aligned with Equity Strategy 3 (Implement equitable talent management to increase and retain faculty, staff, administrators, and trustees of color), the UI System and the UIUC Campus support efforts in this area, particularly in supporting underrepresented

minority faculty. The Distinguished Faculty Recruitment Program has a stated goal of increasing underrepresented minority faculty. Since 2017, the System has committed $20 million to this program, the recruitment of tenured, star, or rising faculty from a range of disciplines who can transform our universities by their exceptional scholarship and teaching. One criterion is that the faculty member "will enhance diversity in the unit and in the college." The Public Voices Fellowship is a year-long program open to tenured faculty to join a cohort of leaders, the majority of whom will be underrepresented (including women) and provide them with extraordinary support, leadership skills, and knowledge to ensure their ideas shape not only their fields, but also the greater public conversations of our age. The Leadership Initiative for Women Faculty brings together women faculty from across the UI System who are leaders and/or potential leaders to identify barriers to and facilitators for advancement of women. Finally, the System will also be providing funding in support of each university's faculty recruitment plans which will also emphasize the recruitment of underrepresented minority faculty.

As a campus, the University of Illinois Urbana-Champaign is committed to investing in strategic hiring of faculty to maintain our academic strengths, respond to student demand, and capture opportunities. Investments from the Office of the Provost in faculty hiring, retention, and development are critical to maintaining and enhancing the academic excellence of our campus, especially at a time when the competition for top talent is intense. The Next 150 strategic plan identified a major hiring initiative to expand faculty hiring in key areas over the next five years, with the goal of expanding the overall size of the faculty. While the COVID-19 pandemic slowed that initiative, the University remains committed to hiring with the goals of enhancing faculty diversity and meeting student demand.

Though all faculty hiring is a department and college-level decision, the campus has devoted significant resources to incentivize hiring activities that support diversity, recruitment, and retention goals. Prominent among those programs are the Targets of Opportunity Program (TOP) and the Dual Career Academic Couples (DCAC) program. The TOP program provides recurring funds for salary support for hires that enhance campus diversity, including faculty from underrepresented groups and women in STEM fields. Nearly all of these hires are identified through a traditional search process. The Provost invests ~$1 million per year in this recurring salary support for TOP. The Office of the Provost, in conjunction with the Office of the Vice Chancellor for Diversity, Equity, and Inclusion also announced a temporary modification to the TOP program to recruit more faculty of color. This initiative made an additional ~$1 million available to units to support hiring in this area. For the DCAC program, the Provost provides recurring matching funds (i.e., 1/3 of the initial salary) if the partner is hired into a tenure track position through the DCAC program. Several years ago, the Provost modified the DCAC program to provide only non-recurring funding (1-3 years) for non-tenure track partner hires which has helped to reduce the overall cost of the program.

The campus also continues to fund postdoctoral fellowships targeted to underrepresented scholars in ethnic studies programs (e.g., Latina/Latino Studies, American Indian Studies, etc.) and through the DRIVE program. These programs are intended to help provide postdocs with an opportunity to build a foundation of scholarship that will prepare them for tenure track positions. While the ethnic studies

postdocs are selected through a specific advertisement, the DRIVE program identifies candidates through a search process for open faculty positions.

Finally, through a partnership with the University System Office and departments, the Provost's Office also supports the Underrepresented Faculty Recruitment Program in making available non-recurring funds for research to enhance offers of employment. Awards up to $20,000 per year for each of the first three years of employment are available for those hired in the 2022-2023 academic year. The Provost's Office funds the additional search expenses incurred by bringing an additional candidate to campus if that person is from an underrepresented group.

Additional retention efforts include programming and development activities for executive officers and faculty members across ranks. Programming and resources for unit executive officers (EOs) equip them with the knowledge and skills necessary for leadership including ways to enhance their ability to support and mentor faculty within their units, particularly faculty members of color. The Office of the Provost also coordinates several leadership development programs to increase the pool of potential academic leaders on campus with intentional focus on supporting faculty members from marginalized and underrepresented groups to explore campus leadership and administrative roles.

The Office of the Provost also invests in faculty development. From recruitment to onboarding, through promotion, and retirement, faculty members have access to programming and resources designed to meet them and address their careers needs. The office also supports several institutional memberships that provide external resources to our faculty, such as the National Center for Faculty Development and Diversity to ensure faculty members' continued access to NCFDD's resources.

To monitor progress of our efforts to recruit and retain faculty members of color on our campus, we collect, manage, and report annual data through the Division of Management Information and Office for Access and Equity. Additionally, we release a yearly report on hiring and retention of women faculty of color through the Women at Illinois report (e.g., 2020-2021 report and 2021-2022 report).
College, department, and program-level efforts to recruit and retain faculty, staff, and administrators of color

College, department, and program-level efforts to recruit and retain faculty, staff, and administrators of color.

The Grainger College of Engineering and Department of Materials Science and Engineering offer many resources to support and retain faculty. Examples of these at the college level include the Collins Scholars Program for new engineering faculty, which exists to help faculty get their careers off to an efficient and productive start. The program provides a culture of support for teaching, research, and service in a relaxing and collegial environment. The Collins Scholars meet every Friday to discuss instructional design, research-based teaching strategies, and innovative assessment techniques. Staff and distinguished guests from around campus, lead the weekly interactive seminars. Collins Scholars also visit the classrooms of excellent teachers and are observed at least once during the academic year. Another college-level

example is the Strategic Instructional Innovation Program (SIIP). SIIP awards education-innovation grants to faculty teams using a model similar to research-grant funding. The motivating vision for education innovation is to teach like we do research, meaning that teaching can and should involve collaboration, creativity, excitement, measurement, perseverance, and continual improvement, as do high-quality research programs at Illinois. SIIP has achieved marked success by bringing aspects of Illinois' outstanding research culture to teaching, including an engaged community, collaborative projects, faculty-led innovation, rigorous evaluation, and a scholarly approach to pedagogical methods. The college also designates faculty members as Education Innovation Fellows (EIF's) and Entrepreneurial Mindset Fellows (EMF's). EIFs and EMFs have a connecting role in the College. They interact with staff, departmental

Sustainability

Describe strategies and initiatives the institution plans to implement that makes the proposed program and college more generally affordable for students and their families, including those who have been historically underserved.

Institution-level affordability plans

The University of Illinois and the University of Illinois System have been committed to implementing strategies to make college "more affordable, particularly those who have been historically underserved." The following initiatives have been implemented and promising outcomes have already been realized. The President's Award Program (PAP) and PAP Honors provide financial support for students admitted to one of the UI Systems three institutions from historically underrepresented groups. The PAP award is $5,000 per year available for a maximum of four years while PAP Honors awards $10,000 per year for four years. Over $244 million has been distributed between 2006 and 2020.

The University participates in the State of Illinois AIM HIGH Grant program, which provides $5,000 per year ($20,000 over four years) in merit-based awards to the top academically admitted new freshmen who meet eligibility requirements.

Aligned with A Thriving Illinois' Equity Strategy 5 and Growth Strategy 4 to encourage high school graduates to enroll in our higher education system and keep talent in Illinois, Illinois recently adopted the Common App.

Recognizing the barrier that affordability creates to higher education, the University of Illinois Urbana-Champaign has taken action to increase the portfolio of financial support for students. The university annually provides over $465 million in financial aid funding to undergraduate students, with 72% of students receiving some type of aid. Over $145 million of that funding comes from institutional sources, with the vast majority provided to Illinois residents as need-based grants and scholarships. The university has two signature financial aid programs. Began in 2005, the Illinois Promise program covers tuition, campus fees, room/board, and books/supplies through a combination of federal, state, and institutional grants and a $2,500 Federal Work-Study award to Illinois residents whose family income is at or below the federal poverty level. In 2019, the Illinois Commitment program began and provides a combination of federal, state, and institutional grants to cover tuition and campus fees for Illinois residents whose family income is $67,100 or less. Approximately 30% of Illinois residents attending UIUC receive funding through either the Illinois Promise or Illinois Commitment programs. Of the 2020-2021 cohort of Illinois Commitment recipients, 36% identify as Hispanic, 28% as White, 19% as Black/African American, 14% as Asian, and 3% identify as two or more races.

In an effort to acknowledge financial constraints that may impact retention, in March 2020, the University of Illinois Urbana-Champaign raised the threshold that previously prevented course registration due to holds placed on student accounts resulting past-due balances of over $200. The change now only impacts students whose past-due balance is over $1,500. This proactive institutional response is an example of alignment with the Sustainability Goal, Strategy 3 of A Thriving Illinois.

College, department and program affordability plans

The Grainger College of Engineering and Department of Materials Science and Engineering offset tuition costs through scholarship incentives, especially for incoming first-year students. Both the Grainger College and MatSE Department are fortunate to have significant amounts of funds provided by generous donors for this purpose. The Grainger College and MatSE Department distribute the scholarships to recruit the best and brightest students nationally. But within that select group of candidates, the College and Department traditionally further deploy the funds to incentivize the recruitment of women, traditionally under-represented student populations, and first-generation students. The Department's efforts to make higher education more affordable for historically underserved students is clear, and will continue on in future years.

Provide tuition cost analysis for comparable programs and institutions in Illinois.

As stated previously, the Materials Science and Engineering + Data Science BS program will currently be the only program in the State of Illinois. However as a point of reference examples are given from three institutions in the state that offer related bachelor in Data Science programs, all of them private schools. The following tuition costs are estimated. These estimates place tuition for the proposed program at the lower spectrum of cost.

Institution: Dominican University, BS in Data Science
Estimated Tuition: $35,850 per academic year
Source: Undergraduate; Rosary College of Arts and Sciences; 2022-2023
https://www.dom.edu/admission/office-financial-aid/student-accounts/tuition-fees-and-expenses

Institution: Olivet Nazarene University, BS in Data Science
Estimated Tuition: $36,950 per academic year
Source: Undergraduate; 2022-2023
https://www.olivet.edu/financial-aid-college-cost-calculator

Institution: Lake Forest College, BA DS - Finance & Economics
Estimated Tuition: $52,000 per academic year
Source: Undergraduate; 2022-2023
https://www.lakeforest.edu/academics/college-catalog/tuition-and-fees

PROPOSED:
Institution: University of Illinois Urbana-Champaign, B.S. in Materials Science and Engineering + Data Science
Estimated Tuition: $17,660 (resident), 38,132 (nonresident), 41,110 (international) per academic year
Source: Undergraduate; Grainger Engineering; Fall 2022 entry term

https://registrar.illinois.edu/ug-tuition-rates-2223/

Growth

Provide a supply and demand analysis for the proposed program that, at minimum, does the following: a) Provides evidence of student interest in the proposed program including any strategies to incentivize students to stay in Illinois. b) Identifies and provides evidence of a high-quality credential with viability for future careers.

There are at least three groups of students that can be identified who have shown interest in a potential degree of this kind (MatSE+DS). First is the group of students who enter the current MatSE degree program, but are drawn by the higher demand (and possibly higher salaries) of fields such as data analysis and computer science. We have revised our curricula over the past decade to include more computational modeling in our required courses, and so some will be primed for this change. Second is the set of students who are currently in the BS in Computer Science degree program, but are interested in a more "sciency and physicsy" degree program. (They cannot imagine themselves writing code all their lives.) This group of student were interested in core STEM fields of math and physics in high school, and would like to continue at the interface of data science aspects of a computer science degree and the math and physics of a more applied engineering field, such as MatSE. Third group consists of the very large number of high school students who apply to pursue the BS in CS degree program, and are not admitted in that degree program because of stiff competition and limited number of slots. Many of these students are similar to the students in the second group, in that they would prefer a degree program at the interface, but none currently exists. This is the largest group of students we expect to enter the MatSE+DS degree program.

As University of Illinois application system allows high school students two choices for degree programs, we expect a significant number of students selecting MatSE+DS as their second degree option.

The University of Illinois program in Materials Science and Engineering is the highest ranked program in the state. Evidence from student exit surveys suggests that in-state students are more likely to stay and become employed in Illinois within the first few years after graduation. A large number of our graduates are employed in the materials industry in the state of Illinois. As the field of materials science and engineering grows to include more data science, providing this new skill set to these students in a field with high demand and high financial rewards within the state of Illinois is likely to help retain these graduates in the state. New initiatives such as Discovery Partner Institute (DPI) will also lead to new demands and opportunities for students with skills at the interface of a STEM field and data science.

Thus, the Department of MatSE aims to continue the successful recruitment and retention of in-state Illinois students with the MatSE+DS program. Furthermore, the Department intends to continue historically strong recruitment and retention of transfer students from Illinois community colleges, as exemplified by the Pathways program. To strengthen connections to the nuclear, power and radiological engineering industry within Illinois, the alumni advisory board will continue to include and even to expand nuclear engineering representatives from within the state of Illinois. The advisory board will meet regularly to provide review input to the program regarding curricular matters as well as job need and placement strategies for the state of Illinois.

It has been widely demonstrated that students' attitudes about the engineering field are strongly linked to their retention [1-3]. In a study of student persistence in engineering, White et al. found that how students felt while participating in STEM courses and after completing STEM assignments was a strong predictor of STEM persistence [4]. The authors further suggest that these feelings are grounded in intrinsic motivation based on their interest in a given activity [4]. Therefore, the development of course materials that peak student interest offers a low-risk opportunity to increase retention in engineering across all student populations.

[1] Besterfield-Sacre, M.; Atman, C. J.; Shuman, L. J., Characteristics of freshman engineering students: Models for determining student attrition in engineering. Journal of Engineering Education 1997, 86, (2), 139-149.
[2] Russell, M. L.; Atwater, M. M., Traveling the road to success: A discourse on persistence throughout the science pipeline with African American students at a predominantly white institution. Journal of Research in Science Teaching 2005, 42, (6), 691-715.
[3] French, B. F.; Immekus, J. C.; Oakes, W. C., An examination of indicators of engineering students' success and persistence. Journal of Engineering Education 2005, 94, (4), 419-425.
[4] White, J. L.; Altschuld, J. W.; Lee, Y. F., Persitence of interest in science, technology, engineering, and mathematics: A minority retention study. Journal of Women and Minorities in Science and Engineering 2006, 12, (1), 47-64.

b) Department/Program Evidence of a High-Quality Credential with Viable Future Careers

The proposed MatSE+DS B.S. program will support (i) educational attainment, (ii) high quality credentials to meet economic demand, and (iii) integration of educational, research and innovation assets. The degree program will provide students with high quality credentials enabling them to enter the workforce. Further, the development of the MatSE+DS B.S. program will leverage the University's research and innovation assets to advance education through an integrated portfolio.

Students receiving a B.S. degree in MatSE+DS will be uniquely trained in the core areas served by the traditional materials science and engineering degree as well as the newly emerging field of data science and data analytics. Data Science is a rapidly growing field with demand far surpassing the supply. As mentioned elsewhere, Office of Labor Statistics predicts the growth in data science jobs to be far higher than average. Starting salary for data science graduates is also higher than average engineering graduate. Linking data science expertise with that of a specific discipline (in this case, MatSE) makes the degree very appealing for those who have interest in the discipline of materials science and engineering, but also are interested in computational sciences and data analysis, and want to improve their job and growth prospects by adding to their portfolio a field that is growing rapidly. Studies and market analyses were conducted at the campus level to assess the viability of X+DS degrees (reported elsewhere in this report), and concluded that there is and will remain for foreseeable future, demand for such degrees. As for the specific MatSE+DS degree, we are relying on nationwide studies that spurred the national Materials Genome Initiative (https://www.nist.gov/mgi), as well as discussions with our alumni board and from

alums in general, and there is strong (though anecdotal) demand for materials engineers who have proficiency in data analysis and data analytics.

Explain how the program engaged with business and industry in its development and how it will spur the state's economy by leveraging partnerships with local, regional, and state industry, business leaders and employers.

Institutional engagement

The University of Illinois Urbana-Champaign has strong partnerships with business and industry through the statewide initiatives like the Discovery Partners Institute (DPI) and the Illinois Innovation Network (IIN), which closely align with A Thriving Illinois' Growth Strategies. As a key gubernatorial initiative, DPI's Tech Talent Lab and immersion programs engage with Chicago's technology workforce, allowing students to interact with Chicagoland technology and innovation culture. Students make meaningful connections to regional employers and industries, university research teams, civic and nonprofit organizations, and startups that will lead to employment and talent retention in the region. IIN works to enrich the student experience through short-term boot camps around topics such as artificial intelligence, data science, entrepreneurship, and more. These intensive programs will encourage students' interest in topics that are key to the 21st century economy and give them a foundation for continued study.

Partnerships with the Research Park, the work of the Campus Community Compact, and PK-12 programming overseen by the Associate Chancellor for PK-12 Initiatives align with A Thriving Illinois' Growth Strategies.

As a crucial hub that provides meaningful and industry-focused research and internship opportunities, the Research Park employs 800 interns year-round in part-time employment, allowing University of Illinois Urbana-Champaign undergraduate and graduate students to work on campus and be enrolled as full-time students. There are more students working at the UIUC Research Park than at any other peer United States university research/tech park. Students are paid highly competitive wages for their specialized skillsets in areas like data analytics, engineering, and business development. A number of these interns are classified as Federal Work-Study. Research Park internships increase students' employment prospects by expanding their professional networks, building their professional portfolios, and developing their leadership skills. Many of the corporate sites focus on DEI outreach and participate as sponsors to various student groups and campus units. Examples include Synchrony's sponsorship of FOCUS Scholars. Building on the well-established relationships of the affinity and community groups both on campus, the Research Park campus office has ongoing partnerships with units like La Casa Cultural Latina, the Bruce Nesbitt African American Cultural Center, and The Career Center, as well as student groups such as the Society of Women Engineers, Alpha Omega Epsilon (professional women's leadership sorority), and Sigma Alpha (professional agricultural sorority), to educate Illinois' diverse population of students on the opportunities available within the Park. The Illinois Reboot tech training program provides a free course in data science literary to Central Illinois professionals who are underrepresented in technology and looking to upskill their careers. Since its inception in 2020, Reboot has trained 150 community

members, 61 percent from underrepresented populations. Reboot also provides career coaching and access to Research Park data science professionals. Accelerating Women And underrepresented Entrepreneurs (AWARE), programmed through the EnterpriseWorks incubator at the Research Park, supports entrepreneurship training, counseling, and networking for women and underrepresented entrepreneurs.

Another local program, We CU, connects student volunteers with community projects. This program empowers students to make a positive impact in the community while building their resume and enriching their university experience. By joining, students become part of a diverse group of peers passionate about serving the community. In the first two years of the program (2020-2022), 1,973 UIUC students from 12 colleges worked to complete almost 37,000 hours of training and service on 516 service projects.

The Campus-Community Compact (Compact) is one of the major initiatives of the Community Action and Public Engagement (CAPE) Committee of UIUC's Chancellor's Call to Action to Address Racism and Social Injustice. Comprised of a co-equal partnership between UIUC and the broader Champaign-Urbana community, the Compact is an ambitious and visionary initiative to accelerate social justice by addressing structural racism, bias, and social injustice over the next 5-10 years in six interrelated grand challenge areas: inclusive education; accessible technology; economic development; health, wellness, and resilience; workforce development; and community relations. The Compact also includes several crosscut areas; namely, accessible campus/transportation, accessible information, community safety, and language (e.g., multilingualism, communications, and messaging).

College, department, and program engagement

Through Career & Professional Development, Engineering Career Services bridges college and community relations by delivering relevant career exploration, development, and recruitment services to all students in the college. Engineering Career Services builds and maintains industry relationships through strategic engagement and intentional outreach and collaboration, such as:
• DEI and Honors Networking events held for James Scholars and Women in Engineering programs.
• Career Fairs: Virtual and In-Person career fairs are offered at the start of fall and spring semesters serving hundreds of employers and thousands of students (BS, MS, PhD and alumni)
• Major Meet-Ups: Opportunities for students to meet with employers seeking specific majors
• Handshake: featuring thousands of companies, jobs and events
• Career Exploration & Search Workshops and Courses: workshops & training events offered each semester, in-person and virtually, partnering with WIE, ARISE, and MEP
• Student Newsletters & Social Media targeted to engage underrepresented groups
• Student & Employer Website and Virtual Career Technologies (JobScan, FirstHand/Vault, Campus Groups, BuzzFile, Parker Dewey, YouTube videos, etc. See website for complete list. https://students.grainger.illinois.edu/ecs/tools-and-resources/
• Grainger Engineering Link Mentoring Program: Mentoring program managed through

the People Grove platform

In addition to the opportunities provided through Engineering Career Services, all Grainger Engineering students have access to coursework and programming provided by the Technology Entrepreneur Center (TEC). These include affiliations with the statewide Illinois Innovation Network and activities supported by the Discovery Partners Institute to strengthen regional focus and state connections, which aligns with Growth Strategy 1 of A Thriving Illinois.

At the Department level, several actions to connect with Illinois industry where MatSE+DS graduates are likely to be employed will be undertaken. We are connecting the design courses (MSE 494 and 495) with alumni engagement, by bringing in industrial design projects. With the development of the MatSE+DS program, we will expand the range of projects to include more data-centric projects in partnership with industry. We will also leverage the graduate level National Science Foundation-funded DigiMat (Digital Materials) program, that includes Ph.D. internships with industry

Describe how the proposed program will expand access and opportunities for students through high-impact practices including research opportunities, internships, apprenticeships, career pathways, and other field experiences.

Institution level high-impact practices

The University Research Park expands access and opportunities for students by employing 800 interns year-round in part-time research opportunities and career-relevant internships, allowing University of Illinois Urbana-Champaign undergraduate and graduate students to work on campus and be enrolled as full-time students.

The Office of Undergraduate Research (OUR) is guided by the philosophy that all Illinois undergraduate students should learn about current disciplinary research, take part in research discussions, and be exposed to research experiences in their regular coursework. Furthermore, where practical, an advanced research experience should be among the capstone options in all major programs of study. Undergraduate research opportunities should be designed to support the pedagogical goals and the research mission of the university. To achieve its mission, OUR seeks to: 1) inspire students and faculty to collaborate on research projects driven by mutual interests by fostering a research mentoring environment that encourages and rewards collaboration; 2) disseminate best practices and models for undergraduate research to campus stakeholders; 3) assist in the development and evaluation of curricular and co-curricular structures that support undergraduate research; 4) encourage the creation of new opportunities for undergraduate research on campus and 5) coordinate and nurture undergraduate research efforts across academic units on campus.

College, department, and program level high-impact practices

Expanding beyond the formal curricular structure, the College offers short-term industry-valued certificate credential opportunities for learning. For example the College, through the Technology Entrepreneur Center (TEC), offers undergraduate certificates in technology commercialization and strategic technology management. In order to encourage academic and research-based learning opportunities, the

Explain how the proposed program will expand its models of teaching and learning, research, and/or public service and outreach that provide opportunity for students to succeed in the work of the future.

The MatSE department has an active Curriculum Committee that works to review and improve courses and teaching practices by considering new developments and best practices. Most recently this committee developed and then implemented a revision to the capstone design course in the MatSE BS degree to include, among other changes, materials data and informatics. These courses, MSE 494 and 495, serve also as the capstone course in the MatSE+DS degree. In addition, these design courses were modified in consultation with our industrial alumni. This Committee will expand its focus to monitor the MatSE+DS degree program once that becomes available. This committee will also work closely for the MatSE+DS dgree program, with the corresponding committees in the other departments that are part of this new degree. Needs of the domain specific industry will be communicated to the sister committees, and then modifications and expansion of the curriculum will take place collaboratively.

Because of the specific focus on data science, graduates of the new degree program will be better equipped to address issues such as environmental justice and energy justice, that require a broader understanding of large data sets.

The Department has earned ABET accreditation for its Materials Science and Engineering degree. The department is prepared and well positioned to earn ABET accreditation for the MatSE+DS degree once it is eligible to do so. In order to earn ABET accreditation, a program must demonstrate suitable satisfaction of pre-set learning outcomes that consider both technical competencies as well as development of broader skills and ethics. The next scheduled ABET evaluation will occur in 2025.

Beyond workforce need, describe how the program broadly addresses societal needs (e.g., cultural or liberal arts contribution, lifelong learning of Illinois residents, or civic participation).

Environmental and social justice in the context of energy and its consumption has become critically important. Typical engineers are usually not equipped to address the data analysis needs when working on these topics. They often need to work in a team with other data scientists. Graduates from the proposed MatSE+DS degree program will be much better equipped to address the challenges of environmental and social justice in the context of sustainability, environmental impact, and energy. By appropriate selection of their general education requirement, these MatSE+DS degree graduates may even be able to address the social science context of these issues.

This novel degree program, and the strengthened relationships across campus that will result, will transform the educational experience of our students and put them in a position to directly serve society through the beneficial impact described above. Additionally, the program is expected to be of greater interest (relative to the broad range of disciplines covered by MatSE and most other engineering disciplines) to female and underrepresented minority students, which will help the Grainger College of Engineering to increase their representation in the student body. Further, this degree program will contribute to the Illinois State Board of Education initiatives to provide all students with "educational opportunities to pursue high-wage, high-skill, in-demand occupations leading to economic self-sufficiency".

A Thriving Illinois: Higher Education Paths to Equity, Sustainability, and Growth - Attach Documents

Program Description and Requirements

Illinois Administrative Code:

1050.30(b)(1) A) The caliber and content to the curriculum assure that the objectives of the unit of instruction will be achieved; B) The breadth and depth of the curriculum are consistent with what the title of the unit of instruction implies; C) The admission and graduation requirements for the unit of instruction are consistent with the stated objectives of the unit of instruction.

1050.30(b)(3): Appropriate steps shall be taken to assure that professional accreditation needed for licensure or entry into a profession as specified in the objectives of the unit of instruction is maintained or will be granted in a reasonable period of time.

1050.50 (a)(2)(C) Requirement for Programs in which State Licensure is Required for Employment in the Field: In the case of a program in which State licensure is required for employment in the field, a program can be found to be in good standing if the institution is able to provide evidence that program graduates are eligible to take the appropriate licensure examination and pass rates are maintained as specified in the objectives of the unit of instruction. If there is no such evidence, the institution shall report the program as flagged for review.

Program Description

Provide a description of the proposed program and its curriculum, including a list of the required core courses and short ("catalog") descriptions of each one. (This list should identify all courses newly developed for the program).

Provide Program Description here:

Materials science and engineering is the basis for all engineering. Improvements in the quality of life require knowledge of the processing and properties of current materials and the design, development and application of new materials. The Materials Science and Engineering + Data Science (MatSE+DS) curriculum provides an understanding of the underlying principles of synthesis and processing of materials and of the interrelationships between structure, properties, and processing. Students learn how to create advanced materials and systems required, e.g., for flexible electronic displays and photonics that will change communications technologies, for site specific drug delivery, for self-healing materials, for enabling the transition to a hydrogen-based economy, and for more efficient photovoltaics and nuclear systems for energy production. The curriculum uses concepts from both basic physics and chemistry combined with principles of data science and provides a detailed knowledge of what makes the materials we use every day behave as they do.

In line with the current practice for the existing Materials Science and Engineering program, all classes, laboratories, and discussion sessions associated with the MatSE + DS program will be held in the face-to-face instructional format. If and when conditions dictate that it be necessary, however, the Department can modify any class to a hybrid or full on-line leaning format. This degree program is expected to be completed in eight semesters of full-time studies and will be offered by the Materials Science and Engineering Department in the Grainger College of Engineering (GCOE). Students will gain core knowledge in the MatSE discipline with additional competency in data science applications.

Educational objectives for the MatSE + DS program reflect the mission of the Department of Materials Science and Engineering and are consistent with ABET (Accreditation Board for Engineering and Technology) guidelines. The educational objectives are designed to position students to be successful in professional practice, to pursue advanced degrees, to assume professional and societal leadership roles, and to develop a commitment to lifelong learning.

Students in the first two years take courses in general areas of data science, science, and engineering as well as courses introducing the concepts in MatSE. In the third year, students study the common, central issues related to MatSE and data science. In the senior year, students focus on an area of MatSE of their greatest interest, providing them with the detailed knowledge to be immediately useful to corporations, become entrepreneurs, or to provide the underpinning knowledge for graduate study.

Course requirements may be found in the CIM Program of Study table above. Course descriptions attached.

Attach Program Description Files if needed

Course Descriptions, MatSE + DS Program Description.docx

Graduation Requirements

Provide a brief narrative description of all graduation requirements, including, but not limited to, credit hour requirements, and, where relevant, requirements for internship, practicum, or clinical. For a graduate program, summarize information about the requirements for completion of the thesis or dissertation, including the thesis committees, and the final defense of the thesis or dissertation. If a thesis or dissertation is not required in a graduate program, explain how the functional equivalent is achieved.

The graduation requirements for the BS in Materials Science and Engineering + Data Science include a minimum GPA of 2.00 and a minimum of 128 credit hours, including general education requirements, the university residency requirement of 60 hours of UIUC coursework of which 21 are 300-or 400-level courses, and a minimum of 40 hours total of upper-division coursework. Finally, the course requirements outlined in the Program of Study section are also required. The total credit hours, 128, are in alignment with all other undergraduate degrees available from the Grainger College of Engineering and are necessary to ensure the curriculum is in compliance with the standards necessary for Accreditation Board for Engineering and Technology (ABET) accreditation.

Specialized Program Accreditation

Describe the institution's plan for seeking specialized accreditation for this program. Indicate if there is no specialized accreditation for this program or if it is not applicable.

The MatSE Department at UIUC will seek to receive accreditation for the proposed BS in Materials Science and Engineering + Data Science program under the Materials Engineering program category of ABET, the Accreditation Board for Engineering and Technology. When mapped to the Materials Engineering BS ABET criteria, the proposed curriculum satisfies requirements including engineering course hours.

ABET accreditation will provide assurance that the MatSE core of the MatSE + DS program is in line with the quality standards for which the program prepares graduates to enter the profession. This review will be provided every six years. The BS in Materials Science and Engineering has been accredited since 1989 (formed from a merger of Metallurgy and Ceramics in 1986). The Department is due for its next ABET review in 2025.

Licensure or Certification for Graduates of the Program

If this program prepares graduates for entry into a career or profession that is regulated by the State of Illinois, describe how it is aligned with or meets licensure, certification, and/or entitlement requirements.

Not applicable.

Plan to Evaluate and Improve the Program

Describe the program's evaluation plan.

The MatSE Curriculum Committee, working closely with the MatSE Associate Head of Undergraduate Programs and Chief Undergraduate Advisor will monitor the MatSE + DS program. The curriculum committee consists of tenured, tenure-track, and specialized faculty members in the Department of Materials Science and Engineering. This committee will be responsible for making curricular decisions and responsible for managing the day-to-day aspects of the program.

Current MatSE Undergraduate Programs advising staff will assist with student recruitment, course scheduling and articulations, student interactions, scholarships, transfers (agreements, criteria, and advising), registration, study abroad agreements, student exchanges and other day-to-day business of running the program.

The Chief Undergraduate Advisor will be responsible for allocating advising duties and for developing best practices for advising. The existing undergraduate advising staff in MatSE will also advise the MatSE + DS students. Engineering Career Services is expected to be the primary facilitator of job placement for Grainger Engineering students. It is anticipated that a majority of graduates will enter industry or go to graduate school, consistent with the placement of BS in Materials Science and Engineering graduates. Advisement for graduate school and professional placement will be through Materials Science and Engineering faculty, with personalized faculty advising for which individual student career interests will be paired to those faculty most capable of offering depth of knowledge and opportunities. Again, the MatSE Chief Undergraduate Advisor and additional departmental staff also serve as advising support for students.

Plan to Evaluate and Improve the Program
Attachments

Budget Narrative

Fiscal and Personnel Resources

Illinois Administrative Code: 1050.30(a)(5): A) The financial commitments to support the unit of instruction, research or public service are sufficient to ensure that the faculty and staff and support services necessary to offer the unit of instruction, research or public service can be acquired and maintained; B) Projections of revenues necessary to support the unit of instruction, research or public service are based on supportable estimates of state appropriations, local tax support, student tuition and fees, private gifts, and/or governmental grants and contracts.

Budget Rationale

Provide financial data that document the university's capacity to implement and sustain the proposed program and describe the program's sources of funding.

Is the unit’s (Department, College, School) current budget adequate to support the program when fully implemented? If new resources are to be provided to the unit to support the program, what will be the source(s) of these funds? Is the program requesting new state funds? (During recent years, no new funds have been available from the state (IBHE) to support new degree programs).

The program will be fully supported by student tuition from increased population of undergraduate students brought in by the MatSE + DS opportunity, thus there will not be a need to financially support this program beyond this. Under the current budget model at Illinois, these students will be considered to belong to the Materials Science and Engineering department, with no split of revenue.

Faculty Resources

Will current faculty be adequate to provide instruction for the new program or will additional faculty need to be hired? If additional hires will be made, please elaborate.

The proposed teaching responsibilities will be met by the existing faculty in Materials Science and Engineering.

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

The Department of Materials Science and Engineering currently has 24.6 full time faculty with 3.8 lecturers. This faculty number is sufficient to support the proposed program. There is no anticipated change in the teaching loads of any MatSE faculty as there are no new MatSE courses being proposed for the program.

We expect an increase in the required courses that overlap with our required courses in MatSE; the expected increase of 10 MatSE+DS students per year will take the typical enrollment of these courses from approximately 70 to 80 per year, which is sustainable.

Our current undergraduate enrollment is 260, so that our undergraduate to faculty ratio is approximately 9 to 1. If we reach our expected 5 year enrollment target of 40, our ratio will increase to approximately 10 to 1, if there is no change in our faculty numbers.

Describe how the unit will support student advising, including job placement and/or admission to advanced studies. Will current staff be adequate to implement and maintain the new program or will additional staff be hired? Will current advising staff be adequate to provide student support and advisement, including job placement and or admission to advanced studies? If additional hires will be made, please elaborate.

The current staff of Materials Science and Engineering department will be sufficient to handle all new duties associated with the new degree program. The principle load for staff is represented by student advising activities. The existing undergraduate advising staff in MatSE will be able to take on the additional load caused by MatSE + DS students as it represents a rather modest increase from the current advising load. In addition, additional advising services are provided by the Grainger College of Engineering Undergraduate Programs Office and the Engineering Career Services office, for example for job placement for Grainger Engineering students, and the current staff of both of these programs will be able to handle the increased advising load form MatSE + DS students. The MatSE Department Head and Chief Undergraduate Advisor will be responsible for allocating advising duties and for developing best practices for advising.

Are the unit’s current facilities adequate to support the program when fully implemented? Will there need to be facility renovation or new construction to house the program?

Classroom space is assigned campus wide by the Office of the Registrar Catalog Management and Section Scheduling (CMSS). Sufficient classroom space is available for supporting the courses in the MatSE + DS program. The majority of classes are scheduled into classrooms located on or near the Bardeen Quad, the engineering quadrangle between Engineering Hall to Grainger Engineering Library. CMSS oversees the scheduling of classroom space, including campus Active Learning Classrooms, such as those located in the Campus Instructional Facility (CIF, 1405 W. Springfield Ave., Urbana, IL 61801), a newly opened facility in Fall 2021. IFLEX classrooms (Illinois Flexible Learning Experience) support the campus mission for spaces that support new technology and teaching approaches. The classroom spaces available in CIF are designed to encourage small group discussion, collaboration, and peer interaction. CIF is on the Bardeen Quad, as is the Materials Science and Engineering Building (1304 W. Green St., Urbana, IL 61801), and is used for a number of MatSE offered courses.

Materials Science and Engineering currently has dedicated space in the Kiln House (107 S. Goodwin Ave., Urbana, IL 61801) and the Ceramics Building (107 S. Goodwin Ave., Urbana, IL 61801) that house our teaching laboratories. The expected increase in enrollment is approximately 10 students per year, which can be adequately handled with current laboratory space.

Library Resources

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

The Grainger Engineering Library is recognized as one of the top Engineering libraries in the nation. Thus, library collections, resources and services are sufficient to support Materials Science and Engineering + Data Science, BS.

Summarize information about library resources for the program, including a list of key textbooks, a list of key text and electronic journals that will support this program, and a short summary of general library resources of the University that will be used by the program's faculty, students, and staff.

Extensive library print and electronic resources are available through the University of Illinois Urbana-Champaign Library system, including the outstanding Grainger Engineering Library (https://www.library.illinois.edu/enx/). Resources not available through the University of Illinois Urbana-Champaign collection may be requested through interlibrary loan or from partner research libraries throughout Illinois. Beyond its holdings and extensive study spaced, The Grainger Engineering library offers outstanding learning resources for students including the IDEA (Innovation, Discovery, DEsign & DAta) Laboratory, which provides space and technology for collaboration, innovation, and entrepreneurship and supports a wide range of digital scholarship activities, the CARE (Center for Academic Resources in Engineering) center where students may find tutoring, advising and other services, and the Writers Workshop, which provide free writing assistance for University of Illinois students from all disciplines and at all stages of the writing process.

In addition, the library maintains a series of reserved books for our courses; as an example, our required courses use the following texts:

"Materials and the environment : eco-informed material choice ", Ashby, M. F.(Butterworth-Heinemann/Elsevier c2009.).
"Materials science and engineering : an introduction ", Callister, William D.,(Wiley [2018]).
"Stuff matters : exploring the marvelous materials that shape our man-made world ", Miodownik, Mark,(Houghton Mifflin Harcourt 2014.).
"Fundamentals of materials science and engineering : an integrated approach, ", Callister, William D.,(John Wiley & Sons Inc [2015]).
"Density functional theory [electronic resource] : a practical introduction ", Sholl, David S.(Wiley c2009.).
"Fundamentals of materials science and engineering : an integrated approach, ", Callister, William D.,(John Wiley & Sons Inc [2015]).
"Materials science : an intermediate text ", Hosford, William F.(Cambridge University Press 2007.).
"X-Ray Diffraction Crystallography [electronic resource] : Introduction, Examples and Solved Problems ", Waseda, Yoshio.(Springer Berlin Heidelberg ; Imprint Springer 2011.).
"Mechanics of materials [electronic resource].", (North-Holland [1982]-).
"Vector mechanics for engineers. Dynamics ", Beer, Ferdinand Pierre,(McGraw-Hill Higher Education c2004.).
"Electrical properties of materials ", Solymar, L.(Oxford University Press 2019.).
"A guide to writing as an engineer ", Beer, David F.(Wiley [2014]).
"Introduction to the thermodynamics of materials ", Gaskell, David R.,(Taylor & Francis 2008.).
"Thermodynamics in materials science ", DeHoff, Robert T.(CRC/Taylor & Francis ©2006.).
"Kinetics of materials ", Balluffi, R. W.(J Wiley & Sons 2005.).
"Kinetics of materials [electronic resource] ", Balluffi, R. W.(J Wiley & Sons 2005.).

"Phase transformations in metals and alloys ", Porter, David A.,(CRC Press [2009]).
"Thermodynamics of materials ", Ragone, David V.,(Wiley ©1995.).
"Deformation and fracture mechanics of engineering materials ", Hertzberg, Richard W.,(John Wiley & Sons Inc [2012], ©2013.).
"Introduction to dislocations ", Hull, Derek.(Butterworth-Heinemann 2001.).
"Materials science and engineering : an introduction ", Callister, William D.,(Wiley [2018]).
"Mechanical behavior of materials ", Courtney, Thomas H.(McGraw Hill 2000.).

Are any sources of funding temporary (e.g., grant funding)? If so, how will the program be sustained once these funds are exhausted?

No. External grant funding is not needed to support the program. MatSE currently has low undergraduate enrollment (260). Its student-to-faculty ratio (UG students only) is low (9). There is capacity to increase undergraduate enrollment in the unit without adding staff or faculty.

Personnel Budget

Please complete all lines below; all fields are required. For fields where there is no anticipated cost or need, enter 0 or NA.

Category Year One Year Five Notes

Faculty (FTE)

Faculty FTE Year1	Faculty FTE Year 5	Faculty FTE Notes
0	0	NA

Faculty ($)

Faculty Year 1	Faculty Year 5	Faculty Notes
0	0	NA

Advising Staff ($)

Advising Staff Year 1	Advising Staff Year 5	Advising Staff Notes
0	0	NA

Graduate
Students ($)

Graduate Students Year 1	Graduate Students Year 5	Graduate Students Notes
0	0	NA

Other Personnel
Costs

Other Personnel Costs Year 1	Other Personnel Costs Year 5	Other Personnel Costs Notes
0	0	NA

Budget Narrative Attachments

Facilities and Equipment

Illinois Administrative Code: 1050.30(a)(4): A) Facilities, equipment and instructional resources (e.g., laboratory supplies and equipment, instructional materials, computational equipment) necessary to support high quality academic work in the unit of instruction, research or public service are available and maintained;

B) Clinical sites necessary to meet the objectives of the unit of instruction, research or public service;

C) Library holdings and acquisitions, owned or contracted for by the institution, that are necessary to support high quality instruction and scholarship in the unit of instruction, research and public service, are conveniently available and accessible, and can be maintained.

Describe the facilities and equipment that are available, or that will be available, to develop and maintain high quality in this program. Summarize information about buildings, classrooms, office space, laboratories and equipment, and other instructional technologies for the program.

The data science core will be delivered by the i-School and the departments of Computer Science, Mathematics, and Statistics. The i-School and the Department of Computer Science are housed in buildings that provide classroom and lab spaces for students to engage with data science. The university has just completed construction of the Campus Instructional Facility and the Siebel Center for Design that provide outstanding modern research in data science. The university is currently renovating and rebuilding the buildings that house Mathematics and Statistics; the renovation provides for increased classroom and lab spaces for instruction and student research. Together these constitute excellent facilities for delivering the X + DS programs.

The Materials Science and Engineering courses are offered in classroom space assigned by the Office of the Registrar Catalog Management and Section Scheduling (CMSS). Sufficient classroom space is available with the majority scheduled into classrooms located on or near the Bardeen Quad, the engineering quadrangle between Engineering Hall and Grainger Engineering Library. This includes classroom space in the Campus Instructional Facility, located on the Bardeen Quad.

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

No

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

No

Are there other costs associated with implementing the program?

No

Facilities and

Faculty and Staff

Illinois Administrative Code: 1050.30(a)(3): A) The academic preparation and experience of faculty and staff ensure that the objectives of the unit of instruction, research or public service are met; B) The academic preparation and experience of faculty and staff, as evidenced by level of degrees held, professional experience in the field of study and demonstrated knowledge of the field, ensure that they are able to fulfill their academic responsibilities; C) The involvement of faculty in the unit of instruction, research or public service is sufficient to cover the various fields of knowledge encompassed by the unit, to sustain scholarship appropriate to the unit, and to assure curricular continuity and consistency in student evaluation; D) Support personnel, including but not limited to counselors, administrators, clinical supervisors, and technical staff, which are directly assigned to the unit of instruction, research or public service, have the educational background and experience necessary to carry out their assigned responsibilities.

Describe the personnel resources available to develop and maintain a high quality program, including faculty (full- and part-time, current and new), staff (full- and part-time, current and new), and the administrative structure that will be in place to oversee the program. Also include a description of faculty qualifications, the faculty evaluation and reward structure, and student support services that will be provided by faculty and staff.

Within MatSE, the degree program will be developed and maintained by existing faculty and staff, following an administrative structure consistent with the BS in Materials Science and Engineering. This includes 24.6 FTE faculty and 3.8 lecturers in the Materials Science and Engineering, a Chief Undergraduate Advisor and the Associate Head of Undergraduate Programs. All undergraduate students will be assigned a faculty advisor.

All of the faculty have earned Ph.D. degrees in related fields and have extensive experience teaching the required courses in the proposed programs. The core faculty include:

Pascal Bellon, Donald W. Hamer Professor
Paul V. Braun, Professor and Grainger Distinguished Chair in Engineering; Director of Materials Research Laboratory
David Cahill, Professor and Grainger Distinguished Chair in Engineering
Qing Cao, Associate Professor
Marie Agathe Charpagne, Assistant Professor
Qian Chen, Associate Professor and Racheff Faculty Scholar, Carle Illinois College of Medicine Affiliate
Rosa M. Espinosa Marzal, Professor and Willett Faculty Scholar
Chris Evans, Associate Professor
Nathan Gabrielson, Senior Lecturer
Matthew D. Goodman, Lecturer
Axel Hoffmann, Founder Professor in Materials Science and Engineering
Pinshane Huang, Associate Professor and Racheff Faculty Scholar
Waltraud M. Kriven, Donald Biggar Willett Professor
Jessica Anne Krogstad, Associate Professor
Cecilia Leal, Associate Professor and Racheff Faculty Scholar, Carle Illinois College of Medicine Affiliate
Laura Nagel, Senior Lecturer
Nicola Helen Perry, Associate Professor
Andre Schleife, Associate Professor
Charles M. Schroeder, James Economy Professor
Kenneth S. Schweizer, G. Ronald and Margaret H. Morris Professor
Moonsub Shim, Professor, Willett Faculty Scholar and Director of Graduate Studies
Daniel P. Shoemaker, Associate Professor and Racheff Faculty Fellow
Nancy R. Sottos, Department Head, Swanlund Endowed Chair and Center for Advanced Study Professor
Antonia Statt, Assistant Professor
Jean-charles Stinville, Assistant Professor
Jessica TerBush, Senior Lecturer
Dallas Trinkle, Ivan Racheff Professor and Associate Head
Hua Wang, Assistant Professor
Yingjie Zhang, Assistant Professor

Jian-Min Zuo, Ivan Racheff Professor

Assistant professors, associate professors, and professors allocate their time among teaching (40%), research (40%) and service (20%). All faculty are evaluated on an annual basis by the Department Head, and assistant and associate professors are also evaluated by the Materials Science and Engineering Department's Faculty Development Committee.

The Data Science courses of the MatSE + DS program will be supported by the four departments of Computer Science in Grainger College of Engineering, Mathematics and Statistics in the College of Liberal Arts and Sciences, and Information Sciences in the School of Information Sciences. The four unites are responsible for overseeing the teaching of the Data Science Core courses in the MatSE + DS program. Sufficient faculty coverage exists for the offering of the eight core Data Science courses in the MatSE + DS program. A partial list of recent faculty teaching these courses follows:

Karle Flanagan, Teaching Assistant Professor, Dept. of Statistics, Ph.D. in Curriculum & Instruction
Wade Fagen-Ulmschneider, Teaching Associate Professor, Dept. of Computer Science, Ph.D. in Computer Science
Julie Deeke, Teaching Assistant Professor, Dept. of Statistics, Ph.D. in Statistics
Tori Ellison, Teaching Assistant Professor, Dept. of Statistics, Ph.D. in Operations Research
Mahesh Viswanathan, Professor, Dept. of Computer Science, Ph.D. in Computer and Information Science
Bo Li, Assistant Professor, Dept. of Computer Science, Ph.D. in Computer Science
Brad Solomon, Teaching Assistant Professor, Dept of Computer Science, Ph.D. in Computational Biology
Peter Darch, Assistant Professor, School of Information Sciences, Ph.D. in Computer Science
Emily Maemura, Assistant Professor, School of Information Sciences, Ph.D. in Faculty of Information

Summarize the major accomplishments of each key faculty member, including research/scholarship, publications, grant awards, honors and awards, etc. Include an abbreviated curriculum vitae or a short description.

See attached file.

Faculty and Staff Attachments	MatSE Faculty CV.docx

HLC Section

Credit Hours

Existing or repackaged curricula (Courses from existing inventory of courses):	Number of Credit Hours: 100	128 Percent of Total:
Revised or redesigned curricula (Courses	Number of Credit	0

for which content has been revised for the new program):	Hours: 0	Percent of Total:
New curricula (Courses developed for the new program that have never been offered):	Number of Credit Hours: 0	0 Percent of Total:
Total Credit Hours of the Program:	Number of Credit Hours:	128 Percent of Total:

100

New Faculty Required

Will new faculty expertise or new faculty members be needed to launch this program?

No

Please explain existing coverage:

MatSE faculty are highly accomplished with extensive experience in teaching undergraduate and graduate courses in materials science and engineering. They also have experience in advising undergraduate students, and conducting research on related topics. No additional faculty expertise will be required to launch the program, current coverage is sufficient. The additional faculty in the data science portions are currently covered by CS, Math, Statistics, and IS.

Additional Funds

Will the proposed program require a large outlay of additional funds by the institution?

No

Institutional Funding

Please explain institutional funding for proposed program:

The current institutional funding model encompasses the courses required for this concentration. Therefore, no additional funds are needed for this program.

EP Documentation

EP Control Number	EP.25.009
Attach Rollback/Approval Notices	ep_25009_letter from AJ Schmidt_20240815.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

DOE Approval Date

Effective Date:

Attached Document Justification for this request

Program Reviewer Comments

Brooke Newell (bsnewell) (09/25/23 3:31 pm): Rollback: Email sent to Dallas, Laura, and Ashley

Brooke Newell (bsnewell) (10/16/23 8:13 am): Rollback: Email sent to Dallas, Ashley, and Laura

Brooke Newell (bsnewell) (05/17/24 12:04 pm): Rollback: Email sent to Dallas, Laura, and Ashley

Key: 1194

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

September 22, 2023

To Whom It May Concern,

I am writing to indicate the strong support of the Department of Computer Science for the proposal to create a BS in Materials Science and Engineering + Data Science.

Blended degree programs like this have proven to be extremely popular and given the demand for data science education amongst students, this new degree will meet an urgent need.

The Department of Computer Science agrees to provide seats for students in this program in the following courses:

- CS 107: Data Science Discovery
- CS 277: Algorithms and Data Structures for Data Science
- CS 307: Modeling and Learning in Data Science

We intend to offer CS 107 every Fall and Spring semester and CS 277 and CS 307 at least once a year to meet student demand.

Sincerely,

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

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Department of Mathematics, 273 Altgeld Hall
1409 W. Green St. (MC-382), Urbana, IL 60801

March 28, 2024

To whom it may concern:

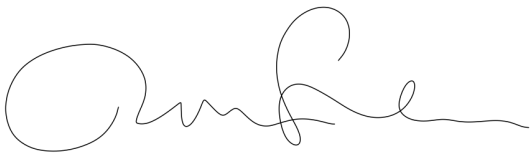
I am writing to indicate the support of the Department of Mathematics for the Material Science + DS proposal. These programs will provide students across the university with the opportunity to study data science along with a disciplinary specialization.

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

- MATH 220
- MATH 221
- MATH 231
- MATH 241
- MATH 257
- MATH 285

We will provide seats for X+DS students in these courses to meet demand. We are currently in the practice of running all of the courses listed above in both the Fall and Spring semesters, and plan to continue to do so.

Sincerely,



Vera Hur
Professor and Chair, Mathematics

UNIVERSITY OF ILLINOIS
AT URBANA–CHAMPAIGN

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

September 5, 2023

To Whom It May Concern,

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

- Materials Science & Engineering + Data Science

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

The Department of Statistics supports including STAT/CS/IS 107 (to be co-taught by Statistics and Computer Science) and STAT/CS 207 or STAT 212 in the data science core curriculum. We will provide seats for X + DS students in these courses starting in Fall 2024. We intend to offer STAT/CS/IS 107 every semester and other courses at least once a year.

Sincerely,

Bo Li
Professor and Department Chair
Department of Statistics
University of Illinois at Urbana-Champaign

telephone 217-333-2167 • *fax* 217-244-7190

ILLINOIS

SCHOOL OF INFORMATION SCIENCES
501 E. Daniel St., MC-493
Champaign, IL 61820-6211

September 21, 2023

Members of the Education Policy Committee:

I am writing to indicate the iSchool's support for the Materials Science and Engineering + Data Science BS degree.

This program will provide students with an opportunity to include data science, along with the disciplinary specialization. The School of Information Sciences will provide seats for all X + DS students in the courses that we contribute to the +DS program, which currently includes IS 467 and IS 477. Each of these courses will be offered at least once per academic year.

Sincerely,

Dr. Cathy Blake
Associate Dean for Academic Affairs

From: **Maghirang, Ronaldo G** ronaldom@illinois.edu
Subject: Re: New Materials Science and Engineering + Data Science BS program (ABE)
Date: September 6, 2023 at 4:55 PM
To: Trinkle, Dallas dtrinkle@illinois.edu
Cc: Boone, Anne M aboone@illinois.edu

Dear Dallas,

Thank you for reaching out. I am writing to express support for the inclusion of our courses in the new proposed Materials Science and Engineering + Data Science BS program. However, I'd like to note that ABE 482, Package Engineering, has not been offered for several years.

Best regards,
Ronaldo

On Sep 5, 2023, at 1:58 PM, Trinkle, Dallas <dtrinkle@illinois.edu> wrote:

Dear Ronaldo Maghirang,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following elective courses

ABE 446 Biological Nanoengineering
ABE 482 Package Engineering
ABE 483 Engineering Properties of Food Materials

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1–2 students enrolled in the elective courses controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle

From: **Nair, Satish K** snair@illinois.edu
Subject: Re: New Materials Science and Engineering + Data Science BS program (BIOC + BIOP)
Date: September 13, 2023 at 12:02 PM
To: Trinkle, Dallas dtrinkle@illinois.edu
Cc: Neff, Alison Marie hantak@illinois.edu

Dear Dr. Trinkle,

Biochemistry approves the addition of BIOC446 and BIOP401 to the newly proposed major provided that enrollment does not exceed 2-3 students per year. Students outside of Biochemistry will likely not be allowed to enroll in BIOC455 given the limited number of seats available. Thank you,

Satish Nair

Satish K. Nair, Ph.D.
Head and Gregorio Weber Chair, Department of Biochemistry
Director, Center for Biophysics & Quantitative Biology
Co-Director, Macromolecular CryoEM and MicroED Facility
Member, Institute for Genomic Biology
Affiliate, Materials Research Laboratory
University of Illinois Urbana-Champaign
600 S. Mathews Ave
Urbana, IL 61801

From: Trinkle, Dallas <dtrinkle@illinois.edu>
Sent: Tuesday, September 5, 2023 1:58 PM
To: Nair, Satish K <snair@illinois.edu>
Cc: Neff, Alison Marie <hantak@illinois.edu>
Subject: New Materials Science and Engineering + Data Science BS program (BIOC + BIOP)

Dear Satish K. Nair,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following elective courses

BIOC 446 Physical Biochemistry
BIOC 455 Technqs Biochem & Biotech
BIOP 401 Introduction to Biophysics

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1–2 students enrolled in the elective courses controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email

Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle
Associate Head for Undergraduate Programs

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering
Associate Head, Materials Science and Engineering
The Grainger College of Engineering
308 Materials Science
1304 W. Green
Urbana, IL 61801
217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

From: **Anastasio, Mark A** maa@illinois.edu
Subject: Re: New Materials Science and Engineering + Data Science BS program (BIOE)
Date: September 13, 2023 at 2:37 PM
To: Trinkle, Dallas dtrinkle@illinois.edu
Cc: Reck, Rebecca rreck@illinois.edu, Darling, Maddie darling4@illinois.edu

Hi Dallas,

Got it.

In that case, the Department of Bioengineering will be happy for you to list BIOE 476 and 479.

Please let me know if this email suffices or you require a formal letter.

Best,
Mark

MARK ANASTASIO
Donald Biggar Willett Professor in Engineering
Head, Department of Bioengineering
Affiliate Professor, Department of Computer Science
Affiliate Professor, Department of Electrical and Computer Engineering
Affiliate Professor, Carle Illinois College of Medicine
Member, Beckman Institute for Advanced Science and Technology

University of Illinois Urbana-Champaign
Department of Bioengineering | The Grainger College of Engineering
1406 W. Green Street | 1102G Everitt Lab, MC 278 | Urbana, IL 61801
(P) 217.300.0314 | maa@illinois.edu
https://bioengineering.illinois.edu/
Lab Website: https://anastasio.bioengineering.illinois.edu

> On Sep 13, 2023, at 2:19 PM, Trinkle, Dallas <dtrinkle@illinois.edu> wrote:
>
> Thanks for the information. As all of the courses we're talking about are electives (from a large menu that students will choose to satisfy a few requirements--in our case, we allow students to use these courses as "topical lectures" in materials science and engineering), we are not asking for any guaranteed seats. Regarding prerequisites, it's up to the students to ensure that they have satisfied the prerequisites before enrolling, and BIOE206 for example would count as a technical elective if a student takes it. Thanks; --d
>
> --
> DALLAS TRINKLE
> Ivan Racheff Professor of Materials Science and Engineering
> Associate Head, Materials Science and Engineering
> The Grainger College of Engineering
> 308 Materials Science
> 1304 W. Green
> Urbana, IL 61801
> 217.244.6519 | dtrinkle@illinois.edu
> dtrinkle.matse.illinois.edu
>
>
>
> > On Sep 13, 2023, at 2:06 PM, Anastasio, Mark A <maa@illinois.edu> wrote:
> >
> > Dear Dallas,
> >
> > I have found out the following information about the courses you mention below:
> >
> > - BIOE 416 Biosensors – Owned by ECE
> > - BIOE 461 Cellular Biomechanics – Owned by TAM
> > - BIOE 476 Tissue Engineering – This is a required part of our core and has BIOE206 and MCB150 listed as prerequisites. It will also be elective for our NE and CS+BIOE majors. Until we have an idea of the demand from all three of our own programs, it will be difficult to guarantee any seats at this time.
> > - BIOE 479 Cancer Nanotechnology – This is an elective for us and has BIOE206 listed as a prerequisite. Will MatSE + DS students have the opportunity to satisfy this prerequisite?
> >
> > Please let me know your thoughts and we'd be happy to discuss more about how we can support your

Please let me know your thoughts and we'd be happy to discuss more about how we can support your proposal.

Thanks,
Mark

MARK ANASTASIO
Donald Biggar Willett Professor in Engineering
Head, Department of Bioengineering
Affiliate Professor, Department of Computer Science
Affiliate Professor, Department of Electrical and Computer Engineering
Affiliate Professor, Carle Illinois College of Medicine
Member, Beckman Institute for Advanced Science and Technology

University of Illinois Urbana-Champaign
Department of Bioengineering | The Grainger College of Engineering
1406 W. Green Street | 1102G Everitt Lab, MC 278 | Urbana, IL 61801
(P) 217.300.0314 | maa@illinois.edu
https://bioengineering.illinois.edu/
Lab Website: https://anastasio.bioengineering.illinois.edu

> On Sep 13, 2023, at 11:30 AM, Trinkle, Dallas <dtrinkle@illinois.edu> wrote:
>
> Hello; I wanted to follow up on my email below. This is an important step in proposing our new BS program; campus requires us to have acknowledgement from all departments that are offering classes we count as electives towards the degree, and we cannot proceed to college review until all of the letters have been received. Please let me know if there are any additional questions I can answer; the electives are the same ones that our current MatSE BS students can take to satisfy an elective.
>
> Thanks, and do let me know if there's any additional information I can provide. I'm looking forward to your positive response to this request. Thanks; --d
>
> --
> DALLAS TRINKLE
> Ivan Racheff Professor of Materials Science and Engineering
> Associate Head, Materials Science and Engineering
> The Grainger College of Engineering
> 308 Materials Science
> 1304 W. Green
> Urbana, IL 61801
> 217.244.6519 | dtrinkle@illinois.edu
> dtrinkle.matse.illinois.edu
>
>
>
> > On Sep 5, 2023, at 1:58 PM, Trinkle, Dallas <dtrinkle@illinois.edu> wrote:
> >
> > Dear Mark A. Anastasio,
> >
> > I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following elective courses
> >
> > BIOE 416 Biosensors
> > BIOE 461 Cellular Biomechanics
> > BIOE 476 Tissue Engineering
> > BIOE 479 Cancer Nanotechnology
> >
> > in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1-2 students enrolled in the elective courses controlled by your unit listed above.
> >
> > Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.
> >
> > Thank you,
> > Dallas R. Trinkle
> > Associate Head for Undergraduate Programs
> >
> > --

From: **Popovics, John S** johnpop@illinois.edu
Subject: RE: New Materials Science and Engineering + Data Science BS program (CEE)
Date: September 5, 2023 at 10:55 PM
To: Trinkle, Dallas dtrinkle@illinois.edu, Barros, Ana barros@illinois.edu

Hi Dallas:

Here I respond on behalf of the Civil and Environmental Engineering Department. We are glad to support your request to include our two classes -- CEE401 and CEE460 -- in your proposed MSE + DS program.

There will be no problem with CEE401 as the pre-requisite is CEE300/TAM324, which is essentially equivalent to your MSE280 (assuming the MSE+DS students will take that course). But I am a bit concerned about CEE460. The is essentially a structural design course, with very little materials science content. Furthermore, 460 has CEE 360 (structural engineering) as a pre-req., and I am sure almost none of your students will take that.

If you are looking for another CEE course that has materials science content to include in your MSE+DS program, I suggest CEE405 (asphalt materials), which basically is an applied polymers course. Students with MSE280 background would be fine in that course, and the CEE department would support its inclusion.

Please let me know if you would like to discuss further or if you have any questions.

Best regards,
John
****
John S. Popovics, Ph.D., P.E.
Professor and Associate Head and Director of Undergraduate Studies
The University of Illinois at Urbana-Champaign
johnpop@illinois.edu
+1 217.244.0843 - voice

-----Original Message-----
From: Trinkle, Dallas <dtrinkle@illinois.edu>
Sent: Tuesday, September 5, 2023 1:59 PM
To: Barros, Ana <barros@illinois.edu>
Cc: Popovics, John S <johnpop@illinois.edu>
Subject: New Materials Science and Engineering + Data Science BS program (CEE)

Dear Ana P. Barros,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following elective courses

CEE 401 Concrete Materials
CEE 460 Steel Structures I

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1-2 students enrolled in the elective courses controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle
Associate Head for Undergraduate Programs

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering Associate Head, Materials Science and Engineering The Grainger College of Engineering
308 Materials Science
1304 W. Green
Urbana, IL 61801
217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

ILLINOIS

COLLEGE OF LIBERAL ARTS & SCIENCES

Department of Chemical & Biomolecular Engineering
114 Roger Adams Laboratory, MC-712
600 S. Mathews Ave.
Urbana, IL 61801

September 14, 2023

To Whom It May Concern,

I am writing to indicate the support by the Department of Chemical and Biomolecular Engineering on the use of the following CHBE courses for the new Material Science and Engineering + Data Science BS Program.

CHBE 458 Synthetic Nanomaterials
CHBE 472 Techniques in Biomolecular Eng
CHBE 473 Biomolecular Engineering
CHBE 475 Tissue Engineering

Please let us know if you require any further assistance and best of luck in the implementation of your new program.

Sincerely,

Christopher V. Rao
Ray and Beverly Mentzer Professor and Head
Chemical and Biomolecular Engineering

From: **Sweedler, Jonathan V** jsweedle@illinois.edu
Subject: New Materials Science and Engineering + Data Science BS program (CHEM)
Date: September 7, 2023 at 10:35 AM
To: Spinner, Todd spinner@illinois.edu, Trinkle, Dallas dtrinkle@illinois.edu
Cc: Axelson, Jordan Cole axelson2@illinois.edu

Hello Dallas,

Thank you for the details below. I have consulted with Todd Spinner and Eric Oldfield (head of our courses and curricula committee) in the department and both do not see this as causing any issues for the Chemistry Department. Thus, we support the new program.

According to Todd Spinner, the extra enrollment in our general chemistry sections should not be an issue. Most engineering students take some kind of chemistry. The two courses that may have some issues:

> CHEM 436 Fundamental Organic Chem II (elective) is only offered in the spring. It has a prerequisite of CHEM 236 and CHEM 237; or CHEM 232 and CHEM 233 with consent of instructor. So students have to take the organic chemistry as well as the lab in order to take CHEM 436.
>
> CHEM 483 Solid State Structural Anlys (elective) has a Prerequisite: CHEM 442 or consent of instructor. CHEM 442 has a lot of prerequisites to take as well but many of them are likely to be taken by engineering students.
>
> Thus if students want to take those courses, they would need to plan ahead and obtain those prerequisites prior to taking either CHEM 436 or 483.
>
> Also, those classes are typically restricted to majors until a certain point after the end of advanced registration so there is no guarantee that there will be seats for students. However, looking at last spring, those two classes did have seats available so it may not be too big of a problem.

Given the number of students you mention, we do not foresee issues with these.

Jonathan

My working day may not be your working day. Please do not feel obligated to reply outside of your normal working hours

Jonathan V. Sweedler
(he, him, his)

James R. Eiszner Family Endowed Chair in Chemistry
Acting Head, Department of Chemistry
Professor of Neuroscience and Molecular & Integrative Physiology
Center for Advanced Study Professor
Professor of the College of Medicine, the Beckman Institute and the Institute of Genomic Biology
Editor-in-Chief, Analytical Chemistry

600 S. Mathews Ave., 63-5

600 S. Mathews Ave., 83-5
Urbana IL 61801 USA
(t) 217 244 7359 jsweedle@illinois.edu https://chemistry.illinois.edu/jsweedle

---

From: Trinkle, Dallas <dtrinkle@illinois.edu>
Sent: Tuesday, September 5, 2023 1:58 PM
To: Sweedler, Jonathan V <jsweedle@illinois.edu>
Cc: Axelson, Jordan Cole <axelson2@illinois.edu>
Subject: New Materials Science and Engineering + Data Science BS program (CHEM)

Dear Jonathan V. Sweedler,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following required and elective courses

CHEM 102 General Chemistry I (required)
CHEM 103 General Chemistry Lab I (required)
CHEM 104 General Chemistry II (required)
CHEM 105 General Chemistry Lab II (required)
CHEM 436 Fundamental Organic Chem II (elective)
CHEM 483 Solid State Structural Anlys (elective)

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect 10 students enrolled in the required courses, and about 1-2 students enrolled in the elective courses controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle
Associate Head for Undergraduate Programs

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering
Associate Head, Materials Science and Engineering
The Grainger College of Engineering
308 Materials Science
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217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

ILLINOIS

THE GRAINGER COLLEGE OF ENGINEERING
Department of Electrical & Computer Engineering
2120 Electrical & Computer Engineering Building, MC-702
306 N. Wright St.
Urbana, IL 61801-2991

To: Prof. Dallas Trinkle, Assoc. Head
Materials Science and Engineering
Dtrinkle.matse@illinois.edu

From: Prof. Bruce Hajek, Head Bruce Hajek
Department of Electrical and Computer Engineering
RE: ECE Courses included in the proposed new BS program
Date: September 13, 2023

I acknowledge and approve of the inclusion of the following required course and elective courses offer by ECE in the new Materials Science and Engineering + Data Science BS. The required course (ECE 205) and electives are the same ones that your current MatSE BS students can take to satisfy an elective.

ECE 205 Electrical and Electronic Circuits (required)

ECE 340 Semiconductor Electronics
ECE 380 Biomedical Imaging
ECE 414 Biomedical Instrumentation
ECE 415 Biomedical Instrumentation Lab
ECE 441 Physcs & Modeling Semicond Dev
ECE 443 LEDs and Solar Cells
ECE 444 IC Device Theory & Fabrication
ECE 472 Biomedical Ultrasound Imaging
ECE 481 Nanotechnology
ECE 485 MEMS Devices & Systems
ECE 487 Intro Quantum Electr for EEs
ECE 488 Compound Semicond & Devices
ECE 495 Photonic Device Laboratory

From: **Makela, Jonathan** jmakela@illinois.edu
Subject: Re: New Materials Science and Engineering + Data Science BS program (ENG)
Date: September 11, 2023 at 2:30 PM
To: Trinkle, Dallas dtrinkle@illinois.edu

Dear Professor Trinkle,

I write to acknowledge that we are looking forward to working with you to support the additional 10 students per year in the proposed MatSE+DS undergraduate degree program in ENG 100: Engineering Orientation. We anticipate being able to accommodate them in existing sections of this course dedicated to MatSE students, perhaps requiring the addition of one section depending on actual enrollments.

Regards,
Jonathan

JONATHAN J. MAKELA
Associate Dean for Undergraduate Programs, The Grainger College of Engineering
Abel Bliss Professor of Engineering, Department of Electrical and Computer Engineering
University of Illinois Urbana-Champaign

206 Engineering Hall
1308 W. Green St.
Urbana, IL 61801
Phone: (217) 333-2280
Fax: (217) 244-4974

http://airglow.ece.illinois.edu/

From: Trinkle, Dallas <dtrinkle@illinois.edu>
Date: Tuesday, September 5, 2023 at 1:59 PM
To: Makela, Jonathan <jmakela@illinois.edu>
Subject: New Materials Science and Engineering + Data Science BS program (ENG)

Dear Jonathan Makela,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following required course

ENG 100 Grainger Engineering Orientation Seminar

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect 10 students enrolled in the required course controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle
Associate Head for Undergraduate Programs

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering
Associate Head, Materials Science and Engineering
The Grainger College of Engineering
308 Materials Science
1304 W. Green
Urbana, IL 61801
217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

From: **Shamma, Jeff** jshamma@illinois.edu
Subject: Re: New Materials Science and Engineering + Data Science BS program (IE + SE)
Date: September 13, 2023 at 4:39 PM
To: Trinkle, Dallas dtrinkle@illinois.edu, Craddock, Heidi hcraddoc@illinois.edu
Cc: Beck, Carolyn L beck3@illinois.edu

Thanks, Heidi, for the follow up.

@Dallas: ISE is glad to accommodate a small number of additional students in IE431 and SE412 in support of the proposed Materials Science and Engineering + Data Science major.

Best regards,
-Jeff

Jeff S. Shamma
Department Head, Industrial and Enterprise Systems Engineering
Professor and Jerry S. Dobrovolny Chair
University of Illinois at Urbana-Champaign
Editor-in-Chief, IEEE Transactions on Control of Network Systems

From: Trinkle, Dallas <dtrinkle@illinois.edu>
Date: Wednesday, September 13, 2023 at 4:32 PM
To: Craddock, Heidi <hcraddoc@illinois.edu>
Cc: Shamma, Jeff <jshamma@illinois.edu>, Beck, Carolyn L <beck3@illinois.edu>
Subject: Re: New Materials Science and Engineering + Data Science BS program (IE + SE)

Thanks. I need at a minimum an email from the head saying they approve. I don't need a letter unless you are interested in making it more formal. Thanks; —d

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering
Associate Head, Materials Science and Engineering
The Grainger College of Engineering
308 Materials Science
1304 W. Green
Urbana, IL 61801
217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

On Sep 13, 2023, at 3:45 PM, Craddock, Heidi <hcraddoc@illinois.edu> wrote:

<hcraddoc@illinois.edu> wrote:

Dallas,

Thank you for the follow up. We are approving a small number of students enrolling in IE 431 and SE 412 for elective choices. Do you need a letter from ISE stating that this is approved?

Best,
Heidi

HEIDI CRADDOCK
Director of Undergraduate Programs

The Grainger College of Engineering
Industrial and Enterprise Systems Engineering

1270C Digital Computer Laboratory
1304 Springfield Ave
Urbana, IL 61801
217.244.3855 I hcraddoc@illinois.edu

-----Original Message-----
From: Trinkle, Dallas <dtrinkle@illinois.edu>
Sent: Wednesday, September 13, 2023 11:30 AM
To: Shamma, Jeff <jshamma@illinois.edu>
Cc: Beck, Carolyn L <beck3@illinois.edu>; Craddock, Heidi <hcraddoc@illinois.edu>
Subject: Re: New Materials Science and Engineering + Data Science BS program (IE + SE)

Hello; I wanted to follow up on this. This is an important step in proposing our new BS program; campus requires us to have acknowledgement from all departments that are offering classes we count as electives towards the degree, and we cannot proceed to college review until all of the letters have been received. Please let me know if there are any additional questions I can answer; the electives are the same ones that our current MatSE BS students can take to satisfy an elective.

Thanks, and do let me know if there's any additional information I can

provide. I'm looking forward to your positive response to this request. Thanks; --d

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering
Associate Head, Materials Science and Engineering The Grainger College of Engineering
308 Materials Science
1304 W. Green
Urbana, IL 61801
217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

> On Sep 5, 2023, at 4:23 PM, Shamma, Jeff <jshamma@illinois.edu> wrote:
>
> Thanks, Dallas, for reaching out. Let me pass this by our undergraduate office.
>
> -Jeff
>
> **********
> ****
> **********
>
> Jeff S. Shamma
>
> Department Head, Industrial and Enterprise Systems Engineering
>
> Professor and Jerry S. Dobrovolny Chair University of Illinois at
>
> Urbana-Champaign Editor-in-Chief, IEEE Transactions on Control of
>
> Network Systems
> **********
> **********
>
> From: Trinkle, Dallas <dtrinkle@illinois.edu>
>
> Date: Tuesday, September 5, 2023 at 1:59 PM
>
> To: Shamma, Jeff <jshamma@illinois.edu>
>
> Cc: Beck, Carolyn L <beck3@illinois.edu>

Subject: New Materials Science and Engineering + Data Science BS

program (IE + SE) Dear Jeff Shamma,

I am writing on behalf of the Materials Science and Engineering

department to request a letter of support to add the following

elective courses

IE 431 Design for Six Sigma

SE 412 Nondestructive Evaluation

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1-2 students enrolled in the elective courses controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,

Dallas R. Trinkle

Associate Head for Undergraduate Programs

--

DALLAS TRINKLE

Ivan Racheff Professor of Materials Science and Engineering Associate

Head, Materials Science and Engineering The Grainger College of

Engineering

308 Materials Science

1304 W. Green

Urbana, IL 61801

217.244.6519 | dtrinkle@illinois.edu

dtrinkle.matse.illinois.edu

From: **Sinha, Sanjiv** sanjiv@illinois.edu
Subject: Re: New Materials Science and Engineering + Data Science BS program (ME + TAM)
Date: September 5, 2023 at 2:10 PM
To: Trinkle, Dallas dtrinkle@illinois.edu
Cc: Jacobi, Anthony M a-jacobi@illinois.edu

Dear Dallas,

I am writing to confirm MechSE's support of the proposed new degree program with the caveat that in cases where a course exceeds its enrollment limits, MechSE will prioritize its own students. Among the courses you list, I expect this to apply mainly to ME 487 which already runs at capacity. Further, MechSE does not guarantee the frequency of offering these elective courses. ‘

Regards,

Sanjiv.

SANJIV SINHA
Professor and Associate Head for Undergraduate Programs
Mechanical Science & Engineering
University of Illinois at Urbana-Champaign

Rm 2115, Mechanical Eng Lab
105 S Mathews Avenue
Urbana, IL 61801

Tel: 217-244-1891
Fax: 217-244-6534

> On Sep 5, 2023, at 1:59 PM, Trinkle, Dallas <dtrinkle@illinois.edu> wrote:
>
> Dear Tony Jacobi,
>
> I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following elective courses
>
> ME 431 Mechanical Component Failure
> ME 432 Fundamentals of Photovoltaics
> ME 472 Introduction to Tribology
> ME 482 Musculoskel Tissue Mechanics
> ME 483 Mechanobiology
> ME 487 MEMS-NEMS Theory & Fabrication
> TAM 451 Intermediate Solid Mechanics
> TAM 456 Experimental Stress Analysis
>
> in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1-2 students enrolled in the elective courses controlled by your unit listed above.
>
> Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.
>
> Thank you,
> Dallas R. Trinkle
> Associate Head for Undergraduate Programs
>
> --
> DALLAS TRINKLE
> Ivan Racheff Professor of Materials Science and Engineering
> Associate Head, Materials Science and Engineering
> The Grainger College of Engineering
> 308 Materials Science
> 1304 W. Green
> Urbana, IL 61801

From: **Uddin, Rizwan** rizwan@illinois.edu
Subject: RE: New Materials Science and Engineering + Data Science BS program (NPRE)
Date: September 5, 2023 at 9:39 PM
To: Trinkle, Dallas dtrinkle@illinois.edu
Cc: Kozlowski, Tomasz txk@illinois.edu

Dear Dallas,
We have no objection to MatSE including NPRE 470 in the tech elective list for its MatSE+DS BS degree.

Regards

Rizwan

-----Original Message-----
From: Trinkle, Dallas <dtrinkle@illinois.edu>
Sent: Tuesday, September 5, 2023 2:00 PM
To: Uddin, Rizwan <rizwan@illinois.edu>
Cc: Kozlowski, Tomasz <txk@illinois.edu>
Subject: New Materials Science and Engineering + Data Science BS program (NPRE)

Dear Rizwan Uddin,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following elective course

NPRE 470 Fuel Cells & Hydrogen Sources

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect about 1–2 students enrolled in the elective course controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle
Associate Head for Undergraduate Programs

--
DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering Associate Head, Materials Science and Engineering The Grainger College of Engineering
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217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

From: **Grosse Perdekamp, Matthias** mgp@illinois.edu
Subject: RE: New Materials Science and Engineering + Data Science BS program (PHYS)
Date: September 5, 2023 at 4:05 PM
To: Trinkle, Dallas dtrinkle@illinois.edu
Cc: Chemla, Yann Robert ychemla@illinois.edu

Dear Dallas,

Physics supports this new degree program (New Materials Science and Engineering+ Data Science).
Best,
Matthias

-----Original Message-----
From: Trinkle, Dallas <dtrinkle@illinois.edu>
Sent: Tuesday, September 5, 2023 2:00 PM
To: Grosse Perdekamp, Matthias <mgp@illinois.edu>
Cc: Chemla, Yann Robert <ychemla@illinois.edu>
Subject: New Materials Science and Engineering + Data Science BS program (PHYS)

Dear Matthias Grosse Perdekamp,

I am writing on behalf of the Materials Science and Engineering department to request a letter of support to add the following required and elective courses

PHYS 211 University Physics: Mechanics (required) PHYS 212 University Physics: Elec & Mag (required) PHYS 214 Univ Physics: Quantum Physics (required) PHYS 485 Atomic Phys & Quantum Theory (elective) PHYS 486 Quantum Physics I (elective) PHYS 487 Quantum Physics II (elective)

in the new proposed Materials Science and Engineering + Data Science BS. This program is expected to enroll approximately 10 students per year, and we would expect 10 students enrolled in the required courses, and about 1-2 students enrolled in the elective courses controlled by your unit listed above.

Please do not hesitate to let me know if you have any questions. Otherwise, I would ask that you please respond to this email acknowledging your support for the new program as it would impact your unit.

Thank you,
Dallas R. Trinkle
Associate Head for Undergraduate Programs

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DALLAS TRINKLE
Ivan Racheff Professor of Materials Science and Engineering Associate Head, Materials Science and Engineering The Grainger College of Engineering
308 Materials Science
1304 W. Green
Urbana, IL 61801
217.244.6519 | dtrinkle@illinois.edu
dtrinkle.matse.illinois.edu

Materials Science & Engineering + Data Science, BS

for the degree of Bachelor of Science in Materials Science & Engineering + Data Science

Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence. Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. See the corresponding section on the Degree and General Education Requirements. MSE 307 and MSE 308 will satisfy technical core requirements and the Campus General Education Advanced Composition requirement.

Free Electives: Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree.

First Year			
FIRST SEMESTER	**HOURS**	**SECOND SEMESTER**	**HOURS**
MSE 182	2	MSE 183 (Optional, recommended)	1
MATH 221 (MATH 220 may be substituted)	4	MATH 231	3
CHEM 102	3	CHEM 104	3
CHEM 103 (Optional, recommended)	1	CHEM 105 (Optional, recommended)	1
ENG 100	1	PHYS 211	4
Composition I *or* CS 107	4	CS 107 *or* Composition I	4
	15		**16**
Second Year			
FIRST SEMESTER	**HOURS**	**SECOND SEMESTER**	**HOURS**
MSE 201	3	MSE 206	4
MATH 241	4	MATH 285	3
MATH 257	3	ECE 205	3
PHYS 212	4	PHYS 214	2
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	STAT 207	4
	17		**16**

Third Year			
FIRST SEMESTER	**HOURS**	**SECOND SEMESTER**	**HOURS**
MSE 307	3	MSE 308	3
MSE 401	3	MSE 304 or MSE 405	3
MSE 406	3	MSE 402	3
CS 277	4	CS 307	4
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	Free elective	2
	16		**15**
Fourth Year			
FIRST SEMESTER	**HOURS**	**SECOND SEMESTER**	**HOURS**
MSE 404 (Each section of MSE 404 is 1.5 hours. Students take 2 unique sections of MSE 404 for 3 hours.)	3	MSE 404 (Each section of MSE 404 is 1.5 hours. Students take 2 unique sections of MSE 404 for 3 hours.)	3
IS 467	3	IS 477	3
MSE 494	1	MSE 495	2
Topical Lecture	3	Topical Lecture	3
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	General Education course (choose a Humanities or Social/Behavioral Science course)	3
Language Other Than English (3rd level) course	4	Free elective	2
	17		**16**

Code	Title	Hours
Total Hours all semesters		**128**

Course List

Orientation and Professional Development

ENG 100 Grainger Engineering Orientation Seminar credit: 1 Hour.
Introduces students to the Grainger College of Engineering and their respective departments. Students will explore the academic environment at Illinois, developing skills that will aid in learning both inside and outside the classroom, build their leadership and collaborative skills, and build community inside and outside the classroom. Through class discussion and assignments, students will explore campus resources, examine and set goals for academic, personal, and professional development, and develop skills to work in diverse teams through a class project.

MSE 183 Introductory Materials Science and Engineering Laboratory credit: 1 Hour.
Team-based laboratory developing concepts introduced in MSE 182. Practical descriptions of materials concepts, literature research, experimental design, concept validation, teamwork, and presentation of results. Prerequisite: MSE 182.

Foundational Mathematics and Science

CHEM 102 General Chemistry I credit: 3 Hours.
For students who have some prior knowledge of chemistry. Principles governing atomic structure, bonding, states of matter, stoichiometry, and chemical equilibrium. Credit is not given for both CHEM 102 and CHEM 202. CHEM 102 and CHEM 103 are approved for General Education credit only as a sequence. Both courses must be completed to receive Natural Science and Technology credit. Prerequisite: Credit in or exemption from MATH 112; one year of high school chemistry or equivalent. All students enrolled in CHEM 102 should also enroll in CHEM 103.
This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences

CHEM 103 General Chemistry Lab I credit: 1 Hour.
Laboratory studies to accompany CHEM 102. Additional fees may apply. See Class Schedule. Credit is not given for both CHEM 103 and CHEM 203. CHEM 102 and CHEM 103 are approved for General Education credit only as a sequence. Both courses must be completed to receive Natural Science and Technology credit. Prerequisite: Credit or concurrent registration in CHEM 102 is required.
This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences

CHEM 104 General Chemistry II credit: 3 Hours.
Lecture and discussions. Chemistry of materials, including organic and biological substances, chemical energetics and equilibrium, chemical kinetics, and electrochemistry. Credit is not given for both CHEM 104 and CHEM 204. Prerequisite: CHEM 102 or CHEM 202 or advanced placement credit for one semester of college-level chemistry.
This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences

CHEM 105 General Chemistry Lab II credit: 1 Hour.
Laboratory studies to accompany CHEM 104. Additional fees may apply. See Class Schedule. Credit is not given for both CHEM 105 and CHEM 205. Prerequisite: CHEM 102 and CHEM 103; credit or concurrent registration in CHEM 104 is required. This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences

MATH 221 Calculus I credit: 4 Hours.

First course in calculus and analytic geometry for students with some calculus background; basic techniques of differentiation and integration with applications including curve sketching; antidifferentation, the Riemann integral, fundamental theorem, exponential and trigonometric functions. Credit is not given for both MATH 221 and either MATH 220 or MATH 234. Prerequisite: An adequate ALEKS placement score as described at http://math.illinois.edu/ALEKS/ and either one year of high school calculus or a minimum score of 2 on the AB Calculus AP exam.
This course satisfies the General Education Criteria for:
Quantitative Reasoning I

MATH 231 Calculus II credit: 3 Hours.
Second course in calculus and analytic geometry: techniques of integration, conic sections, polar coordinates, and infinite series. Prerequisite: MATH 220 or MATH 221.
This course satisfies the General Education Criteria for: Quantitative Reasoning I

MATH 241 Calculus III credit: 4 Hours.
Third course in calculus and analytic geometry including vector analysis: Euclidean space, partial differentiation, multiple integrals, line integrals and surface integrals, the integral theorems of vector calculus. Credit is not given for both MATH 241 and MATH 292. Prerequisite: MATH 231.
This course satisfies the General Education Criteria for: Quantitative Reasoning II

MATH 257 Linear Algebra with Computational Applications credit: 3 Hours.
Introductory course incorporating linear algebra concepts with computational tools, with real world applications to science, engineering and data science. Topics include linear equations, matrix operations, vector spaces, linear transformations, eigenvalues, eigenvectors, inner products and norms, orthogonality, linear regression, equilibrium, linear dynamical systems and the singular value decomposition. Credit is not given for both MATH 257 and any of MATH
125, MATH 225, MATH 227, MATH 415 or ASRM 406. Prerequisite: MATH 220 or MATH 221; CS 101 or equivalent programming experience.

MATH 285 Intro Differential Equations credit: 3 Hours.
Techniques and applications of ordinary differential equations, including Fourier series and boundary value problems, and an introduction to partial differential equations. Intended for engineering majors and others who require a working knowledge of differential equations. Credit is not given for both MATH 285 and any of MATH 284, MATH 286, MATH 441. Prerequisite: MATH 241.
This course satisfies the General Education Criteria for: Quantitative Reasoning II

PHYS 211 University Physics: Mechanics credit: 4 Hours.
Newton's Laws, work and energy, static properties and fluids, oscillations, transverse waves, systems of particles, and rotations. A calculus-based approach for majors in engineering, mathematics, physics and chemistry. Credit is not given for both PHYS 211 and PHYS 101. Prerequisite: Credit or concurrent registration in MATH 231.
This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences Quantitative Reasoning II

PHYS 212 University Physics: Elec & Mag credit: 4 Hours.
Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance, circuits, magnetic forces and fields, Ampere's law, induction, electromagnetic waves, polarization, and geometrical optics. A calculus-based approach for majors in engineering, mathematics, physics, and chemistry. Credit is not given for

both PHYS 212 and PHYS 102. Prerequisite: PHYS 211; credit or concurrent registration in MATH 241. This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences Quantitative Reasoning II

PHYS 214 Univ Physics: Quantum Physics credit: 2 Hours.
Interference and diffraction, photons and matter waves, the Bohr atom, uncertainty principle, and wave mechanics. A calculus-based course for majors in engineering, mathematics, physics, and chemistry. Credit is not given for both PHYS 214 and PHYS 102. Prerequisite: PHYS 212.
This course satisfies the General Education Criteria for:
Nat Sci & Tech - Phys Sciences
Quantitative Reasoning II

Materials Science and Engineering with Data Science Technical Core

PHYS 212 University Physics: Elec & Mag credit: 4 Hours.
Coulomb's Law, electric fields, Gauss' Law, electric potential, capacitance, circuits, magnetic forces and fields, Ampere's law, induction, electromagnetic waves, polarization, and geometrical optics. A calculus-based approach for majors in engineering, mathematics, physics, and chemistry. Credit is not given for both PHYS 212 and PHYS 102. Prerequisite: PHYS 211; credit or concurrent registration in MATH 241. This course satisfies the General Education Criteria for: Nat Sci & Tech - Phys Sciences Quantitative Reasoning II

MSE 182 Introduction to MatSE credit: 2 Hours.
Overview of MatSE as a basis for understanding how structure, property, and processing relationships are developed and used for different types of materials. Case studies of advances in new materials and processes illustrating the role of materials in modern society. Laboratory-discussion demonstrations and experiments. Design-team analysis or synthesis of objects that use materials creatively.

ECE 205 Electrical and Electronic Circuits credit: 3 Hours.
ECE 205 is an introductory course on circuit analysis and electronics for non-majors in engineering. The course includes bi-weekly electronics lab experiments designed to provide students with hands-on experience. Basic principles of circuit analysis and DC circuits; time-domain analysis of 1st and 2nd order linear circuits; complex numbers, phasors, AC steady-state analysis; frequency response; op-amp, diode, and BJT circuits; logic gates and digital logic circuits. Credit is not given to Computer or Electrical Engineering majors. Credit is not given to Computer or Electrical Engineering majors.
Prerequisite: PHYS 212.

MSE 201 Phases and Phase Relations credit: 3 Hours.
Understanding microstructure. Quantitative examination of phases (crystalline and non-crystalline structures) and the relationships between phases (phase diagrams). Commercial practices for producing desired microscopic phase configurations and macroscopic shapes (processing). Credit is not given for both MSE 201 and MSE 280. Prerequisite: MSE 182; credit or concurrent enrollment
in CHEM 104, MATH 231 and PHYS 211.

MSE 206 Mechanics for MatSE credit: 4 Hours.
Statics and mechanics of materials concepts pertinent to the fields of materials science and engineering: force resultants; stresses and strains produced in elastic bodies; microscopic effects of different loading states (tension, compression, torsion, and bending) on deformable bodies; beam stresses and

deflections; three-dimensional stresses and strains. Credit is not given for both MSE 206and TAM 251. Prerequisite: MATH 241 and PHYS 211. Credit or concurrent enrollment in CS 101 or CS 124 or CS 125; and MATH 225or 257 or MATH 415; and MSE 201.

MSE 307 Materials Laboratory I credit: 3 Hours.
Experiments using optical microscopy and various thermal and thermodynamic measuring techniques including differential scanning calorimetry. Experience with laboratory test instruments and technical communication, including reports and oral presentations. MSE 307 and MSE 308 are approved for General Education credit only as a sequence. Both courses must be completed to receive Advanced Composition credit. Prerequisite: Credit or concurrent registration in MSE 201 and MSE 401.
This course satisfies the General Education Criteria for: Advanced Composition

MSE 308 Materials Laboratory II credit: 3 Hours.
Experiments characterizing mechanical, transport, and electronic properties of materials and the use of optical microscopy, quartz crystal microbalance, and various mechanical testing equipment. Technical communication is refined through the use of lab reports and oral
presentations. MSE 307 and MSE 308 are approved for General Education credit only as a sequence. Both courses must be completed to receive Advanced Composition credit. Prerequisite: Credit or concurrent registration in MSE 307 and MSE 406.
This course satisfies the General Education Criteria for: Advanced Composition

MSE 304 Electronic Properties of Matls credit: 3 Hours.
Electronic structure and bonding of materials, electrical conduction in metals and semiconductors, and dielectric and magnetic properties of solids. Credit is not given for both MSE 304 and PHYS 460. Prerequisite: PHYS 214.

MSE 405 Microstructure Determination credit: 3 Hours.
Fundamentals and applications of various forms of microscopy and diffraction for characterization of physical microstructure of materials and of various forms of spectroscopy for characterization of chemical microstructure. 3 undergraduate hours. 3 graduate hours.
Prerequisite: MSE 201, MATH 285 and PHYS 214.

MSE 401 Thermodynamics of Materials credit: 3 Hours.
Basic thermodynamic principles including energy, entropy, and free energy; macroscopic properties of hard and soft materials systems, such as equilibrium states, phases, and phase transitions. Application of phase diagrams. Statistical interpretation of thermodynamics on the atomistic level. 3 undergraduate hours. 3 graduate hours. Credit is not given for both MSE 401 and CHEM 444 or PHYS 427.
Prerequisite: MSE 201 or MSE 280; credit or concurrent registration in MATH 285.

MSE 402 Kinetic Processes in Materials credit: 3 Hours.
Kinetics of chemical reactions; rate equations, reaction mechanisms; transport processes; diffusion equations, atomic and molecular diffusion; phase transformations; nucleation, crystallization, displacive, spinodal decomposition; surface and interface phenomena; sintering, grain growth, recovery, and recystallization. 3 undergraduate hours. 3 graduate hours. Prerequisite: MSE 201 and MSE 401.

MSE 406 Thermal-Mech Behavior of Matls credit: 3 Hours.
Fundamentals of elastic, viscoelastic and plastic deformation of materials, elementary theory of statics and dynamics of dislocations; strengthening mechanisms; behavior of composites; fracture and fatigue

behavior; fundamentals of thermal behavior: heat capacity, thermal expansion and conductivity; effects of thermal stress. 3 undergraduate hours. 3 graduate hours. Credit is not given for both MSE 406 and either ME 430 or TAM 424. Prerequisite: MSE 206; credit or concurrent registration in MSE 201 and 401.

MSE 404 Laboratory Studies in Materials Science and Engineering credit: 1.5 Hours.
Experiments include direct hands-on investigations or are performed through computational approaches. Laboratory experiences include both fundamental studies as well as investigations on more applied topics. 1.5 undergraduate hours. 1.5 graduate hours. May be repeated if topics vary. Prerequisite: MSE 307 and MSE 308 or permission of instructor. Senior standing.

Data Science Core

Mathematical Foundations

MATH 221 Calculus I credit: 4 Hours.
First course in calculus and analytic geometry for students with some calculus background; basic techniques of differentiation and integration with applications including curve sketching; antidifferentation, the Riemann integral, fundamental theorem, exponential and trigonometric functions. Credit is not given for both MATH 221 and either MATH 220 or MATH 234. Prerequisite: An adequate ALEKS placement score as described at http://math.illinois.edu/ALEKS/ and either one year of high school calculus or a minimum score of 2 on the AB Calculus AP exam.
This course satisfies the General Education Criteria for: Quantitative Reasoning I

MATH 227 Linear Algebra for Data Science credit: 3 Hours.
Linear algebra is the main mathematical subject underlying the basic techniques of data science. Provides a practical computer-based introduction to linear algebra, emphasizing its uses in analyzing data, such as linear regression, principal component analysis, and network analysis. Students will also explore some of the strengths and limitations of linear methods. Students will learn how to implement linear algebra methods on a computer, making it possible to apply these techniques to large data sets. Credit is not given for both MATH 227 and any of Math 125, MATH 225, MATH 257, MATH 415, or ASRM 406. Prerequisite: Assumes an introductory knowledge of Python, such as students acquire in STAT 107.

MATH 257 Linear Algebra with Computational Applications credit: 3 Hours.
Introductory course incorporating linear algebra concepts with computational tools, with real world applications to science, engineering and data science. Topics include linear equations, matrix operations, vector spaces, linear transformations, eigenvalues, eigenvectors, inner products and norms, orthogonality, linear regression, equilibrium, linear dynamical systems and the singular value decomposition. Credit is not given for both MATH 257 and any of MATH 125, MATH 225, MATH 227, MATH 415 or ASRM 406. Prerequisite: MATH 220 or MATH 221; CS 101 or equivalent programming experience.

Data Science Fundamentals

STAT 107 Data Science Discovery credit: 4 Hours.
Data Science Discovery is the intersection of statistics, computation, and real-world relevance. As a project-driven course, students perform hands-on-analysis of real-world datasets to analyze and

discover the impact of the data. Throughout each experience, students reflect on the social issues surrounding data analysis such as privacy and design. Same as CS 107 and IS 107.
This course satisfies the General Education Criteria for:
Quantitative Reasoning I

STAT 207 Data Science Exploration credit: 4 Hours.
Explores the data science pipeline from hypothesis formulation, to data collection and management, to analysis and reporting. Topics include data collection, preprocessing and checking for missing data, data summary and visualization, random sampling and probability models, estimating parameters, uncertainty quantification, hypothesis testing, multiple linear and logistic regression modeling, classification, and machine learning approaches for high dimensional data analysis. Students will learn how to implement the methods using Python programming and Git version control. Prerequisite: STAT 107 or consent of instructor. This course satisfies the General Education Criteria for:
Quantitative Reasoning II

CS 307 Modeling and Learning in Data Science credit: 4 Hours.
Introduction to the use of classical approaches in data modeling and machine learning in the context of solving data-centric problems. A broad coverage of fundamental models is presented, including linear models, unsupervised learning, supervised learning, and deep learning. A significant emphasis is placed on the application of the models in Python and the interpretability of the results. Prerequisite: STAT 207; one of MATH 225, MATH 227, MATH 257, MATH 415, MATH 416, ASRM 406.

Computational Fundamentals

CS 277 Algorithms and Data Structures for Data Science credit: 4 Hours.
Introduction to elementary concepts in algorithms and classical data structures with a focus on their applications in Data Science. Topics include algorithm analysis (ex: Big-O notation), elementary data structures (ex: lists, stacks, queues, trees, and graphs), basics of discrete algorithm design principles (ex: greedy, divide and conquer, dynamic programming), and discussion of discrete and continuous optimization. Credit is not given for CS 277 if credit for CS 225 is earned. Prerequisite: STAT 207; one of MATH 220, MATH 221, MATH 234. CS 277 cannot be taken concurrently with CS 225.

Social Impact in Data Science

IS 467 Ethics and Policy for Data Science credit: 3 or 4 Hours.
The course will address common ethical challenges related to data including **privacy**, bias, and data access. These challenges will be explored through real-world cases of corporate settings, non-profits, governments, academic research, and healthcare. The course emphasizes the complexity of ethical decision-making and that trade-offs between priorities are often necessary. The course also considers how the burdens of addressing ethical concerns should be distributed among stakeholders. Students will be introduced to a range of relevant policy responses at the organizational, institutional, governmental, and supranational levels. 3 undergraduate hours. 4 graduate hours.

IS 477 Data Management, Curation & Reproducibility credit: 3 or 4 Hours.
Addresses issues in Data Management, Curation & Reproducibility from a Data Science perspective. We discuss definitions of data science, and then introduce and use the Data Science Life Cycle as an intellectual foundation. Topics include Research Artifact Identification and Management, Metadata, Repositories, Economics of Artifact Preservation and Sustainability, and Data Management Plans. We

use the case study to ground our discussions in both data sets and in specific data science research. This course requires a final project that applies course knowledge to a data science experiment and creates a data management plan for that experiment. 3 undergraduate hours. 4 graduate hours. Prerequisite: IS 205 or STAT 207 or equivalent programming experience.

Research or Discovery Experience

MSE 494 Materials Design Thinking credit: 1 Hour.
Introduction to design methodologies in the context of Materials Science and Engineering. Topics include Human Centered Design (HCD), Statistical Modeling, Design Tradeoffs, Material Selection, Materials Design, and Team Management. Development of design projects for implementation in a subsequent course (MSE 495). Understanding of objectives and constraints such as economic, manufacturability, environmental, ethical, health and safety, sustainability, social, and political concerns as they relate to project design. 1 undergraduate hour. No graduate credit. Prerequisite: MSE 308.

MSE 495 Materials Design credit: 2 Hours.
Continuation of MSE 494. Design teams evaluate alternatives, finalize concepts, model and analyze solutions, build and test a final product (physical or digital), and present the results professionally. Solutions are based on the knowledge, skills, and design experience acquired in earlier course work and incorporate realistic constraints. 2 undergraduate hours. No graduate credit. Prerequisite: Credit in MSE 494.

PASCAL BELLON
Professor

Education
Ph.D. - Mat'ls. Sci. - Univ. Paris-6 - 6/89
D.E.A. - Mat'ls. Sci. - Univ. Paris-6 - 6/84
Engr. Sch. - Elec. Engr. - Ecole Supérieure d'Electricité - 6/84

Academic experience
Interim Department Head (1/19-12/19)
Professor - University of Illinois (8/09-present)
Associate Professor - University of Illinois (8/02-8/09)
Assistant Professor - University of Illinois (8/96-8/02)
Visiting Researcher - University of Illinois (11/93-10/94)

Non-academic experience and consulting
Researcher - Atomic Energy Commission - 12/89-8/96
Researcher, 2nd Class - National Center for Scientific Research - 1/88-11/89
National Postdoctoral Association, Affiliate

Certifications, professional registrations, and patents

Professional registrations
American Physical Society
TMS Society

Honors and awards

Teaching
Named on the List of Teachers Ranked as Excellent by Their Students
Outstanding Advisors List
Outstanding Advisors' List
Outstanding Advisors' List
Outstanding Advisors' List

Research
Donald W. Hamer Professor, Materials Science and Engineering
COE Racheff Facuty Scholar
Invited Faculty, University of Lille, France
NSF CAREER Award

Service activities (institutional and professional)
May 2022, NSF-DMR: Review Panel
March 2022, DOE-BES: 1 proposal review
March 2021: NSF-DMR: 2 proposal reviews.
2022: 3 US tenure dossier evaluations
2021: ! full professor promotion evaluation, Germany

Publications and presentations (five most recent and important)
"Convection-induced compositional patterning at grain boundaries in irradiated alloys", G. F. Bouobda Moladje; R. S. Averback; P. Bellon; L. Thuinet, arXiv (2022).

"Strengthening of nanocrystalline Al using grain boundary solute additions: Effects of thermal annealing and ion irradiation", Sung Eun Kim; Nisha Verma; Sezer Özerinç; Soumyajit Jana ; Sourav Das; P. Bellon; R.S. Averback, Materialia, vol. 26, 101564 (2022).

"Role of interfaces on phase formation during severe plastic deformation", N. Pant, S. Das, P. Bellon, R.S. Averback, M. Krief, and Y. Ashkenazy, Acta Materialia vol. 240, 118333 (2022)

"Radiation-resistant binary solid solutions via vacancy trapping on solute clusters", C. Daniels, P. Bellon, R. S. Averback, Materialia, 20, 101261 (2021).

"Anisotropic Cahn-Hilliard free energy and interface energies for binary alloys with pairwise interactions", P. Bellon, Q. Li, Acta Materialia, 215, 117041 (2021).

"Role of interfaces on the trapping of He in 2D and 3D Cu-Nb nano composites", T. G. Lach, E. H. Ekiz, R. S. Averback, N. A. Mara, P. Bellon, J. Null. Mater. 466, 36-42 (2015).

“Sliding wear-induced chemical nanolayering in Cu-Ag, and its implications for high wear resistance”, F. Ren, S. N. Arshad, P. Bellon, R. S. Averback, M. Pouryazdan, H. Hahn, Acta Mater. 72, 148-158 (2014).

"Shear induced chemical mixing in heterogeneous systems," Y. Ashkenazy, N. Q. Vo, D. Schwen, R. S. Averback, P. Bellon, Acta. Mater. 60, 984-993 (2012).

“Nanoscale characterization of the transfer layer formed during dry sliding of Cu-15wt%Ni-8wt%Sn bronze alloy,” J. B.Singh, J.-G. Wen and P. Bellon, Acta Materialia, Vol. 56, pp. 3053-3064 (2008).

“Crossover from superdiffusive to diffusive mixing in plastically deformed solids,” P. Bellon, R. S. Averback, S. Odunuga, Y. Li, P. Krasnochtchekov, A. Caro, Phys. Rev. Lett. Vol. 99, 110602-4 (2007).

Recent professional development activities

AE3, Classroom observer, 2021-2022

AE3 "Teaching with tablet" presentation for Collins Scholars, 2019.

AE3 Annual promotion and tenure panel for Collins Scholars, 2019.

AE3 "Teaching with tablet" presentation for Collins Scholars, 2018.

AE3 "Teaching with tablet" presentation for Collins Scholars, 2017.

PAUL V. BRAUN

Professor / Director, Materials Research Laboratory

Education

Ph.D. - Materials Science and Engineering - University of Illinois U-C - 1998
B.S. - Materials Science and Engineering - Cornell University - 1993

Academic experience

University of Illinois - Grainger Distinguished Chair in Engineering, Materials Science and Engineering (8/20-present)
University of Illinois - Director, Materials Research Lab (6/16-present)
University of Illinois - Professor, Department of Chemistry (8/15-present)
University of Illinois, Professor, Department of Mechanical Sciences and Engineering (8/09-present)
University of Illinois - Ivan Racheff Professor, Materials Science and Engineering (10/11-8/20) 100%
University of Stuttgart, and Max Plank Institute for Solid-State Science, Stuttgart, Germany - Guest Professor (2/10-7/10)
University of Illinois - Professor, Materials Science and Engineering (8/09-10/11) 100%
University of Illinois - Faculty Affiliate, Department of Chemistry (12/06-08/15)
University of Illinois - Associate Professor, Materials Science and Engineering (8/05-8/09) 100%
University of Illinois - Group Leader, 3D Micro- and Nanosystems Group at the Beckman Institute (8/05-2018)
University of Illinois - Member of the Holonyak Micro and Nanoelectronics Laboratory (01/01-present)
University of Illinois - Member of the Beckman Institute (8/99 to present)
University of Illinois - Member of Materials Research Laboratory (8/99-present)
University of Illinois - Assistant Professor, Materials Science and Engineering (8/99-8/05) 100%
University of Illinois - Ivan Racheff Assistant Professor (8/99-8/01)

Non-academic experience and consulting

CTO, TearDX, Champaign, IL (2018-present)
CTO, Xerion Advanced Battery Corporation, Kettering, OH (2012-present)
Postdoctoral Member of Technical Staff, Bell Laboratories, Lucent Technologies, Murray Hill, NJ (9/98-8/99)
Graduate Research Assistant, Department of Materials Science and Engineering, University of Illinois-Urbana/Champaign (9/93-8/98)
Summer Intern, Martin Marietta/General Electric Company, Moorestown, NJ (Summers 91-93)
Xerion Advanced Battery Corporation, Kettering, OH
3M Corporation, St. Paul, MN
Autonomic Materials, Inc., Champaign, IL
UT Dots Inc., Champaign, IL

Certifications, professional registrations, and patents

Patents

(PENDING) US20200010946A1, “Ferrous structural component for use in fouling and corrosive environments, and method of making and using a ferrous structural component,” Jessica A. Krogstad, Paul V. Braun, Pralav P. Shetty and Seyed Soheil Daryadel, January 9, 2020. (Application US16/460,05)

(PENDING) “Chemical Force Driven Concentration for Amplified Detection of Chemical Agents,” U.S. Provisional Application No. 62/451,389, filed January 27, 2017.

(PENDING) “High Efficiency LCD Design Based on an Advanced Optical Design,” US CIP Provisional Application 2016-017-01(PRO), filed April 12, 2016.

Honors and awards

Teaching

Young Alumnus Award, Department of Materials Science and Engineering Alumni Board
Named on List of Teachers Ranked as Excellent by Their Students
Accenture Engineering Council Award for Excellence in Advising
Accenture Multi-year Faculty Achievement Award, College of Engineering, UIUC
Accenture Engineering Council Award for Excellence in Advising

Research

Elected Fellow, National Academy of Inventors (NAI)
American Association for the Advancement of Science (AAAS) Fellow
Grainger Distinguished Chair in Engineering, University of Illinois
Materials Research Society Fellow
Visiting Lecturer Award of the Chemistry Promotion Center, Ministry of Science and Technology, Taiwan

Service activities (institutional and professional)

Electrochemical Society
Named Professor Committee 2020-2021, Chair 2022-2023
Faculty Awards: 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021, 2021-2022, 2022-2023
Advisory Board for Device, May 2023
Editorial Board for Electron, February 2023

Publications and presentations (five most recent and important)

PUBLISHED ON THE WEB

C.A. Richards, C.R. Ocier, D. Xie, H. Gao, T. Robertson, L.L. Goddard, R.E. Christiansen, D. G. Cahill and P.V. Braun, Hybrid achromatic microlenses with high numerical apertures and focusing efficiencies across the visible, Nature Communications, 14, 1, 3119 (2023). DOI: 10.1038/s41467-023-38858-y

D. Xie, W. Li, C.A. Richards, H. Gao, C. Chen, N. Miljkovic, S. Fan, S.N. Joshi, and P.V. Braun, Thermally Responsive Hydrogels for Passive Temperature Regulation under Direct Sunlight, Advanced Photonics Research, 4, 4, 2200253 (2023). DOI: 10.1002/adpr.202200253

A. Littlefield, D. Xie, C.A. Richards, C.R. Ocier, H. Gao, J.F. Messinger, L. Ju, J.Gao, L. Edwards, P.V. Braun and L.L. Goddard, Enabling High Precision Gradient Index Control in Subsurface Multiphoton Lithography, ACS Photonics (2023). DOI: 10.1021/acsphotonics.2c01950

J. Huang, N. Ramlawi, G. Sheridan, R. Ewoldt, P. Braun, and C. Evans, Dynamic Covalent Bond Exchange Enhances Penetrant Diffusion in Dense Vitrimers, Macromolecules, 56, 3, 1253-1262 (2023). DOI: 10.1021/acs.macromol.2c02547

A.A. Kulkarni, E. Hanson, R. Zhang, K. Thornton, and P.V. Braun, Archimedean lattices emerge in template-directed eutectic solidification, Nature, 577, 355-358 (2020). DOE 10.1038/s41586-019-1893-9

H. Zhang, H. Ning, J. Busbee, Z. Shen, C. Kiggins, Y. Huang, J. Eaves, J. Davis, T. Shi, Y.-T. Shao, J.-M. Zuo, X. Hong, Y. Chen, S. Wang, P. Wang, P. Sun, S. Xu, J. Liu, and P.V. Braun, Electroplating Lithium Transition Metal Oxides, Science Advances, 3, e1602427 (2017). DOI: 10.1126/sciadv.1602427

H. Zhang and P.V. Braun: Three-dimensional Metal Scaffold Supported Bicontinuous Silicon Battery Anodes, Nano Letters, 12, 2778-2783 (2012). DOI: dx.doi.org/10.1021/nl204551m

E.C. Nelson, N. Dias, K. Bassett, S. Dunham, V. Verma, M. Miyake, P. Wiltzius, J. Rogers, J. Coleman, X. Li and P.V. Braun: Epitaxial growth of three-dimensionally architectured optoelectronic devices, Nature Materials, 10, 676-681 (2011). (cover) DOI: 10.1038/NMAT3071

H.-G. Zhang and P. V. Braun: Three-dimensional Bicontinuous Ultrafast Charge and Discharge Bulk Battery Electrodes, Nature Nanotechnology, 6, 277-281 (2011). DOI: 10.1038/NNANO.2011.38

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

DAVID CAHILL

Professor / co-Director IBM-Illinois Discovery Accelerator Institute

Education

Ph.D. Physics, Cornell University, 1989
B.S. Engineering Physics, Ohio State University, 1984

Academic experience

co-Director IBM-Illinois Discovery Accelerator Institute, University of Illinois - (2021-present)
Grainger Distinguished Chair in Engineering, University of Illinois - (2020-present)
Visiting Professor, Pritzker School of Molecular Engineering, University of Chicago - (2020)
Advisory Professor, Center for Phononics and Thermal Energy Science, Tongji University, Shanghai, China -(2014-present)
Head of Department - Department of Materials Science and Engineering, University of Illinois - (2010-2018)
Willett Professor of Engineering. College of Engineering, University of Illinois - (2005-2020)
Professor - Department of Materials Science and Engineering, University of Illinois - (2002-present)
Visiting Scholar, Mechanical Engineering Dept., University of California, Berkeley (1998)
Associate Professor - Department of Materials Science and Engineering, University of Illinois - (1997-2002)
Assistant Professor - Department of Materials Science and Engineering, University of Illinois - (1991-1997)

Non-academic experience and consulting

Postdoctoral Research Associate, IBM Watson Research Center (1989-91)
Graduate Research Assistant, Cornell University (1984-1989)
Winchester Technology, 2021-2022
Electroninks, 2021
Materials Characterization Services, 2019-2022
Diamond Foundry, 2019-2022
Evatec, 2016-2017; 2020-2021
Linseis, 2014-2018
Sheetak Inc., 2009, 2019-2020
Western Digital Corporation, 2008-2011; 2021
Precision Instruments and Measurement Company, 2007-2008; 2010; 2014-2016, 2018-2020; 2023
Balzers AG, later Oerlikon Balzers, 2003-2006, 2011, 2019, 2021, 2023
Seagate Technology, 2002-2009; 2015-2016; 2021; 2022

Certifications, professional registrations, and patents

Patents

US patent application 16264376, Gaohua Zhu, Qiye Zheng, Debasish Banerjee, David G. Cahill, Ni-Mn based Heusler alloys for thermal regulation applications (2020)
US patent 7182510 B2, David G. Cahill, Apparatus and method for measuring thermal conductivity (2007)

Honors and awards

Research

Paul G. Klemens Award, International Conference on Phonon Scattering in Condensed Matter
Elected member, American Academy of Arts and Sciences, Engineering and Technology Section
Grainger Distinguished Chair in Engineering, College of Engineering, University of Illinois at Urbana-Champaign
Tau Beta Pi Daniel C. Drucker Eminent Faculty Award, College of Engineering, University of Illinois at Urbana-Champaign
Fellow, American Association for the Advancement of Science, Section on Engineering

Service activities (institutional and professional)

Ad-hoc named appointment review committee, chair 2021
Faculty development committee, chair 2020-2021
Teaching Evaluation Committee, 2019-2020
Advisory Committee, 2019-2020, 2020-2021
NSF CAREER review panel (2020)

Publications and presentations (five most recent and important)

Hyeuk Jin Han, Sushant Kumar, Xiaoyang Ji, James L. Hart, Gangtae Jin, David J. Hynek, Quynh P. Sam, Vicky Hasse, Claudia Felser, David G. Cahill, Ravishankar Sundararaman, Judy J. Cha, "Topological metal MoP nanowire for interconnect," Adv. Mater., in press.
Darshan Chalise and David G. Cahill, "Highly sensitive and high throughput magnetic resonance thermometry using superparamagnetic nanoparticles," Phys. Rev. Appl., in press.
Jinchi Sun, Guangxin Lv, and David G. Cahill, "Frequency-domain probe beam deflection method for measurement of thermal conductivity of materials on micron length scale," Rev. Sci. Instrum. 94, 014903 (2023).
Guangxin Lv, Chengtian Shen, Naisong Shan, Elynn Jensen, Xiaoru Li, Christopher M. Evans, and David G. Cahill, "Odd-even effect on the thermal conductivity of liquid crystalline epoxy resins," PNAS 119, e2211151119 (2022).
Zhe Cheng, Jianbo Liang, Keisuke Kawamura, Hidetoshi Asamura, Hiroki Uratani, Samuel Gra-ham, Yutaka Ohno, Yasuyoshi Nagai, Naoteru Shigekawa, and David G. Cahill, "High thermal conductivity in wafer-scale cubic silicon carbide crystals," Nature Comm. 13, 1–9 (2022).

Recent professional development activities

4/00 AE3 Teaching College, Listening to Your Students
1/24-1/25/92 Dean's Seminars on Teaching and its Improvement: Starting to Teach Well
10/15/92 Dean's Seminars on Teaching and its Improvement: Improving Your Lecturing
1/25/94 Dean's Seminars on Teaching and its Improvement: Using Early Student Feedback
11/8/94 Dean's Seminars on Teaching and its Improvement: Teaching Ethics

QING CAO
Associate Professor

Education

Ph.D. degree in Materials Chemistry from University of Illinois at Urbana-Champaign, January 2009.
B.S. degree in Chemistry from Nanjing University, China, June 2004.

Academic experience

University of Illinois at Urbana-Champaign, Urbana, IL. (October 2018-prsent) Associate Professor of Materials Science and Engineering, with affiliated appointments in Chemistry, Electrical and Computer Engineering, Seitz Materials Research Lab, and Holonyak Micro & Nanotechnology lab.

Non-academic experience and consulting

IBM Thomas J. Watson Research Center,Yorktown Heights, NY. (February 2009−October2018) Research Staff Member

Certifications, professional registrations, and patents

Patents

Q. Cao, Z.-W. Li, F. Liu, and Z. Zhang, "Techniques for fabricating Janus MEMS transistors," U.S. Patent No. US 8614136 B1.
Q. Cao, D.-C. Guo, S.-J. Han, Y. Lu, and K. K. H. Wong, "Transistor employing vertically stacked self-aligned carbon nanotubes," U.S. Patent No. US 8772782 B2.
Q. Cao, Z.-W. Li, F. Liu, and Z. Zhang, "Janus complementary MEMS transistors and circuits," U.S. Patent No. US 8847287 B1.

Honors and awards

Research

Forbes Magazine "30 under 30" list of rising stars in Science and Healthcare
I.B.M. Corporation Outstanding Technical Achievement Award
"All-Star Alumni" of Forbes 30 Under 30s
I.B.M. Research Division Award
U.S. Frontiers of Engineering by National Academy of Engineering

Service activities (institutional and professional)

MatSE Department Faculty Search Committee
Graduate Student Admission Committee
Faculty Award Committee
Curriculum Committee
H-MNTL Director Search Committee

Publications and presentations (five most recent and important)

S.-P. Bi, C.-Y. Wang, Q. Cao, and C.-H. Zhang, "Studies on the mechanism of hydrolysis and polymerization of aluminum salts in aqueous solution: correlations between the 'Core-Links' Model and 'Cage-Like' Keggin-Al13 Model," Coord. Chem. Rev. 248(5), 441-455 (2004).
Q. Miao, Q. Cao, and S.-P. Bi, "Density functional theory study on the bridge structure in dimeric aluminum (III) water complexes," J. Chem. Phys. 121(10), 4650-4656 (2004).

X.-F. Long, D.-S. Li, N. Wang, C.-H. Zhang, Q. Cao, T.-C. Xian, and S.-P. Bi, "A novel and sensitive method for recognition and indirect determination of AlIII in biological fluid based on the quenching of resonance Rayleigh scattering intensities of 'AlIII-EV-DNA' complexing system," Spectroc. Acta Pt. A-Molec. Biomolec. Spectr. 69(1), 142-147 (2008).

F.-P. Zhang, Q. Cao, J.-J. Cheng, C.-H. Zhang, N. An, and S.-P. Bi, "Electrochemical and spectrometric studies of double-strand calf thymus gland DNA denatured by Al(III) at neutral pH," Anal. Sci. 25(8), 1019-1023 (2009).

C.-J. Wang, Q. Cao, T. Ozel, A. Gaur, J. A. Rogers, and M. Shim, "Electronically selective chemical functionalization of carbon nanotubes: correlation between Raman spectral and electrical responses," J. Am. Chem. Soc. 127(32), 11460-11468 (2005).

Q. Cao, H.-S. Kim, N. Pimparkar, J. P. Kulkarni, C. Wang, M. Shim, K. Roy, M. A. Alam, and J. A. Rogers, "Medium-scale carbon nanotube thin-film integrated circuits on flexible plastic substrates," Nature 454(7203), 495-500 (2008).

Q. Cao, S.-J. Han, G. S. Tulevski, Y. Zhu, D. D. Lu, and W. Haensch, "Arrays of single-walled carbon nanotubes with full surface coverage for high-performance electronics," Nature Nanotechnol. 8(3), 180-186 (2013).

Q. Cao, S.-J, Han, and G. S. Tulevski, "Fringing-field dielectrophoretic assembly of ultrahigh-density semiconducting nanotube arrays with a self-limited pitch," Nature Commun. 5, 5071 (2014).

Q. Cao, S.-J. Han, J. Tersoff, A. D. Franklin, Y. Zhu, Z. Zhang, G. S. Tulevski, J.-S. Tang, and W. Haensch, "End-bonded contacts for carbon nanotube transistors with low, size-independent resistance," Science 350(6256), 68-72 (2015).

Q. Cao, J. Tersoff, D. B. Farmer, Y. Zhu, and S.-J. Han, "Carbon nanotube transistors scaled to a 40-nanometer footprint," Science 356(6345), 1369-1372 (2017).

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

MARIE AGATHE CHARPAGNE
Assistant Professor

Education

M.Eng., Materials and Mechanics - *Ecole Nationale Superieure des Mines de Saint Etienne* (2013)
M.Sc., Energy, Materials and Processing - *Ecole Nationale Superieure des Mines de Saint Etienne* (2013)
PhD, Materials Science - *Mines ParisTech* (2017)

Academic experience

Adjunct assistant professor - *University of Illinois at Urbana-Champaign* (May-Aug 2021)
Postdoctoral researcher - *University of California Santa Barbara* (Feb 2017-Aug 2021)
Graduate student - *CEMEF Mines Paristech (Nov 2013-Dec 2016)*

Certifications, professional registrations, and patents

Professional registrations

Women In 3D printing member since 2022
ASM international member since 2020
TMS member since 2017

Honors and awards

American Chemical Society PRF DNI award
NSF CAREER award

Teaching

Teachers Ranked as Excellent

Research

2021 JOM editor's choice for A Multi-modal Data Merging Framework for Correlative Investigation of Strain Localization in Three Dimensions
Best PhD thesis award - Society for Metals and Materials (SF2M)

Public Service

"Rising Talent" of the Women's Forum for the economy and society
Key Reader Award, Metallurgical and Materials Transactions A

Service activities (institutional and professional)

TMS: High Temperature Alloys Committee: elected new secretary by the committee members in March 2023. typical trajectory is secretary for 1yr, vice-chair for 2 yrs and chair for 2 yrs.
Materials Colloquium Committee: Fall 2022, Spring 2023, Fall 2023 (lead)
Qualification Exams jury member, physical metallurgy, Spring 2022: 1 student, Spring 2023: 3 students, Summer 2023: 2 students
NASA reviewer: FINESST programs (2 proposals)
NSF SBIR Phase I/II review panel, 2022 (6 proposals)

Publications and presentations (five most recent and important)

***M.A. Charpagne**, P. Vennéguès, T. Billot, J.M. Franchet, N.Bozzolo, Evidence of multimicrometric coherent γ' precipitates in a hot-forged γ /γ' nickel-based superalloy, Journal of Microscopy 263-1, p.106-112 (2016)*

- ***M.A. Charpagne**, T. Billot, J.M. Franchet, N. Bozzolo, Heteroepitaxial recrystallization: A new mechanism discovered in a polycrystalline γ-γ' nickel based superalloy", Journal of Alloys and Compounds 688, p.685-694 (2016)*
- ***M.A. Charpagne**, T. Billot, J.M. Franchet, N. Bozzolo, Heteroepitaxial recrystallization observed in RENE 65™ and UDIMET 720™ : A new recrystallization mechanism possibly occurring in all low lattice mismatch γ /γ' Nickel based superalloys , Superalloys 2016 : 13th International Symposium on Superalloys, p. 417-426. (2016)*
- ***M.A. Charpagne**, J.M. Franchet., N. Bozzolo, Overgrown grains appearing during sub-solvus heat treatment in a polycrystalline gamma-gamma' Nickel-based superalloy, Materials and Design 144, p.353-360 (2017)*
- *B.R. Goodlet, L. Mills, B. Bales, **M.A. Charpagne**, S.P. Murray, W.C. Lenthe, L. Petzold, T.M. Pollock Elastic Properties of Novel Co and CoNi-Based Superalloys Determined through Bayesian Inference and Resonant Ultrasound Spectroscopy, Metallurgical and Materials Transaction A 49-6, p.2324-2339 (2018)*
- *JC Stinville, MA Charpagne, A Cervellon, S Hemery, F Wang, PG Callahan, V Valle, TM Pollock, On the origins of fatigue strength in crystalline metallic materials, Science vol. 377, issue 6610, p.1065-1071 (2022)*
- *J.C. Stinville, M.A. Charpagne, R. Maass, H. Proudhon, W. Ludwig, P.G. Callahan, F.Wang, I.J. Beyerlein, M.P. Echlin, T.M.Pollock, Insights into Plastic Localization by Crystallographic Slip from Emerging Experimental and Numerical Approaches, Annual Reviews of Materials Research (2023)*

Recent professional development activities

QIAN CHEN
Associate Professor

Education

2012 Ph.D. in Materials Science and Engineering, University of Illinois at Urbana-Champaign; Ph.D. Advisor: Prof. Steve Granick; Ph.D. Thesis: "Synthesis and self-assembly of multiblock Janus particles".
2007 B.S. in Chemistry, Peking University, China

Academic experience

2022-present Affiliated Faculty Carl R. Woese Institute for Genomic Biology
2021 Jan-present Associate Professor, Department of Materials Science and Engineering, Department of Chemistry (0%), Department of Chemical and Biomolecular Engineering (0%), University of Illinois at Urbana-Champaign
2019-present Affiliated Faculty, Carle Illinois College of Medicine, University of Illinois at Urbana-Champaign
2018-present Affiliated part-time faculty, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign
2015-2021 Assistant Professor, Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign
2015-present Affiliated Faculty, Materials Research Laboratory University of Illinois Urbana-Champaign
2012-2015 Miller Postdoctoral Fellow, University of California, Berkeley; Postdoc Advisor: Prof. A. Paul Alivisatos

Certifications, professional registrations, and patents

Patents

see B1H.3 in the above.

Honors and awards

Advisee: Ahyoung Kim, Schmidt Science Fellow
Advisee: Chang Liu, Oral Presentation Prize, Symposium SB05 “Emergent Order and Mesoscale Structure Formation in Soft Condensed Matter”, 2022 Fall MRS Meeting
Advisee: Oliver Lin, Government scholarship for studying aboard Ministry of Education of Taiwan
Advisee: Oliver Lin, Drickamer Fellowship, Department of Chemistry, UIUC
Advisee: Jiahui Li, PPG-MRL Graduate Research Assistantship, UIUC

Teaching

see 8.15 in the above: Teachers Ranked as Excellent by Their Students, University of Illinois at Urbana-Champaign

Research

See 8.1-8.9, 8.11-8.16, 8.16-8.19 in the above.

Service activities (institutional and professional)

Award Committee, Grainger College of Engineering (2022-present)
Beckman Institute Executive Committee (2021–present)
MatSE named lecture selection committee (chair, 2020-present)
MatSE faculty search committee (2018-present)

See C2.10 in the above.

Publications and presentations (five most recent and important)

Younan Xia, Qian Chen, and Uri Banin, "Introduction: Anisotropic Nanomaterials," Chemical Reviews 123, 3328 (2023)

Deborah Liu, Samyukta Shrivastav, Soheil Daraydel, Nathan Levandovsky, Hyosung An, Siddhesh Shevade, Qian Chen, Jessica A. Krogstad, Daniel V. Krogstad "Biofeedstock-induced metal corrosion: Reactions between carbon steel and triacylglycerol-based solutions at elevated temperature," Corrosion Science, 216, 111088 (2023)

Binbin Luo, Ziwei Wang, Tine Curk, Garrett Watson, Chang Liu, Ahyoung Kim, Zihao Ou, Erik Luijten,* Qian Chen* "Unravelling crystal growth of nanoparticles," Nature Nanotechnology (2023) DOI: 10.1038/s41565-023-01355-w

Dongsheng Li*, Qian Chen, Jaehun Chun, Kristen Fichthorn, James De Yoreo, Haimei Zheng, "Nanoparticle assembly and oriented attachment: Correlating controlling factors to the resulting structures," Chemical Reviews 123, 3127 (2023)

Zhiheng Lyu, Lehan Yao, Wenxiang Chen, Falon Kalutantirige, Qian Chen* "Electron microscopy studies of soft nanomaterials," Chemical Reviews 123, 4051 (2023)

Shan Zhou, Jiahui Li, Jun Lu, Haihua Liu, Ji-Young Kim, Ahyoung Kim, Lehan Yao, Chang Liu, Chang Qian, Zachary D. Hood, Xiaoying Lin, Wenxiang Chen, Thomas E. Gage, Ilke Arslan, Alex Travesset, Kai Sun, Nicholas A. Kotov*, Qian Chen*, "Chiral Assemblies of Pinwheel Superlattices on Substrates", Nature 612, 259 (2022)

Ahyoung Kim, Thi Vo, Hyosung An, Progna Banerjee, Lehan Yao, Shan Zhou, Chansong Kim, Delia J. Milliron, Sharon C. Glotzer,* Qian Chen* "Symmetry-breaking in patch formation on triangular gold nanoparticles by asymmetric polymer grafting," Nature Communications 13, 6774 (2022).

Wenxiang Chen, Xun Zhan, Renliang Yuan, Saran Pidaparthy, Adrian Xiao Bin Yong, Hyosung An, Zhichu Tang, Kaijun Yin, Arghya Patra, Heonjae Jeong, Cheng Zhang, Kim Ta, Zachary W. Riedel, Ryan M. Stephens, Daniel P. Shoemaker, Hong Yang, Andrew A. Gewirth, Paul V. Braun, Elif Ertekin, Jian-Min Zuo,* Qian Chen* "Formation and impact of nanoscopic oriented phase domains in electrochemical crystalline electrodes", Nature Materials 22, 92 (2023).

Hyosung An, John W. Smith, Bingqiang Ji, Stephen Cotty, Shan Zhou, Lehan Yao, Falon C. Kalutantirige, Wenxiang Chen, Zihao Ou, Xiao Su, Jie Feng, Qian Chen*, "Mechanism and performance relevance of nanomorphogenesis in polyamide films revealed by quantitative 3D imaging and machine learning" Science Advances 8, eabk1888 (2022)

Juyeong Kim, Zihao Ou, Matthew R. Jones, Xiaohui Song, Qian Chen, "Imaging the polymerization of multivalent nanoparticles in solution," Nature Communications, 8, 761 (2017).

Recent professional development activities

Collins Scholar AE3 program in College of Engineering (2015-2016)

ROSA M. ESPINOSA MARZAL

Professor

Education

PhD. (Materials Science and Engineering), Hamburg University of Technology (Germany), 2004

BEng. (Mechanical Engineering), Universidad Politecnica de Valencia (Spain), 1997

Academic experience

Professor (100%), Civil and Environmental Engineering Department, University of Illinois at Urbana-Champaign, 08/2020-present

Professor (0%), Institute for Genomics Biology, University of Illinois at Urbana-Champaign, 2020-present

Professor (0%), Materials Science and Engineering Department, University of Illinois at Urbana-Champaign, 2018-present

CAS Associate, Center for Advanced Study, University of Illinois at Urbana-Champaign, 2016-2017

Associate Professor NCSA (0%), National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, 2014-present

Associate Professor (100%), Civil and Environmental Engineering Department, University of Illinois at Urbana-Champaign, 10/2013-07/2020

Senior Scientist, Materials Science Department, ETH Zurich (Switzerland), 2009-2013

Postdoctoral Researcher, Civil and Environmental Engineering and Princeton Institute for the Science and Technology of Materials, Princeton University, 2007-2009

Postdoctoral Researcher, Institute of Materials, Physics and Chemistry of Buildings, Hamburg University of Technology (Germany), 2005-2007

Non-academic experience and consulting

Editorial Board of the journal Biotribology (Elsevier) since 2022.

Certifications, professional registrations, and patents

Professional registrations

Tribology and Lubrication Engineering Society, 2015-present

Association of Environmental Engineering and Science Professors, 2014-present

American Chemical Society, 2014-present

Honors and awards

Teaching

List of Teachers Ranked as Excellent by Their Students

Research

Donald Biggar Willett Faculty Scholar (The Grainger College of Engineering)

Deans Award for Excellence in Research (The Grainger College of Engineering)

Cutting Edge in Tribology & Lubrication Technology, Outstanding Paper Recognition

Excellence Faculty Scholar in Civil and Environmental Engineering.

CAS Associate (UIUC)

Public Service

Selected Vice-Chair 2024 and Chair 2026 Gordon Research Conference in Tribology

Outstanding Contribution to Membership Recruitment (Division of Colloid and Surface Chemistry, American Chemical Society)
Top reviewer for Tribology Letters (Springer), 2018

Service activities (institutional and professional)

Space committee, 2022-present
Advisory committee member to the Head, 2022-present
P&T committee member, 2021-present (not in 2022 due to sabbatical)
Executive committee to the Dean of CoE, 2022-present

Publications and presentations (five most recent and important)

Qianlu Zheng, Zachary A. H. Goodwin, Varun Gopalakrishnan, Alexis G. Hoane, Mengwei Han, Ruixian Zhang, Nathaniel Hawthorne, James D. Batteas, Andrew A. Gewirth, Rosa M. Espinosa- Marzal. Water in the electrical double layer of ionic liquids on graphene. ACS Nano (2023). https://doi.org/10.1021/acsnano.3c01043.

Zita Zachariah, Manfred Heuberger, Rosa Espinosa-Marzal. Colloidal Interactions – DLVO theory and beyond. ACS Book: 100 Years of Colloid and Surface Science (2023). Just accepted.

Rosa M. Espinosa-Marzal, Joaquin Yus, Jiheon Kwon. Reinforced Hydrogels via Mineralization: Next Generation Bioscaffold. JPhys Materials, IOP Publishing (2023). Just accepted.

RM Espinosa-Marzal, ZAH Goodwin, X Zhang, Q Zheng. Colloidal Interactions in Ionic Liquids–the electrical double layer inferred from ion layering and aggregation. ACS Book: 100 Years of Colloid and Surface Science (2023). Just accepted. https://chemrxiv.org/engage/chemrxiv/article-details/644c1b786ee8e6b5ed445527

Alex Deptula, Jessica Galera, Rosa Espinosa-Marzal. Control of surface morphology, adhesion and friction of colloidal gels with lamellar surface interactions. Advanced Functional Materials (2023) 2300896.

Y. Diao, G. Greenwood, M. C. Wang, S. Nam, R. M. Espinosa-Marzal. Slippery and Sticky Graphene in Water. ACS Nano (2019) 13(2), 2072-2082.

T. Shoaib, R. M. Espinosa-Marzal. Insight into the Viscous and Adhesive Contributions to Hydrogel Friction. Tribology Letters (2018) 66(96).

Y. Diao, R. M. Espinosa-Marzal. About how water lubricates faults. Nature Communications (2018) 9, 2309.

L.A. Jurado, R.M. Espinosa-Marzal. Molecular Insight into the Electrical Double Layer of an Ionic Liquid on Graphene. Scientific Reports (2017) 7, 4225.

Y. Diao, R.M. Espinosa-Marzal. Molecular Insight into the Nanoconfined Calcite-Solution Interface. Proceedings National Academy of Sciences (2016) 113(43), 12047-12052.

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

CHRIS EVANS

Associate Professor

Education

2008, Bachelor of Science in Chemistry, University of Minnesota
2008, Bachelor of Chemical Engineering, University of Minnesota
2013, PhD, Northwestern University

Academic experience

Associate Professor, Materials Science and Engineering, 2022-present
Affiliate, Chemical and Biomolecular Engineering, 2018-present
Beckman Institute for Advanced Science and Technology (0% appointment), 2016-present
Materials Research Laboratory (0% appointment), 2016-present
Assistant Professor, Materials Science and Engineering, 2016-present

Non-academic experience and consulting

University of California, Santa Barbara, June 2014-June 2016
Lawrence Berkeley National Lab, June 2013-June 2014

Certifications, professional registrations, and patents

Professional registrations

American Institute of Chemical Engineers, 2007-2016
American Chemical Society, 2010-present
Materials Research Society, 2019-present

Patents

"HYDROPHOBIC, SELF-HEALING COATING AND COATED SUBSTRATE, AND FABRICATION METHOD", filed November 2021
"Dynamic boron-based polymer networks for energy dissipation applications", filed February 2019
"Polymer network electrolyte for Li ion battery applications", filed September 2017

Honors and awards

ACS PMSE Young Investigator Award
3M Non-tenured Faculty Award
NSF CAREER Award
American Chemical Society: Petroleum Research Fund Doctoral New Investigator
APS Padden Award Finalist

Teaching

Teachers Ranked as Excellent

Service activities (institutional and professional)

Curriculum Committee, 2018- present (Chair in 2022)
Graduate College Summer Predoctoral Institute - Advised a student and judged posters for a summer research program for underrepresented students.
Middle School Girls Learning about Materials (mid-GLAM) day camp - Organized and developed demos on self-healing polymers and salt-water batteries.
Panel reviewer for NSF CBET: 2 panels

Reviewer for NSF-Division of Materials Research-Polymers (ad-hoc). Reviewed 8 proposals from December 2017-present

Publications and presentations (five most recent and important)

P. Lan, Q. Zhao, G. Lv, G. S. Sheridan, D. G. Cahill, C. M. Evans "Molecular-weight dependance of center-of-mass chain diffusion in polymerized ionic liquids" Macromolecules 2023, 56, 3383-3392

L. Porath, N. Ramlawi, J. Huang, M. T. Hossain, M. Derkaloustian, R. H. Ewoldt, C. M. Evans "Molecular design rules for imparting multiple damping modes in dynamic covalent polymer networks" ChemRxiv 2023

B. Mei, T. W. Lin, G. S. Sheridan, C. M. Evans, C. E. Sing, K. S. Schweizer "How segmental dynamics and mesh confinement determine the selective diffusivity of molecules in crosslinked dense polymer networks" ACS Central Science 2023, 9, 508-518

G. Lv, X. Li, E. Jensen, B. Soman, Y. H. Tsao, C. M. Evans, D. G. Cahill "Dynamic covalent bonds in vitrimers enable 1.0 W/(m K) intrinsic thermal conductivity" Macromolecules 2023, 56

J. Huang, N. Ramlawi, G. S. Sheridan, C. Chen, R. H. Ewoldt, P. V. Braun, C. M. Evans "Dynamic covalent bond exchange enhances penetrant diffusion in dense vitrimers" Macromolecules 2023, 56

L. Porath, C. M. Evans "Importance of broad temperature windows and multiple rheological approaches for probing viscoelasticity and entropic elasticity in vitrimers" Macromolecules 2021, 54, 4782-4791

Q. Zhao, C. M. Evans "Effect of molecular weight on viscosity scaling and ion transport in linear polymerized ionic liquids" Macromolecules 2021, 54, 3395-3404

B. B. Jing, C. M. Evans "Catalyst-free Dynamic Networks for Recyclable, Self-Healing Solid Polymer Electrolytes" Journal of the American Chemical Society 2019, 141, 18932-18937.

Q. Zhao, C. Shen, K. P. Halloran, C. M. Evans " Effect of Network Architecture and Linker Polarity on Ion Aggregation and Conductivity in Precise Polymerized Ionic Liquids" ACS Macro Letters 2019, 8, 658-663.

C. Shen, Q. Zhao, C. M. Evans "Ion Specific, Odd-Even Glass Transition Temperatures and Conductivities in Precise Network Polymerized Ionic Liquids" Molecular Systems Design and Engineering 2019, 4, 332-341.(Invited article)

Recent professional development activities

NSF CAREER mock panel, March 2017

Collins Scholar Teaching Fellow program, 2016-2017

AXEL HOFFMANN

Education

Ph.D., Physics, University of California – San Diego, 1999
Diplom, Physics, RWTH Aachen, Germany, 1994

Academic experience

Adjunct Professor, Texas A&M University, Physics, 2015-present
Professor, University of Illinois at Urbana-Champaign, Materials Science and Engineering, 2019–present

Non-academic experience and consulting

Postdoctoral Fellow, Los Alamos National Laboratory, Los Almost, NM, 1999–2001
Assistant Materials Scientist, Argonne National Laboratory, Lemont, IL, 2001–2005
Materials Scientist, Argonne National Laboratory, Lemont, IL, 2005–2014
Senior Group Leader, Argonne National Laboratory, Lemont, IL, 2014–2019
Associate Editor, Journal of Applied Physics, American Institute or Physics, 2009–present

Certifications, professional registrations, and patents

Patents

US Patent Application # 16/916,895 ”Super Resolution for Magneto-Optical Microscopy” M. C. S. Vogel, S. G. E. Te Velthuis, and A. F. Hoffmann,

- US Patent # 7,042,036 ”Magnetic memory using single domain switching by direct current” S.-H. Chung and A. F. Hoffmann
- US Patent # 7,323,113 ”Pattern transfer with self-similar sacrificial mask layer and vector magnetic field sensor” A. Hoffmann

Honors and awards

Research

Highly Cited Researcher for 2022, Web of Science Group
David Adler Lectureship Award in the field of Materials Physics, American Physical Society
Highly Cited Researcher for 2021, Web of Science Group
Highly Cited Researcher for 2020, Web of Science Group
Highly Cited Researcher for 2019, Web of Science Group

Public Service

Outstanding Referee, American Physical Society
Pacesetter Award, Argonne National Laboratory, Argonne, IL

Service activities (institutional and professional)

Associate Chair for Major Conferences, IEEE Magnetics Society, since 2017
Faculty Recruitment Committee, since 2020
Faculty Awards Committee, since 2020 (chair 2021–2022)
College Award Committee, since 2020 (chair: 2021–2022)
DFG panel, TRR, 2/2023

Publications and presentations (five most recent and important)

The effects of field history on magnetic skyrmion formation in [Pt/Co/Ir]3 multilayers, A. T. Clark, X. Wang, A. R. Stuart, Q. Wang, W. Jiang, J. E. Pearson, S. G. E. te Velthuis, A.

Hoffmann, X. M. Cheng, and K. S. Buchanan, Journal of Magnetism and Magnetic Materials 563, 169951 (2022).

Spin Transport Modified by Magnetic Order, A. Hoffmann, Journal of Magnetism and Magnetic Materials 563, 169896 (2022).

Topological spin memory of antiferromagnetically coupled skyrmion pairs in Co/Gd/Pt multilayers, X. Wang, A. R. Stuart, M. S. Swyt, C. M. Quispe Flores, A. T. Clark, A. Fiagbenu, R. V. Chopdekar, **P. N. Lapa**, Z. Xiao, D. Keavney, R. Rosenberg, M. Vogel, J. E. Pearson, S. G. E. te Velthuis, A. Hoffmann, K. S. Buchanan, and X. M. Cheng, Physical Review Materials 6, 084412 (2022).

Large Exotic Spin Torques in Antiferromagnetic Iron Rhodium, J. Gibbons, T. Dohi, V. P. Amin, F. Xue, H. Ren, J.-W. Xu, H. Arava, S. Shim, **H. Saglam**, Y. Liu, J. E. Pearson, N. Mason, A. K. Petford-Long, P. M. Haney, M. D. Stiles, E. E. Fullerton, A. D. Kent, S. Fukami, and A. Hoffmann, Physical Review Applied 18, 024075 (2022).

Dynamic fingerprints of synthetic antiferromagnet nanostructures with interfacial Dzyaloshinskii-Moriya interaction, M. Lonsky and A. Hoffmann, Journal of Applied Physics 132, 043903 (2022).

Strong Coupling between Magnons and Microwave Photons in On-Chip Ferromagnet-Superconducting Thin-Film Devices Y. Li, T. Polakovic, Y.-L. Wei, J. Xu, S. Lendinez, Z. Zhang, J. Ding, T. Khaire, H. Saglam, R. Divan, J. Pearson, W.-K. Kwok, Z. Xiao, V. Novosad, A. Hoffmann, and W. Zhang, Physical Review Letters 123, 107701 (2019).

Direct observation of the skyrmion Hall effect W. Jiang, X. Zhang, G. Yu, W. Zhang, M. B. Jungfleisch, J. E. Pearson, O. Heinonen, K. L. Wang, Y. Zhou, A. Hoffmann, and S. G. E. te Velthuis, Nature Physics 13, 162 (2017).

Antiferromagnetic Spin Seebeck Effect S. Wu, W. Zhang, A. KC, P. Borisov, J. E. Pearson, J. S. Jiang, D. Lederman, A. Hoffmann, and A. Bhattacharya, Physical Review Letters 116, 097204 (2016).

Blowing Magnetic Skyrmion Bubbles W. Jiang, P. Upadhyaya, W. Zhang, G. Yu, M. B. Jungfleisch, F. Y. Fradin, J. E. Pearson, Y. Tserkovnyak, K. L. Wang, O. Heinonen, S. G. E. te Velthuis, and A. Hoffmann, Science 349, 283 (2015).

Spin Hall Effects in Metallic Antiferromagnets W. Zhang, M. B. Jungfleisch, W. Jiang, J. E. Pearson, A. Hoffmann, F. Freimuth, and Y. Mokrousov, Physical Review Letters 113, 196602 (2014).

Recent professional development activities

Attended several conference and workshops in 2022 including Joint MMM-Intermag, APS March Meeting, Magnonics 2022, Trends in Magnetism, Spin Argentina, IEEE International Electron Devices Meeting

Participated in the 2022 Illinois Summer Teaching Institute

Attended several conference and workshops in 2021 including MRS Spring Meeting, NSF Emerging Opportunities at the Interception of Quantum and Thermal Science, IEEE NMDC

Participated in the 2021 Illinois Summer Teaching Institute

Attended several conferences and workshops in 2020 including 2020 MMM conference, Devices Research conference, Workshop Emergent Quantum Materials and Technologies, and Workshop on Magnetism and Magnetic Materials: From Basic Physics to Magnonics

PINSHANE HUANG
Associate Professor

Education

PhD, Cornell University, Applied and Engineering Physics
MS, Cornell University, Applied and Engineering Physics
BA, Carleton College, Department of Physics (with Distinction)

Academic experience

Affiliate Faculty, University of Illinois, Materials Research Laboratory, 2015-present
Affiliate Faculty, University of Illinois, Beckman Institute, 2016-present
Assistant Professor, University of Illinois, Department of Materials Science and Engineering, 2015-2020
Associate Professor, University of Illinois, Department of Materials Science and Engineering, 2021-present
Ivan Racheff Faculty Scholar, University of Illinois, Department of Materials Science and Engineering, 2022-present

Non-academic experience and consulting

Postdoctoral Fellow, Columbia University, Department of Chemistry 2014-2015; Advisors: Louis Brus, Abhay Pasupathy

Certifications, professional registrations, and patents

Professional registrations

Patents

Patent application filed "DEFORMABLE ELECTRONIC DEVICE AND METHOD OF MAKING A DEFORMABLE ELECTRONIC DEVICE" 17/226,331 Filing date: April 9, 2021
Provisional patent application filed U.S. Patent Application No.: 63/008,463 Title: “ULTRASOFT SLIP-MEDIATED BENDING IN FEW-LAYER GRAPHENE” Filing date: April 10, 2020

Honors and awards

Teaching

Rose Award for Teaching Excellence
The Grainger College of Engineering Teaching Excellence Award
Illinois Student Government Teaching Excellence Award
List of Teachers Ranked as Excellent by Their Students for MSE 182: Introduction to Materials Science
List of Teachers Ranked as Excellent by Their Students for MSE 481: Electron Microscopy

Research

Dean's Award for Excellence in Research
Presidential Early Career Award for Scientists and Engineers
Kavli Fellow of the National Academy of Sciences
NSF CAREER Award
Highly Cited Researchers List 2018, Clarivate Analytics

Service activities (institutional and professional)

Microscopy Society of America Tour Speaker (2022-present)
Committee Member: Microscopy Society of America Microscopy & Microanalysis Awards Committee (2022-present)
MatSE Graduate Awards Committee (2016-present); Committee Chair (2020-present)
Diversity Advocate: MatSE Graduate Admissions Committee (2019-2020)
Grant Reviewer for: DOE

Publications and presentations (five most recent and important)

Khan, A., Lee, C.-H., Huang, P. Y. & Clark, B. K. Leveraging generative adversarial networks to create realistic scanning transmission electron microscopy images. npj Computational Materials 9, 85 (2023).

Chen, D., Zhuang, H., Chen, M., Huang, P. Y., Vlcek, V. & Jiao, Y. Disordered hyperuniform solid state materials. Applied Physics Reviews 10 (2023).

Han, E., Nahid, S. M., Rakib, T., Nolan, G., Ferrari, P. F., Hossain, M. A., Schleife, A., Nam, S., Ertekin, E., van der Zande, A. M. & Huang, P. Y. Bend-Induced Ferroelectric Domain Walls in α-In2Se3. ACS Nano 17, 7881-7888 (2023).

Nguyen, K. X., Huang, J., Karigerasi, M. H., Kang, K., Cahill, D. G., Zuo, J.-M., Schleife, A., Shoemaker, D. P. & Huang, P. Y. Angstrom-scale imaging of magnetization in antiferromagnetic Fe2As via 4D-STEM. Ultramicroscopy 247, 113696 (2023).

Lee, C. H., Ryu, H., Nolan, G., Zhang, Y., Lee, Y., Oh, S., Cheong, H., Watanabe, K., Taniguchi, T., Kim, K., Lee, G. H. & Huang, P. Y. In Situ Imaging of an Anisotropic Layer-by-Layer Phase Transition in Few-Layer MoTe(2). Nano Lett 23, 677-684 (2023).

Kharel, P., Janicek, B. E., Bae, S. h., Loutris, A. L., Carmichael, P. T. & Huang, P. Y. Atomic-Resolution Imaging of Small Organic Molecules on Graphene. Nano Letters 22, 3628-3635 (2022).

Karigerasi, M. H. et al. High-resolution diffraction reveals magnetoelastic coupling and coherent phase separation in tetragonal CuMnAs. Physical Review Materials 6, 094405 (2022). doi:10.1103/PhysRevMaterials.6.094405 (2022).

Yu, J., Han, E., Hossain, M. A., Watanabe, K., Taniguchi, T., Ertekin, E., van der Zande, A. M. & Huang, P. Y. Designing the Bending Stiffness of 2D Material Heterostructures. Adv Mater 33, e2007269 (2021).

Lee, C. H., Khan, A., Luo, D., Santos, T. P., Shi, C., Janicek, B. E., Kang, S., Zhu, W., Sobh, N. A., Schleife, A., Clark, B. K. & Huang, P. Y. Deep Learning Enabled Strain Mapping of Single-Atom Defects in Two-Dimensional Transition Metal Dichalcogenides with Sub-Picometer Precision. Nano letters 20, 3369-3377 (2020).

E. Han, J. Yu, E. Annevelink, J. Son, D. A. Kang, K. Watanabe, T. Taniguchi, E. Ertekin, P. Y. Huang & A. M. van der Zande. Ultrasoft slip-mediated bending in few-layer graphene. Nature Materials 19, 305-309 (2019).

Recent professional development activities

Sandia National Laboratory Academic Alliance Early Career Faculty Field Day
AE3 Collins Scholars Program

WALTRAUD M KRIVEN
Professor

Education

Ph. D. - Physical and Inorganic Chemistry, University of Adelaide, South Australia (Dr. S.W. Kennedy, Thesis Advisor) - 1976

B.Sc. (Hons)- Physical and Inorganic Chemistry (Hons.), University of Adelaide, South Australia (Dr. S.W. Kennedy, Advisor) - 1971

B.Sc. - Physical and Inorganic Chemistry and Biochemistry, University of Adelaide, South Australia - 1970

Academic experience

Sabbatical leave, University of South Australia at Mawson Lakes and Commonwealth Scientific and Industrial Research Organization (CSIRO), Newcastle, New South Wales; Nov 2018.

Visiting Sabbatical Professor, Department of Earth Sciences, Cambridge University, UK - June 2011

Affiliate Professor, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign - 2009-present

Affiliate Professor, Department of Bioengineering, University of Illinois at Urbana-Champaign- 2005-2012

Visiting professor (sabbatical leave), The Institut für Kristallographie und Angewandte Mineralogie, (Institute for Crystallography and Applied Mineralogy) Ludwig-Maximilians-Universität, München - Spring and summer semesters 1997

Professor of Materials Science and Engineering - UIUC, 1995 - present

Associate Professor, Department of Material Science and Engineering, University of Illinois at Urbana-Champaign - 1987-95

Principal investigator, Materials Research Laboratory, University of Illinois at Urbana-Champaign - 1984-89

Visiting Research Associate Professor, Materials Research Laboratory and Department of Ceramic Engineering, University of Illinois at Urbana-Champaign - 1984-85

Assistant Research Engineer, Department of Materials Science and Mineral Engineering, University of California, Berkeley - 1983-84

Visiting Scientist, Max Planck Institut für Metallforschung, Institut fur Werkstoffwissenschaften (Stuttgart) Dr. Manfred Rule, Advisor - 1980-83

Assistant Research Engineer and Lecturer, University of California, Berkeley, Dept. of Materials Science and Mineral Engineering, Prof. A.G. Evans, Advisor - 1979-80

Lecturer, Dept. of Materials Science and Mineral Engineering, University of California, Berkeley, Fall Quarters - 1977-80

Post-doctoral research scientist, Lawrence Berkeley Laboratory, Division of Materials and Molecular Research, University of California, Berkeley, Prof. J.A. Pask, Advisor - 1977-79

Post-doctoral Teaching and Research Fellow, Chemistry Dept., University of Western Ontario, London, Ontario, Canada - 1976-77

Non-academic experience and consulting

• Organized the 15th to 20th (5 years) International Symposia on “Geopolymers and Alkali Activated Materials,” held each year in January as part of the International Conference and Exposition on Advanced Ceramics and Composites at Daytona Beach, Florida.

Professor Kriven was a Past-Chair and Counselor to the Engineering Ceramics Division of the American Ceramic Society and Symposium Organizer of the Focused session on Geopolymers at the ACERS Annual Meetings, the Cocoa Beach and Daytona Beach Conferences and Expositions on Advanced Ceramics and Composites from 2003 to 2023.

ALD Technical Solutions, San Diego, CA . Consulted on how to repair cross-country gas pipes with geopolymer carbon-mesh composites.

Aquantis Inc., Santa Barbara, CA, USA. Consulted on ARPA-E project 2020-2022 on how to make underwater turbines for electricity generation

Kohler Co., Wisconsin, USA from Jan 2020 Dec2021

US Army Corps of Engineers - Construction Engineering Research Laboratory (CERL) 2013 - present

Consulting for Madewell, Inc- a company which applies corrosion resistant coatings to wasste water and sewage pipes 2017- 2019

Dow Chemical, Inc, 2008 - 2014

Certifications, professional registrations, and patents

Professional registrations

Member of the European Union Academy of Sciences, 2020 - present

Member of the Australian Ceramic Society, 2000 - present

Member of the Royal Australian Chemical Institute, 1976 - 2018

Patents

“Anatase-geopolymer composite dosimeter for detecting and measuring gamma radiation,” Ali Ozer, Alexander Fields, Jianxin Zhou, Angela di Fulvio and Waltraud M. Kriven US (patent disclosure in preparation for submission to UIUC).

“Anatase-geopolymer composite dosimeter for detecting and measuring gamma radiation,” Ali Ozer, Alexander Fields, Jianxin Zhou, Angela di Fulvio and Waltraud M. Kriven US (patent disclosure in preparation for submission to UIUC).

“Porous Geopolymer-graphene Oxide Type Composites for Heavy Metal Ion Removal from Water” Inventors: Abdul Qadeer, Ali Ozer and Waltraud M. Kriven US Patent disclosed to UIUC Office of Technology Management Urbana-Champaign, Feb 27th 2023. • U.S. Patent Application No.: 63/504,222 Title: “Geopolymer Compositions and Systems and Methods Thereof for Sequestering and Removing Chemical Species From Water” Filing date: May 25, 2023

Honors and awards

• Brunauer Award (1988), jointly with C.J. Chan. and Prof. J.F. Young. Awarded by the Cements Division of the American Ceramic Society, for the Best Paper of the Year. • Brunauer Award (1991), jointly with Dr. O.O. Popoola and Prof. J. F. Young. Awarded by the Cements Division of the American Ceramic Society, for the Best Paper of the Year. • James I. Mueller Award of the Engineering Division of the American Ceramic Society, (2017) for research in Advanced Ceramics. • Invited to become a member of the European Union Academy of Sciences

Research

Invited to become a member of the European Union Academy of Sciences
2017 Mueller Award for Research in Ceramic Engineering
Academician, World Academy of Ceramics
Fellow of the American Ceramics Society
Brunauer Award (jointly with Dr. O.O. Popoola and Prof. J. F. Young)

Service activities (institutional and professional)

Chairperson and main organizer of the Int. Symposium on Geopolymers held each year as part of the American Ceramic Society Annual Int. Conf. and Expo on Advanced Ceramics and Composites, held in Daytona Beach, FL in Jan each year (since Jan 2003 to 2023)
Served on the Grainger College of Engineering Academic Integrity Committee (2019-2023)
Served on the Grainger College of Engineering Design Council Committee 2021-2023
College of Engineering, served on 2019-2022 Academic Integrity Committee
Periodically serve as a consultant to the US Army Corps of Engineers (CERL), ERDC, as well as private industries (Kohler Inc., Brayton Inc., Aquantis, ALD Technical Solutions, LLC)

Publications and presentations (five most recent and important)

"Specimen Displacement Correction for Powder X-ray Diffraction in Debye-Scherrer Geometry with a Flat Area Detector," Benjamin S. Hulbert and Waltraud M. Kriven. J. Applied Crystallography, **56** 160-166 (2023)
"Isotropic Negative Thermal Expansion in ZrW_2O_8 and HfW_2O_8 from 1100 ℃ to 1275 ℃," Benjamin S. Hulbert, Dylan W. Blake, Gerard S. Mattei and Waltraud M. Kriven. Phys. Rev. B, in press (2023).
"Isolating the Effects of Thixotropy in Geopolymer Pastes", by Allison S. Brandvold, Ghassan K. Al-Chaar and Waltraud M. Kriven. J. Am. Ceram Soc., 106 [5] 2797-2807 (2023)
"V-notched Rail Shear Test Applied to Geopolymer Composites," Ana Carolina Constâncio Trindade, Pengqing Wang and Waltraud M. Kriven. J. Am. Ceram. Soc., **106** [2] 1260-1272 (2022).
"Thermal Conductivity of Several Geopolymer Composites and Discussion of their Formulation," Devon M. Samuel, Nathaniel Inumerable, Andrew Stumpf and Waltraud M. Kriven. Int. J. of Applied Ceramic Technology, **20** 475-486 (2022).

Recent professional development activities

Invited to give lecture at the ERDC in Vicksburg, Mississippi, USA to discuss potential collaboration
Was awarded an Air Force Research Lab Summer Faculty Fellowship at Wright Patterson Air Force Laboratory, Summer 2020
1996-1998 inclusive: GE Scholar, completed UIUC Teaching College - Faculty Development Program
Trained as a high school science teacher, earned 3/4 of a Diploma of Teaching from Adelaide Teachers College and the University of South Australia, Australia 1967-1971.

JESSICA ANNE KROGSTAD
Associate Professor

Education

B.S. Materials Science and Engineering, University of Illinois, Urbana-Champaign, 2007
Ph.D. Materials, University of California, Santa Barbara, 2012

Academic experience

Graduate Research Assistant: Materials, University of California, Santa Barbara, CA, September 2007 – June 2012
Postdoctoral Research Assistant: Mechanical Engineering, Johns Hopkins University, Baltimore, MD, June 2012 – July 2014
Assistant Professor: Materials Science and Engineering, University of Illinois Urbana-Champaign, Urbana, IL, August 2014 – August 2021
Associate Professor: Materials Science and Engineering, University of Illinois Urbana-Champaign, Urbana, IL, August 2021 – Present

Certifications, professional registrations, and patents

Patents

Sim, G., J.A. Krogstad, T.P. Weihs, K.J. Hemker. "Method of depositing nanotwinned nickel-molybdenum-tungsten alloys." Patent Application PCT/US18/30384. Filed May 1, 2018.
Krogstad, J.A., P.S. Shetty, R. Zhang, J. Angle, P.V. Braun. "Aluminized Metallic Scaffold for High Temperature Application and Method of Making an Aluminized Metallic Scaffold" Patent Application 15/641,822. Published Jan 11, 2018.
Krogstad, J.A., P.S. Shetty, R. Zhang, P.V. Braun. "Pack Bed-based Chemical Surface Modification of Structural Alloys for Improved Corrosion and Fouling Resistance" Pub No. 2020/0010946 A1. Appl. No.: 16/460,050. Published Jan 09, 2020.

Honors and awards

Teaching

Center for Innovation in Teaching and Learning, Teacher Ranked as Excellent
Center for Innovation in Teaching and Learning, Teacher Ranked as Excellent

Research

TMS Young Leader Professional Development Award
DOE Early Career Award
NSF CAREER Award
United Kingdom Royal Academy of Engineering Distinguished Visiting Fellowship
The American Ceramic Society's Robert L. Coble Award for Young Scholars

Service activities (institutional and professional)

The Minerals, Metals & Materials Society (TMS): TMS Diversity, Equity & Inclusion Committee Vice-Chair (2020-2021), JOM subcommittee lead 2014-2019, TMS Mechanical Behavior of Materials Committee 2014-, TMS Phase Transformations Committee 2014-, TMS Nuclear Materials Committee 2016- , TMS Membership & Student Development Committee 2018-, TMS Larry Kaufman CALPHAD Scholarship Committee 2018- , TMS ad hoc Poster Session Enhancement Committee 2019-
Graduate Awards Committee (2018-2021)
Undergraduate Recruitment Committee (2017-) Chair, Spring 2021-

Undergraduate Awards Committee (2022-)
Institute for Inclusion, Diversity, Equity, and Access: Member (2020-)

Publications and presentations (five most recent and important)

D. Liu, S. Shrivastav, S. Daraydel, N. Levandovsky, H. An, S. Shevade, Q. Cheng, J.A. Krogstad, D.V. Krogstad. "Biofeedstock-Induced Metal Corrosion: Reactions between Carbon Steel and Triacylglycerol-based Solutions at Elevated Temperature." Accepted to Corrosion Science 2023.

E. Lang, C.N. Taylor, N.J. Madden, T. Marchhart, C.S. Smith, X.Wang, J.A. Krogstad, J.P. Allain. "Examination of Early-Stage Helium Retention and Release in Dispersion-Strengthened Tungsten Alloys." Fusion Science and Technology. (2023) DOI: 10.1080/15361055.2022.216444

]Y-Y. Lin, J.Qu, W.J. Gustafson, P-C Kung, N. Shah, S. Shrivastav, E. Ertekin, J.A. Krogstad, N.H. Perry. "Coordination flexibility as a high-throughput descriptor for identifying solid electrolytes with Li+ sublattice disorder: A computational and experimental study." J Power Sources 553 (2023) 232251. DOI: 10.1016/j.jpowsour.2022.232251

G.M. Valentino, S. Xiang, K.Y. Xie, M-R. He, W.C. Oliver, G.M. Pharr, J.A. Krogstad, T.P. Weihs, K.J. Hemker. "Investigating the localized anisotropic plasticity of nanotwinned Ni-Mo-W alloys." Acta Mater 204 116507 (2021). DOI: 10.1016/j.actamat.2020.116507

O.K. Celebi, A.S.K. Mohammed, J.A. Krogstad, H. Sehitoglu. "Evolving dislocation cores at Twin Boundaries: Theory of CRSS Elevation." Int J Plasticity 148C (2022) 103141. DOI: 10.1016/j.ijplas.2021.103141

P. Shetty, M. Emigh, J.A. Krogstad. "Coupled oxidation resistance and thermal stability in sputter deposited nanograined alloys." J Mater Res. 34 [1], 48-57 (2019) DOI: 10.1557/jmr.2018.403.

M. Emigh, R. McAuliffe, T. Weihs, K.J. Hemker, D.P. Shoemaker, J.A. Krogstad. "Influence of a nanotwinned, nanocrystalline microstructure on aging of a Ni-25Mo-8Cr superalloy." Acta Mater. 156, 411-419 (2018). DOI: 10.1016/j.actamat.2018.07.007

P.P.Shetty, R. Zhang, J.P.Angle, P.V. Braun, J.A. Krogstad. Pack aluminization assisted enhancement of thermo-mechanical properties in nickel inverse opal structures. Chem. Mater., 30 [5], 1648–1654 (2018). DOI: 10.1021/acs.chemmater.7b04988

Gi-Dong Sim, J.A. Krogstad, K.M. Reddy, K.Y. Xie, T.P. Weihs, K.J. Hemker. "Nano-twinned Nickel-Molybdenum-Tungsten thin films with ultra high strength and thermal mechanical stability." Science Advances 3 [6] (2017). DOI: 10.1126/sciadv.1700685.

Krogstad, J.A., S. Krämer, D.M. Lipkin, C.A. Johnson, D.G.R. Mitchell, J.M. Cairney, C.G.Levi. "Phase Stability of t'-Zirconia Based TBCs: Mechanistic Insights." J. Am. Ceram. Soc., 94 s168-s177 (2011). DOI: 10.1111/j.1551-2916.2011.04531.x.

Recent professional development activities

Strategic Instructional Initiatives Program (SIIP), Computational Modules for the MatSE Undergraduate Curriculum

AE3 Collins Scholar Program

CECILIA LEAL

Associate Professor

Education

Ph. D. Physical Chemistry, University of Lund, Sweden, 2006. Thesis Advisors: Håkan Wennerström and Björn Lindman

B.S + M. S. Industrial Chemistry, University of Coimbra, Portugal, 2000

Academic experience

Affiliate, Bioengineering, 2023-present

Affiliate, Cancer Center Illinois, 2020-present

Affiliate, Carle Illinois College of Medicine, 2020-present

Associate Professor, University of Illinois at Urbana-Champaign, Materials Science and Engineering, 2019-present

Affiliate, Beckman Institute , 2018-present

Affiliate, Materials Research Laboratory, 2013-present

Assistant Professor, University of Illinois at Urbana-Champaign, Materials Science and Engineering, 2012-2019

Non-academic experience and consulting

Vetenskapsrådet Postdoctoral Fellow, University of California, Santa Barbara, 2008-2011. Postdoctoral Advisor: Cyrus Safinya

Researcher, Norwegian Radium Hospital, Oslo, 2006-2007

Venable, Law firm, New York, (LNP scientific expert), March 2023-present

Weil, Law firm, New York, (LNP scientific expert), August 2022-January 2023

Henkel, North American AG Product Development, Connecticut, 2015

Certifications, professional registrations, and patents

Patents

"Materials, Electronic Systems and Modes for Active and Passive Transience" J. A. Rogers, C. Leal, C. H. Lee, L. Yin, X. Huang. US patent. US 10154592.

“Materials, Electronic Systems and Modes for Active and Passive Transience", John A. Rogers, Cecilia Leal, Chi Hwan Lee, Lan Yin, Xian Huang, Pending US patent (Filing date 2014-04-11). PCT/US2014/033817

"Acoustically Sensitive Drug Delivery Particles" E. Nilssen, S. Fossheim, C. Leal, P. Juzenas and S. Rögnvaldsson, Norway. US patent. US 20090098212

Honors and awards

Teaching

List of Teachers Ranked as Excellent by their Students for Spring 2023 - MSE 473-Biomolecular Materials Science, UIUC

List of Teachers Ranked as Excellent by their Students for Spring 2022 - MSE 473-Biomolecular Materials Science, UIUC

List of Teachers Ranked as Excellent by their Students for Fall 2021 - MSE 201 - Phases and Phase Relations, UIUC

List of Teachers Ranked as Excellent by their Students for Fall 2020 - MSE 201-Phases and Phase Relations, UIUC

List of Teachers Ranked as Excellent by their Students for Spring 2017 - MSE 473-Biomolecular Materials Science, UIUC

Research

University of Illinois Scholar

Illinois Grainger College of Engineering Dean's Award for Excellence in Research for Associate Professor

Racheff Faculty Scholar Award

UIUC Campus Distinguished Promotion Award

Illinois Grainger College of Engineering Dean's Award for Excellence in Research for Assistant Professor

Public Service

Grainger College of Engineering Award for Sustained Excellence in Diversity, Equity, and Inclusion

Service activities (institutional and professional)

Gordon Research Conference in Liquid Crystal. Vice-Chair (2019), Chair (2021, postponed to 2023)

MatSE faculty Hiring committee, Fall 2021. [Chair]-Fall 2022

MatSE Diversity Committee [Chair], Fall 2020-Fall 2022, Fall 2023-present. [Member] Fall 2022-Spring 2023

Grainger College of Engineering undergraduate education committee - Spring 2022-present

Grainger College of Engineering executive committee - alternate member- 2020-Fall 2022

Publications and presentations (five most recent and important)

M. Kang, Y. K. Go, M. Porras-Gómez, T. Koulaxizis, D. Steer, A. Statt* and C. Leal*, "Cooperative Self-Assembly of Lipid-Polymer Hybrids Stabilizing Highly-ordered Bicontinuous Cubic Phases in Air", Macromolecules 56, 5774–5783 (2023)

J. Rueben, D. Steer and C. Leal*, "Super-swelling Behavior of Stacked Lipid Bilayer Systems", Eur. Phys. J. E. 46, 67 (2023) (This special issue aims at acknowledging Philip (Fyl) Pincus' achievements)

L. Zheng, S. Bandara, Z. Tan, and C. Leal*, "Lipid nanoparticle topology regulates endosomal escape and delivery of RNA to the cytoplasm", Proc. Natl. Acad. Sci. USA 120, e2301067120 (2023)

N. Kambar and C. Leal*, "Microfluidic synthesis of multilayered lipid/polymer hybrid nanoparticles for the formulation of low solubility drugs", Soft Matter 19, 1596-1605 (2023)

M. Porras-Gomez, H. Kim, M. T. Dronadula, N. Kambar, N. R. Aluru, Arend van der Zande* and C. Leal*, "Compression-induced restructuring of stacked lipid multilayers: from molecular to microscale", PLOS ONE 17, e0275079 (2022)

M. Kang, B. Lee, and C. Leal*, "Three-Dimensional Microphase Separation and Synergistic Permeability in Stacked Lipid-Polymer Hybrid Membranes" Chem. Mater. 29, 9120–9132 (2017).

H. Kim, Z. Song, and C. Leal*, "Super-swelled Lyotropic Single Crystals" Proc. Natl. Acad. Sci. USA 114, 10834-10839 (2017).

M. Kang and C. Leal*, "Soft Nanostructured Films for Actuated Surface-Based siRNA Delivery" Adv. Funct. Mater. 26, 5610–5620 (2016). [Featured in the journal cover]

C. H. Lee, H. Kim, D. Harburg, G. Park, Y. Ma, T. Pan, J. S. Kim, N. Y. Lee, B. H. Kim, K.-I. Jang, S.-K. Kang, Y. Huang, J. Kim, K.-M. Lee, and C. Leal*, J. A. Rogers*, "Biological lipid membranes for on-demand, wireless drug delivery from thin, bioresorbable electronic implants" NPG. Asia. Mater. 7(e227), 969-973 (2015).

H. Kim and C. Leal*, “Cuboplexes: Topologically Active siRNA Delivery“ ACS Nano 9, 10214–10226 (2015).

Recent professional development activities

Sabbatical in the group of Zvonimir Dogic, Physics, University of California Santa Barbara (Spring 2020)

Kavli Institute of Theoretical Physics Program: The Physics of Elastic Films: from Biological Membranes to Extreme Mechanics (May 17 - Jun 18, 2021), participant

Kavli Institute of Theoretical Physics Program: Symmetry, Thermodynamics and Topology in Active Matter (Mar 16 - May 29, 2020), participant

CCIL Faculty Leadership Development Program, September 2020-May 2021

Moving Forward: Advancing the Future of Women Faculty at Illinois, UIUC, February 2013

NICOLA HELEN PERRY
Associate Professor

Education

PhD, Materials Science and Engineering, Northwestern University, 2009
BA (magna cum laude), French Studies, Rice University, 2005
BS (magna cum laude), Materials Science and Engineering, Rice University, 2005

Academic experience

Associate Professor, University of Illinois Urbana-Champaign, Department of Materials Science and Engineering, 8/2023-Present
Assistant Professor, University of Illinois Urbana-Champaign, Department of Materials Science and Engineering, 1/2018-8/2023
Affiliate Faculty, University of Illinois Urbana-Champaign, Materials Research Laboratory, 1/2018-Present
World Premier Initiative Assistant Professor, Kyushu University, International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), 8/2014-3/2020
Research Affiliate / Visiting Scholar, Massachusetts Institute of Technology, Department of Materials Science and Engineering, 10/2012-1/2018
Postdoctoral Research Associate, Kyushu University, International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), 9/2012-8/2014
Postdoctoral Fellow, Northwestern University / Energy Frontier Research Center for Inverse Design, Materials Science and Engineering, 12/2009-8/2012

Honors and awards

Teaching

List of Teachers Ranked as Excellent
List of Teachers Ranked as Excellent
"Professor Pig" Award from Undergraduate Students
List of Teachers Ranked as Excellent

Research

Richard M. Fulrath Award, American Ceramic Society
Dean's Award for Excellence in Research
NSF CAREER Award
J. Bruce Wagner Jr. Award, Electrochemical Society
DOE Early Career Award

Service activities (institutional and professional)

European Materials Research Society (E-MRS) Member (2014-2015, 2020-2021, 2023-2024)
ACerS Global Distinguished Doctoral Dissertation Award Committee, Member (2021-present)
Women in Engineering: panelist for welcome lunch in MatSE for new first-year undergraduate women (2018-2022)
MRL Administrative Staff Search Committee, 2022-2023 (x2)
College Leadership Retreat & Strategic Planning, 2019 & 2022

Publications and presentations (five most recent and important)

Z. Liu, J.G. Sederholm, K.-W. Lan, E.J. Cho, M.J. Dipto, Y. Gurumukhi, K.F. Rabbi, M.C. Hatzell, N.H. Perry, N. Miljkovic, P.V. Braun, P. Wang, and Y. Li, “Life cycle assessment of hydrometallurgical recycling for cathode active materials,” Journal of Power Sources 580, 233345 (2023) DOI: 10.1016/j.jpowsour.2023.233345

A.X.B. Yong, L.O. Anderson, N.H. Perry, E. Ertekin, “Effects of State Filling and Localization on Chemical Expansion in Praseodymium-Oxide Perovskites” Journal of Materials Chemistry A (2023) DOI: 10.1039/D2TA06756K (selected as a JMCA "HOT Paper")

Y.Y. Lin, J. Qu, W.J. Gustafson, P.-C. Kung, N. Shah, S. Shrivastav, E. Ertekin, J.A. Krogstad*, and N.H. Perry*, “Coordination Flexibility as a High-Throughput Descriptor for Identifying Solid Electrolytes with Li+ Sublattice Disorder: A Computational and Experimental Study,” Journal of Power Sources 553, 232251 (2023, online 2022) DOI: 10.1016/j.jpowsour.2022.232251

E.J. Skiba and N.H. Perry, “High-Temperature 2D Optical Relaxation Visualizes Enhanced Oxygen Exchange Kinetics at Metal-Mixed Conducting Oxide Interfaces” ACS Applied Materials & Interfaces 14, 42, 47659–47673 (2022) DOI: 10.1021/acsami.2c12184

A. Tarancon, A. Aguadero, N. Pryds, and N.H. Perry, “Special issue for the 2021 E-MRS Spring Meeting Symposium on Solid State Ionics,” Solid State Ionics 385 116008 (2022) DOI: 10.1016/j.ssi.2022.116008

H.B. Buckner, Q. Ma, J. Simpson-Gomez, E.J. Skiba, and N.H. Perry, “Multi-scale Chemo-Mechanical Evolution During Crystallization of Mixed Conducting SrTi0.65Fe0.35O3-d Films and Correlation to Electrical Conductivity” Journal of Materials Chemistry A (2022) Advance Article DOI: 10.1039/D1TA06455J

N. Kim, B.J. Blankenau, T. Su, N.H. Perry, and E. Ertekin, "Multisublattice cluster expansion study of short-range ordering in iron-substituted strontium titanate," Computational Materials Science 202, 110969 (2022) DOI: 10.1016/j.commatsci.2021.110969

T. Chen*, Y. Jing*, L.O. Anderson*, K. Leonard*, H. Matsumoto, N. Aluru, and N.H. Perry, "Toward durable protonic ceramic cells: Hydration-induced chemical expansion correlates with symmetry in the Y-doped BaZrO3 – BaCeO3 solid solution," J. Phys. Chem. C 125, 47, 26216–26228 (2021) DOI: 10.1021/acs.jpcc.1c08334 (*=equal contribution)

L.O. Anderson, A.X.B. Yong, E. Ertekin, and N.H. Perry, “Toward Zero-Strain Mixed Conductors: Anomalously Low Redox Coefficients of Chemical Expansion in Praseodymium-Oxide Perovskites,” Chemistry of Materials 33, 21, 8378–8393 (2021) DOI: 10.1021/acs.chemmater.1c02739

Y.Y. Lin, W.J. Gustafson, S.E. Murray, D.P. Shoemaker, E. Ertekin, J.A. Krogstad, N.H. Perry, "Perovskite Na-ion conductors developed from analogous Li3xLa2/3-xTiO3 (LLTO): chemo-mechanical and defect engineering" Journal of Materials Chemistry A 9, 21241-21258 (2021) DOI: 10.1039/D1TA04252A

Recent professional development activities

NSF Ceramic Materials PI Workshop, 2011

Graduate Teaching Certificate Program, Northwestern, 2010-2011

Finding Funding Sources Workshop, Office of Research, 2018

i>clicker Training, Center for Innovation in Teaching and Learning, 2018

NSF Career Workshops, followed by one-on-one meetings to discuss pedagogy and teaching/outreach innovation, Office of Research & Center for Innovation in Teaching and Learning, 2018& 2019

ANDRE SCHLEIFE
Associate Professor

Education

Dr. rer. nat. (equivalent to Ph.D.) in Physics, Friedrich-Schiller-University Jena, Germany, 2010
Diploma (equivalent to M.Sc.) in Physics, Friedrich-Schiller-University Jena, Germany, 2006

Academic experience

Affiliated Associate Professor, Computational Materials Science and Engineering Program, University of Illinois at Urbana-Champaign, 9/2020-current
Affiliated Assistant Professor, Computational Materials Science and Engineering Program, University of Illinois at Urbana-Champaign, 1/2014-8/2020
Affiliated Associate Professor, National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, 9/2020-current
Affiliated Assistant Professor, National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, 5/2015-8/2020
Affiliated Associate Professor, Materials Research Laboratory, University of Illinois at Urbana-Champaign, 9/2020-current
Affiliated Assistant Professor, Materials Research Laboratory, University of Illinois at Urbana-Champaign, 8/2017-8/2020
Associate Professor, University of Illinois at Urbana-Champaign, 09/2020-current
Assistant Professor, University of Illinois at Urbana-Champaign, 12/2013-8/2020

Non-academic experience and consulting

Postdoctoral Researcher, Lawrence Livermore National Laboratory, Livermore, CA, 02/2011 - 12/2013
Postdoctoral Researcher, Friedrich-Schiller-University, Jena, Germany, 10/2010 - 01/2011

Certifications, professional registrations, and patents

Patents

None

Honors and awards

Teaching

List of Teachers Ranked as Excellent by their Students for MSE598-Machine Learning for MatSE
List of Teachers Ranked as Excellent by their Students for MSE404-Computational MSE
List of Teachers Ranked as Excellent by their Students for MSE404-Computational MSE
List of Teachers Ranked as Excellent by their Students for MSE304-Electronic Properties of Materials
List of Teachers Ranked as Excellent by their Students for MSE404-Computational MSE

Research

2023 Dean's Award for Excellence in Research
National Center for Supercomputing Applications (NCSA) Faculty Fellowship
Mercator Fellow for the SFB 1242
Finalist "Rising Stars in Computational Materials Science"
Office of Naval Research Young Investigator Award

Public Service

None

Service activities (institutional and professional)

Chair of the Campus Cluster Investor Forum 2021-2022

Reviewer for Lawrence Livermore "17th Institutional Grand Challenge" Computing Program (2022)

Reviewer for the Gauss Computing Center, Germany (2023)

Reviewer for the Canada Excellence Research Chairs (CERC) (2022)

Reviewer for the CSCS Swiss National Supercomputing Centre (2018)

Publications and presentations (five most recent and important)

Zhihao Jiang, Jinho Lim, Yi Li, Wolfgang Pfaff, Tzu-Hsiang Lo, Jiangchao Qian, André Schleife, Jian-Min Zuo, Valentine Novosad, and Axel Hoffmann, "Integrating Magnons for Quantum Information", accepted Appl. Phys. Lett. (2023)

Kameron R. Hansen, Cindy Y. Wong, C. Emma McClure, Blake Romrell, Laura Flannery, Daniel Powell, Kelsey Garden, Alex Berzansky, Michele Eggleston, Daniel J. King, Carter M. Shirley, Matthew C. Beard, Wanyi Nie, André Schleife, John S. Colton, Luisa Whittaker-Brooks, "Mechanistic origins of excitonic properties in 2D perovskites: Implications for exciton engineering", Matter (2023)

Xiao Zhang, Joshua A. Leveillee, and André Schleife, "Effect of dynamical screening in the Bethe-Salpeter framework: Excitons in crystalline naphthalene", Phys. Rev. B 107, 235205 (2023)

Alina Kononov, Cheng-Wei Lee, Ethan Shapera, and André Schleife, "Identifying native point defect configurations in α-alumina", J. Phys.: Condens. Matter 35, 334002 (2023)

Edmund Han, Shahriar Muhammad Nahid, Tawfiqur Rakib, Gillian Nolan, Paolo F. Ferrari, M. Abir Hossain, Andre Schleife, SungWoo Nam, Elif Ertekin, Arend M. van der Zande, and Pinshane Y. Huang, "Bend-induced ferroelectric domain walls in α-In2Se3", ACS Nano (2023)

Lee, C.-W., Schleife, A., "Hot-electron mediated ion diffusion in semiconductors for ion-beam nanostructuring" Nano Lett. 19, 3939-3947 (2019)

Martinolich, A., Lee, C.-W., Lu, I-Te, Bevilacqua, S., Preefer, M., Bernardi, M., Schleife, A., See, K., "Solid State Divalent Ion Conduction in ZnPS3", Chem. Mater. 31, 3652-3661 (2019)

Wagner, C., Schuster, J., Schleife, A., "Strain and screening: Optical properties of a small-diameter carbon nanotube from first principles", Phys. Rev. B 99, 075140 (2019)

Shapera, E. P. & Schleife, A. "Database-Driven Materials Selection for Semiconductor Heterojunction Design" Adv. Theor. Simul. 1, 1800075 (2018)

Zhang, X. & Schleife, A. . Nonequilibrium BN-ZnO: Optical properties and excitonic effects from first principles. Phys. Rev. B 97, 125201 (2018)

Recent professional development activities

Collins Scholar 2013/2014

CHARLES M SCHROEDER

Professor / James Economy Professor

Education

Postdoctorate, University of California at Berkeley, 2007-2008
Postdoctorate, Harvard University, 2004-2007
Ph.D., Stanford University, 2004
B.S., Carnegie Mellon University, 1999

Academic experience

James Economy Professor, Department of Materials Science and Engineering, Department of Chemical & Biomolecular Engineering, University of Illinois at Urbana-Champaign, Urbana, IL (8/21-present)
Co-Chair, Molecular Science and Engineering (Research Theme) Leader, Molecular Design & Engineering (Research Group) Beckman Institute for Advanced Science and Technology University of Illinois at Urbana-Champaign, Urbana, IL, 61801 (8/18-present)
Professor and Ray and Beverly Mentzer Faculty Scholar Department of Chemical & Biomolecular Engineering University of Illinois at Urbana-Champaign, Urbana, IL, 61801 (8/17-8/20)
Visiting Associate, Division of Chemistry and Chemical Engineering California Institute of Technology, Pasadena, CA, 91125 (1/17-5/17)
Associate Professor, Department of Chemical & Biomolecular Engineering University of Illinois at Urbana-Champaign, Urbana, IL, 61801 (8/14-8/17)
Assistant Professor, Department of Chemical & Biomolecular Engineering University of Illinois at Urbana-Champaign, Urbana, IL, 61801 (8/08-8/14)
Postdoctoral Fellow, Department of Chemical Engineering University of California, Berkeley, Berkeley, CA, 94720 (12/07-7/08)
Postdoctoral Fellow, Department of Chemistry and Chemical Biology (Xie Group) Harvard University, Cambridge, MA 02138 (11/04-11/07)
Graduate Research Assistant, Department of Chemical Engineering Stanford University, Stanford, CA 94305 (3/00-11/04)

Non-academic experience and consulting

Research Assistant, Department of Chemical Engineering, Jhon/Tilton Groups, Carnegie Mellon University, Pittsburgh, PA 15213
Research Engineer Intern, Photolithography, Fab 15 (Summer 1998), Intel Corporation, Portland, OR 97007
Research Engineer Intern, Chemical/Mechanical Polish, Fab 15 (Summer 1999), Intel Corporation, Portland, OR 97007

Certifications, professional registrations, and patents

Patents

O. Milenkovic, C. M. Schroeder, H. Tabatabaei, K. Tabatabaei, A. Hernandez, C. Pan, \DNA Based Image Storage and Retrieval", United States Non-Provisional Patent, UIUC2019-195-02(US), 17/102,143, November 2020.
O. Milenkovic, N. Athreya, A. Khandelwal, J.-P. LeBurton, X. Li, C. M. Schroeder, K. Tabatabaei, B. Li, "On-Chip Nanoscale Storage System Using Chimeric DNA", United States Non-Provisional Patent, 19-1227-US, 16/593,450, October 2019.

Y. Kim, S. Kim, M. Tanyeri, J. A. Katzenellenbogen, C. M. Schroeder, "Dye-conjugated Dendrimers", United States Patent, No. 9,448,173, University of Illinois at Urbana-Champaign, September 2016.

Honors and awards

American Association for the Advancement of Science Fellow, 2023
James Economy Professor, 2021
List of Teachers Ranked as Excellent, University of Illinois, S'20
Ray & Beverly Mentzer Professor, 2019
Society of Rheology Publication Award, 2019

Service activities (institutional and professional)

Materials Research Society (MRS)
American Physical Society (DSOFT, DPOLY)
American Association for the Advancement of Science (AAAS)
Chair, Faculty Advisory Committee, Department of Materials Science & Engineering, University of Illinois at Urbana-Champaign
Group Leader, AI for Materials (AIM) Group, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign

Publications and presentations (five most recent and important)

G. R. Burks, L. Yao, F. Kalutantirige, K. Gray, E. Bello, S. Rajagopalan, S. Bialik, J. Barrick, M. Alleyne, Q. Chen, C. M. Schroeder, “Electron Tomography and Machine Learning for Understanding the Highly Ordered Structure of Leafhopper Brochosomes”, Biomacromolecules, 24, 190-200 (2023).

H. Yu, F. Kalutantirige, L. Yao, C. M. Schroeder, Q. Chen, J. S. Moore, “Self-Assembly of Repetitive Segment and Random Segment Polymer Architectures”, ACS Macro Letters, 11, 1366-1372 (2022).

N. H. Angello, V. Rathore, W. Beker, A. Wolos, E. R. Jira, R. Roszak, T. C. Wu, C. M. Schroeder, A. Aspuru-Guzik, B. A. Grzybowski, M. D. Burke, “Closed-loop Optimization of General Reaction Conditions”, Science, 378, 399-405 (2022).

M.Pence, O. Rodr´ıguez, N. Lukhanin, C. M. Schroeder, J. Rodr´ıguez-L´opez, “Automated Measurement of Electrogenerated Redox Species Degradation Using Multiplexed Interdigitated Electrode Arrays”, ACS Measurement Science Au, DOI: 10.1021/acsmeasuresciau.2c00054 (2022).

M. I. Jacobs, P. Bansal, D. Shukla, C. M. Schroeder, “Understanding Supramolecular Assembly of Supercharged Proteins”, ACS Central Science, 8, 1350-1361 (2022).

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

KENNETH S. SCHWEIZER

Professor

Education

Thesis: "Quantum Statistical Mechanics of Molecules in Condensed Phases"; Advisor: David Chandler, Department of Chemistry
Ph.D., Physics - University of Illinois, Urbana-Champaign - 1981
M.S., Physics - University of Illinois, Urbana-Champaign - 1976
B.S. (summa cum laude), Physics - Drexel University - 1975

Academic experience

University of Illinois - Research Professor, Materials Research Laboratory (2008-present)
University of Illinois - Member, Institute for Condensed Matter Theory (2007-present)
University of Illinois - Member, Center for Advanced Theory & Molecular Simulation, School of Chemical Sciences (2006-present)
University of Illinois - Professor of Chemical and Biomolecular Engineering, 0% (1998-present)
University of Illinois - Professor, Materials Chemistry Program (1996-present)
University of Illinois - Polymer Division Chair (1994-2001)
University of Illinois - Professor, Beckman Institute
University of Illinois - Professor, Materials Research Lab
University of Illinois - Professor, Chemical and Biomolecular Engineering
University of Illinois - Professor, Chemistry
University of Illinois - G. Ronald and Margaret H. Morris Professor of Materials Science and Engineering
University of Illinois - Professor of MatSE (1991-Present)

Non-academic experience and consulting

Visiting Faculty, University of Chicago (2019)
Visiting Faculty, U.Pennsylvania and U.Wisconsin-Madison (2012)
Visiting Faculty, Kavli Institute for Theoretical Physics, UCSB (2010)
Senior Member of Technical Staff, Sandia National Lab (1983-1990)
Postdoctoral Research Associate with F.H. Stillinger, AT&T Bell Labs, Murray Hill, NJ (1981-1983)
Graduate Teaching and Research Assistant, University of Illinois (1976-1981)
Cooperative Education Student Trainee, U.S.D.A. Research Center, Philadelphia, PA (1971-1974)
Member, Sigma Xi (Mathematics Honor Society)
Member, Pi Mu Epsilon (Physics Honor Society)
Member, Society of Rheology
Member, Materials Research Society
Member, American Chemical Society
Member, American Physical Society

Honors and awards

Teaching

Campus-wide Award for Excellence in Graduate and Professional Teaching
Engineering Council Outstanding Advisor Award, UIUC College of Engineering

William L. Everitt Award for Teaching Excellence, COE, UIUC
Daily Illini List of Excellent Teachers, about 85% of the times I have taught over last 28 years
Burnett Award for Undergraduate Teaching Excellence

Research

Member, American Academy of Arts and Sciences, elected
Joel Henry Hildebrand Award in the Theoretical and Experimental Chemistry of Liquids, American Chemical Society
Invited Faculty at Kavli Institute of Theoretical Physics (UCSB) program on "The Physics of Glasses"
Opening Plenary Lecture, "Slow Dynamics and Nonlinear Mechanical Response in Glassy Polymers & Colloids," Society of Rheology Annual Meeting
Invited to write 5 major feature articles to be published during 2009-2010: 2 on polymer nanocomposite theory, 2 on polymer glass theory and 1 on self-assembly of Janus Colloids.

Service activities (institutional and professional)

NSF decade study of future directions in polymer science and engineering, 2016
Advisory Review Board for U.Wisconsin MRSEC, 2018-present
NSF review panel for Harvard MRSEC, 2018

Publications and presentations (five most recent and important)

Google Scholar

G.Chaudhary, A.Ghosh, J.G.Kang, P.V.Braun, R.H.Ewoldt and K.S.Schweizer, Linear and Nonlinear Viscoelasticity of Dense Attractive Microgel Suspensions, J. Colloid & Interface Science, submitted, November, 2020.

A. Ghosh and K.S.Schweizer, Physical Bond Breaking in Associating Copolymer Liquids, ACS Macro Letters, in press, December, 2020.

Y.Zhou and K.S.Schweizer, PRISM Theory of Local Structure and Phase Behavior of Polymer Nanocomposites, New Closure Approximation and Comparison to Simulation, Macromolecules, 53, 9962 (2020).

Y.Zhou and K.S.Schweizer, Theory of Microstructure-Dependent Glassy Shear Elasticity and Dynamic Localization in Model Polymer Nanocomposites, J.Chemical Physics, 153, 114901 (2020). Editors Pick.

K.Chen and K.S.Schweizer, Molecular Theory of Physical Aging in Polymer Glasses, Physical Review Letters, 98, 167802 (2007).

K.S.Schweizer and E.J.Saltzman, *Theory of Dynamic Barriers, Activated Hopping and the Glass Transition in Polymer Melts*, J.Chemical Physics, 121, 1184 (2004).

K.S.Schweizer and E.J.Saltzman, *Entropic Barriers, Activated Hopping, and the Glass Transition in Colloidal Suspensions*, J.Chemical Physics, 119, 1181 (2003).

M.Fuchs and K.S.Schweizer, *Structure of Polymer-Colloid Suspensions, J.Physics-Condensed Matter*, 14, R239 (2002). (Invited feature article.)

K. S. Schweizer & J. G. Curro, *Integral Equation Theories Of The Structure, Thermodynamics And Phase Transitions Of Polymer Fluids*, Advances in Chemical Physics, vol. 98, chapter 1 (1997). [Invited Review].

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

MOONSUB SHIM

Professor / Director of Graduate Studies

Education

Ph.D. Chemistry, University of Chicago, 2001
M.S. Chemistry, University of Chicago, 1998
B.S. Chemistry, University of California at Berkeley, 1997

Academic experience

Willet Faculty Scholar, 1/1/2010 - 1/2014 (0%)
Research Professor, University of Illinois, Materials Research Laboratory, 8/2009 - present (0%)
Beckman Institute Faculty Affiliate, University of Illinois, Beckman Institute, 2002 - 2019(0%)
Professor, University of Illinois, Materials Science & Engineering, 8/2017 - present (100%)
Associate Professor, University of Illinois, Materials Science & Engineering, 8/2008 - 8/2017
Assistant Professor, University of Illinois, Materials Science & Engineering, 7/2002 - 8/2008

Non-academic experience and consulting

Postdoctoral Fellow, Stanford University, Stanford, CA 4/2001 - 6/2002

Certifications, professional registrations, and patents

Patents

"Photoresist contact patterning of quantum dot films," Seok Kim, Moonsub Shim, Jun Kyu Park, Hohyun Keum, and Yiran Jiang, US Patent No. 11,152,536, B2.
Shim, Moonsub; Oh, Nuri; Kim, Bong Hoon; Rogers, John; Trefonas III, Peter; Zhang, Jieqian; Joo, Jake, "Optoelectronic Device and Methods of Use," US Patent Number US20190114032A1
Shim, Moonsub; Oh, Nuri; Kim, Bong Hoon; Rogers, John; Trefonas III, Peter; Zhang, Jieqian; Joo, Jake, "Optoelectronic Device and Methods of Use," US Patent Number US20190172878A1

Honors and awards

Teaching

Engineering Council Award for Excellence in Advising

Research

Industry Project Award, Institute of Chemical Engineers (Dow and UIUC)
Dean's Award for Faculty Research, University of Illinois
Visiting Professor to KAIST under the Brain Pool program
Willet Faculty Scholar
Xerox Award for Faculty Research, University of Illinois

Service activities (institutional and professional)

Hard Materials Seminar (2021 -)
ad hoc committee on MS program in MatSE (2021-2022, chair)
Graduate Recruitment committee (on going, chair since 2019 -)

Examiner for Solid State (FA 2006, SP & FA 2011), Optical Materials (SP 2009 - present), Electronic Materials Processing, and electrochemistry Qualifying Exams
TEC and ENG course proposal reviews (S2016, F2017)

Publications and presentations (five most recent and important)

C. Huang, Y. Jiang, G. A. Drake, L. P. Keating, and M. Shim, "Improving Photovoltaic Performance of Light-Responsive Double-Heterojunction Nanorod Light-Emitting Diodes," J. Chem. Phys. 153, 244701 (2023).

L. P. Keating, H. Lee, S. P. Rogers, C. Huang, and M. Shim, "Charging and Charged Species in Quantum Dot Light-Emitting Diodes," Nano Lett. 22, 9500 – 9506 (2022).

G. A. Drake, L. P. Keating, and M. Shim, "Design Principles of Colloidal Nanorod Heterostructures," Chem. Rev. (2022).

A. Vikram, K. Brudnak, A. Zahid, M. Shim, and P. J. A. Kenis, "Accelerated Screening of Colloidal Nanocrystals using Artificial Neural Network-Assisted Autonomous Flow Reactor Technology," Nanoscale 13, 17028 – 17039 (2021).

L. P. Keating and M. Shim, "Mechanism of Morphology Variations in Colloidal CuGaS2 Nanorods," Nanoscale Adv. 3, 5322 – 5331 (2021).

A. Vikram, A. Zahid, S. Bhargava, H. Jang, A. Sutrisno, A. Khare, P. Trefonas, M. Shim, and P. J. A. Kenis, "Unraveling the Origin of Interfacial Oxidation of InP-based Quantum Dots using an Automated Sequential Shell Growth Flow Reactor," ACS Appl. Nano Mater. 3, 12325 – 12333 (2020).

N. Oh, B. H. Kim, S. –Y. Cho, S. Nam, S. P. Rogers, Y. Jiang, J. C. Flanagan, Y. Zhai, J. –H. Kim, J. Lee, Y. Yu, Y. K. Cho, G. Hur, J. Zhang, P. Trefonas, J. A. Rogers, and M. Shim, "Double-Heterojunction Nanorod Light-Responsive LEDs for Novel Display Applications," Science 355, 616 – 619 (2017).

S. Nam, N. Oh, Y. Zhai, and M. Shim, "High Efficiency and Optical Anisotropy in Double-Heterojunction Nanorod Light-Emitting Diodes," ACS Nano 9, 878 – 885 (2015).

N. Oh, S. Nam, Y. Zhai, K. Deshpande, P. Trefonas, and M. Shim, "Double Heterojunction Nanorods," Nature Commun. 5, 3642 (2014).

K. T. Nguyen, A. Gaur, and M. Shim, "Fano Lineshape and Phonon Softening in Single Isolated Metallic Carbon Nanotubes," Phys. Rev. Lett. 98, 145504 (2007).

Recent professional development activities

Mid-Career Faculty Development Symposium, 8/19/2010
Orientation for New Directors of Graduate Studies, 8/16/2010
Workshop for Directors of Graduate Study and Graduate Contacts, UIUC 10/13/2009
Career Development Workshop for New Faculty, UIUC 2/17/2003

DANIEL P. SHOEMAKER

Associate Professor

Education

PhD 2010, Materials, University of California, Santa Barbara. Thesis: Understanding atomic disorder in polar and magnetic oxides. Advisor: Prof. Ram Seshadri

BS with Honors 2006, Materials Science and Engineering, University of Illinois, Urbana-Champaign

Academic experience

Assistant Professor, University of Illinois at Urbana-Champaign, Materials Science and Engineering, 2013-2020

Associate Professor, University of Illinois at Urbana-Champaign, Materials Science and Engineering, 2020-Present

Non-academic experience and consulting

Postdoctoral Researcher, Argonne National Laboratory, Materials Science Division, Argonne, IL, Dec 2010 - Aug 2013. Advisor: Prof. Mercouri Kanatzidis

Certifications, professional registrations, and patents

Patents

C. Tu, C. Zhao, R. Lu, T. Manzaneque, A. Gao, Y. Yang, D. P. Shoemaker, S. Gong. A Chip-scale Magnetoelectric MEMS Gyrator for RF Non-reciprocal Networks. (pending, #15/790,999)

Honors and awards

Teaching

Center for Innovation in Teaching and Learning List of Teachers Ranked as Excellent for Spring 2021

Center for Innovation in Teaching and Learning List of Teachers Ranked as Excellent for Spring 2020

Center for Innovation in Teaching and Learning List of Teachers Ranked as Excellent for Fall 2019

Collins Scholar of the Illinois AE3 Teaching College

Research

Engineering Council Outstanding Advising Award

2017 Ivan Racheff Fellow Award

DOE Early Career Award

Materials Research Society Graduate Student Gold Award

23rd Louis Rosen Thesis Prize - Los Alamos Neutron Science Center

Service activities (institutional and professional)

Undergraduate Recruitment Committee 2021-present

Faculty Hiring Committee 2015-2021

2022 - Invited Panelist for NSF Envisioning Pathways to Accelerated Materials Discovery Forum

2021 - Elected Chair of SNS/HFIR User's Group Executive Committee
2019 - Elected to SNS/HFIR User's Group Executive Committee 2020-2023

Publications and presentations (five most recent and important)

K. X. Nguyen, J. Huang, M. H. Karigerasi, K. Kang, D. G. Cahill, J.-M. Zuo, A. Schleife, D. P. Shoemaker, P. Y. Huang. Angstrom-Scale Imaging of Magnetization in Antiferromagnetic Fe2As via 4D-STEM. Ultramicroscopy (accepted)

K. Qu, Z. W. Riedel, I. Sánchez-Ramírez, S. Bettler, J. Oh, E. N. Waite, N. Mason, P. Abbamonte, F. de Juan, M. G. Vergniory, D. P. Shoemaker. A quasi-one-dimensional transition metal chalcogenide semiconductor (Nb4Se15I2)I2. Inorg. Chem. (accepted)

W. Chen, X. Zhan, R. Yuan, S. Pidaparthy, A. X. B. Yong, H. An, Z. Tang, K. Yin, A. Patra, H. Jeong, C. Zhang, K. Ta, Z. W. Riedel, R. M. Stephens, D. P. Shoemaker, H. Yang, A. A. Gewirth, P. V. Braun, E. Ertekin, J.-M. Zuo, Q. Chen. Formation and impact of nanoscopic oriented phase domains in electrochemical crystalline electrodes. Nature Mater. 22 92-99 (2023)

X. Liu, R. P. Panguluri, D. P. Shoemaker, Z.-F. Huang, B. Nadgorny. Nanoparticle geometrical effects on percolation, packing density, and magnetoresistive properties in ferromagnet-superconductor-insulator nanocomposites. Phys. Rev. B 106 224417 (2022)

M. H. Karigerasi, K. Kang, J. Huang, V. K. Peterson, K. C. Rule, A. J. Studer, A. Schleife, P. Y. Huang, D. P. Shoemaker. High-resolution diffraction reveals magnetoelastic coupling and coherent phase separation in tetragonal CuMnAs. Phys. Rev. Mater. 6 094405 (2022)

K. Qu, H. A. Bale, Z. W. Riedel, J. Park, L. Yin, A. Schleife, D. P. Shoemaker. Morphology and growth habit of the new flux-grown layered semiconductor KBiS2 revealed by diffraction-contrast tomography. Cryst. Growth Des. 22 [5] 3228-3234 (2022)

M. H. Karigerasi, K. Kang, G. E. Granroth, A. Banerjee, A. Schleife, D. P. Shoemaker. Strongly two-dimensional exchange interactions in the in-plane metallic antiferromagnet Fe2As probed by inelastic neutron scattering. Phys. Rev. Mater. 4, 114416 (2020)

A. Bhutani, X. Zhang, P. Behera, R. Thiruvengadam, S. E. Murray, A. Schleife, D. P. Shoemaker. A new family of anisotropic zinc-based semiconductors in a shallow energy landscape. Chem. Mater. 32 [1] 326-332 (2020)

M. H. Karigerasi, K. Kang, A. Ramanathan, D. L. Gray, M. D. Frontzek, H. Cao, A. Schleife, D. P. Shoemaker. An in-plane hexagonal antiferromagnet in the Cu-Mn-As system, Cu0.82Mn1.18As. Phys. Rev. Mater. 3 111402(R) (2019)

M. H. Karigerasi, L. K. Wagner, D. P. Shoemaker. Uncovering anisotropic magnetic phases via fast dimensionality analysis. Phys. Rev. Mater. 2 094403 (2018)

Recent professional development activities

03/02/21 Study group on Racism in STEM - I-MRSEC
01/28/21 Study group on Racism in STEM - I-MRSEC
08/13/20 Workshop on Delivering Your Presentation Remotely by Jean-Luc Doumont - I-MRSEC
10/10/19 Workshop on Making the most of your presentation by Jean-Luc Doumont - I-MRSEC
03/28/19 Workshop on Stewarding Funding Sources for Research - Illinois COE Office of Research

NANCY R SOTTOS

Professor and Department Head

Education

Ph.D., Mechanical Engineering University of Delaware 1991
B.S., Mechanical Engineering University of Delaware 1986

Academic experience

Head - Materials Science and Engineering, UIUC 2020-present
Swanlund Endowed Chair - Materials Science and Engineering, UIUC 2019-present
Full Professor - Materials Science and Engineering, UIUC 2006-present
Donald B. Willet Professor of Engineering (2005-2019)
Interim Head - Theoretical and Applied Mechanics, UIUC 2005-2006
Full Professor - Theoretical and Applied Mechanics, UIUC 2002-2006
Assistant Dean of Engineering - College of Engineering, UIUC 1998-1999
Associate Professor - Theoretical and Applied Mechanics, UIUC 1997-2002
Assistant Professor - Theoretical and Applied Mechanics, UIUC 1991-1997
Graduate Fellow - Mechanical Engineering, Center for Composite Materials, University of Delaware 1986-1991
Teaching Assistant - University of Delaware 1983-1987

Non-academic experience and consulting

Research Fellow - Naval Air Development Center, Warminster, PA, 1987-1989
Visiting Research Associate - Imperial College, Center for Composite Materials, London, England, Summer 1986
Staff Technologist - Bell Communications Research, Piscataway, NJ, Summer 1985

Certifications, professional registrations, and patents

Professional registrations

Engineer in Training (EIT), Delaware, 1987

Patents

J.S. Moore, N.R. Sottos, B.A. Suslick, K. Stawiasz, J.E. Paul, "Frontally Polymerized Polymeric Body and Method of Producing a Polymeric Body Having Spatially Varying Properties." Application No. 17/571,750 filed on January 10, 2022.

J.S. Moore, N.R. Sottos, K.J. Schwarz, K.J. Stawiasz, J.E. Paul, "Method of Light-Promoted Frontal Ring-Opening Metathesis Polymerization" Application No. 17/500,436 filed October 31, 2021.

J.F. Patrick, K.R. Hart, B.P. Krull, N.R. Sottos, J.S. Moore and S.R. White, "Method of Making a Self-Healing Composite System," U.S. Patent Application No. 14/607759 filed January 28, 2015.

Honors and awards

Teaching

Frocht Award, Society of Experimental Mechanics
Robert E. Miller Award for Teaching Excellence
Outstanding Advisor List, Engineering Council College Awards

Research

National Academy of Sciences (NAS)
American Academy of Arts and Sciences
Charles E. Taylor Award, Society for Experimental Mechanics
Innovation Transfer Award, University of Illinois
Center for Advanced Study (CAS) Professor

Public Service

Society for Experimental Mechanics, Editorial Council Chair
Society for Experimental Mechanics, President (2014-15), President Elect (2013-14), Vice President (2012-13).
Society for Engineering Science, Board of Directors
Society of Experimental Mechanics, Executive Committee
Society for Engineering Science, National Student Chapter Coordinator

Service activities (institutional and professional)

American Association for the Advancement of Science (2016-present)
American Chemical Society (ACS), member POLY and PMSE divisions (2015-present)
Materials Research Society (MRS), member (2015-present).
Society for Engineering Sciences (SES), member (1994-present), SES National Student Chapter Coordinator (1999-2002), Fellow (2007), Board of Directors (2008-2012)
Northwestern University, Materials Research Center, External Review Team (2020)

Publications and presentations (five most recent and important)

Alzate-Sanchez, D.M.; Yu, C.H.; Lessard, J.J.; Paul, J.E.; Sottos, N.R.; Moore, J.S. Rapid Controlled Synthesis of Large Polymers by Frontal RIng-Opening Metathesis Polymerization, Macromolecules, published online 2/14/23 DOI: 10.1021/acs.macromol.2c01892

Husted, K.E.L.; Brown, C.M.; et. al. Remolding and Deconstruction of Industrial Thermosets via Carboxylic Acid-Catalyzed Bifunctional Silyl Ether Exchange, J. Am. Chem. Soc., 145, 1916-1923 (2023). DOI: 10.1021/jacs.2c11858

Gao, Y.; Paul, J.E.; Chen, M.; Hong, L.; Chamorro, L.P.; Sottos, N.R.; Geubelle, P.G. Buoyancy-Induced Convection Driven by Frontal Polymerization, Phys. Rev. Lett., 130, 028101 (2023). DOI: 10.1103/PhysRevLett.130.028101

Lloyd, E.M; Vakil, J.R.; Yao, Y.; Sottos, N.R.; Craig, S.L. Covalent Mechanochemistry and Contemporary Polymer Network Chemistry: A Marriage in the Making, J. Am. Chem. Soc., 145, 751-768 (2023). DOI: 10.1021/jacs.2c09623

Suslick, B.; Hemmer, J.; Groce, B.; Stawiasz, K.; Geubelle, P.; Malucelli, G.; Mariani, A.; Moore, J.; Pojman, J.; Sottos, N. Frontal Polymerizations: From Chemical Perspectives to Macroscopic Properties and Applications, ChemRxiv. Cambridge: Cambridge Open Engage; 2022. DOI: 10.26434/chemrxiv-2022-f4k95

Lu, X., Li, W., Sottos, N.R., and Moore, J.S., Autonomous Damage Detection in Multilayered Coatings via Integrated Aggregation-Induced Emission Luminogens, ACS Applied Materials and Interfaces, 10, 40361-40365 (2018). DOI: 10.1021/acsami.8b16454

White, S.R., Moore, J.S., Sottos, N.R., Krull, B.P., Santa Cruz, W.A., Gergely, R.C.R., Restoration of Large Damage Volumes in Polymers, Science, 344, 620-623 (2014). DOI: 10.1126/science.1251135

Davis, D. A., Hamilton, A., Yang, Y., Cremar, L. D., Gough, D. V., Potisek, S. L., Ong, M. T., Braun, P. V., Martínez, T. J., White, S. R., Moore, J. S. and Sottos, N. R. Force-Induced Activation of Covalent Bonds in Mechanoresponsive Polymeric Materials, Nature, 459, 68-72 (2009). DOI: 10.1038/nature07970

Toohey, K.S., Sottos, N.R., Lewis, J.A., Moore, J.S., and White, S.R., Self-healing materials with microvascular networks, Nature Materials, 6, 581-585 (2007).

White, S. R., Sottos, N. R., Geubelle, P. H., Moore, J. S., Kessler, M. R., Siram, S. R., Brown, E. N., Viswanathan, S. Autonomic healing of polymer composites, Nature 409, 794-797 (2001).

Recent professional development activities

Individual sessions with M. Paulsen (OIR) (1992)
Classroom observation, Spring (1992)
Office of Instructional Resources:
Lecturing Tips, January (1996)
Collaborative Learning - A Cooperative Experience, September (1993)

ANTONIA STATT
Assistant Professor

Education

PhD, Physics, University of Mainz, Oct 2015
Diploma, Physics, University of Mainz, 2012

Academic experience

Assistant Professor (0% Appointment), Chemical & Bimolecular Engineering, January 2023 - present
Postdoctoral Fellow, Chemical and Biological Engineering, Princeton University, Princeton, NJ, April 2016 - November 2019
Affiliate Assistant Professor, Beckman Institute, April 2020 - present
Affiliate Assistant Professor, Chemical & Biomolecular Engineering, January 2020 - January 2023
Assistant Professor, Materials Research Lab, November 2019 - present
Assistant Professor, Materials Science & Engineering, November 2019 - present

Honors and awards

CoMSEF Young Investigator Award for Modeling & Simulation
Dies Academicus award for exceptional PhD in the Department of Physics, Mathematics and Computer Science, University of Mainz
MAINZ Graduate School Award

Teaching

List of teachers ranked as excellent by their students
List of teachers ranked as excellent by their students

Research

NSF CAREER Award
American Chemical Society Petroleum Research Fund Doctoral New Investigator Award

Service activities (institutional and professional)

American Physical Society
Materials Science Department Colloquium Committee, 2020-21
Graduate Admissions and Recruiting Committee, 2020-present
NSF Ad-hoc Reviewer for CMMT (2023)
NSF Panel Reviewer for CBET (2021,2022)

Publications and presentations (five most recent and important)

Predicting aggregate morphology of sequence-defined macromolecules with recurrent neural networks D Bhattacharya, DC Kleeblatt, A Statt, WF Reinhart, Soft matter 18 (27), 5037-5051, 2022
Computational Study of Mechanochemical Activation in Nanostructured Triblock Copolymers Z Huo, **SJ Skala**, L Falck, JE Laaser, A. Statt , ACS Polymers Au,2, 6, 467–477, 2022

Opportunities and Challenges for Inverse Design of Nanostructures with Sequence Defined Macromolecules WF Reinhart, A. Statt, Accounts of Materials Research 2 (9), 697-700, 2021

Unsupervised learning of sequence-specific aggregation behavior for a model copolymer A. Statt, DC Kleeblatt, WF Reinhart Soft Matter 17 (33), 7697-7707, 2021

Michael P. Howard, Antonia Statt, Howard A. Stone, and Thomas M. Truskett "Stability of force-driven shear flows in nonequilibrium molecular simulations with periodic boundaries" J. Chem. Phys. 152, 214113 (2020)

Statt A, Casademunt H, Brangwynne, CP, Panagiotopoulos AZ (2020), "Model for disordered proteins with strongly sequence-dependent liquid phase behavior", The Journal of Chemical Physics 152 (7), 075101

Howard MP, Statt A, Madutsa F, Truskett TM and Panagiotopoulos AZ (2019), "Quantized bounding volume hierarchies for neighbor search in molecular simulations on graphics processing units", Computational Materials Science. Vol. 164, pp. 139-146. Elsevier.

Moghimi E, Chubak I, Statt A, Howard MP, Founta D, Polymeropoulos G, Ntetsikas K, Hadjichristidis N, Panagiotopoulos AZ, Likos CN and others (2019), "Self-Organization and Flow of Low-Functionality Telechelic Star Polymers with Varying Attraction", ACS Macro Letters. Vol. 8(7), pp. 766-772. American Chemical Society.

Statt A, Virnau P and Binder K (2015), "Finite-size effects on liquid-solid phase coexistence and the estimation of crystal nucleation barriers", Physical review letters. Vol. 114(2), pp. 026101. American Physical Society.

Recent professional development activities

GEAR: Grainger Engineering Research Workshop Program

Collins Scholar program - Academy for Excellence in Engineering Education

JEAN-CHARLES STINVILLE
Assistant Professor

Education

Ph.D., Solid Mechanics, Materials Science and Structures Mechanics - Ecole Nationale Supérieure de Mécanique et Aérotechnique (ISAE –ENSMA) - University of Poitiers (2010)

M.Sc., Materials Science and Mechanical Engineering - Ecole Nationale Supérieure de Mécanique et Aérotechnique (ISAE –ENSMA) - University of Poitiers (2006)

M. Eng., Aeronautics, Computer Science, Materials Science and Mechanics - Ecole Nationale Supérieure de Mécanique et Aérotechnique (ISAE –ENSMA) (2006)

Academic experience

Assistant professor - University of Illinois at Urbana-Champaign (2021)

Specialist - University of California Santa Barbara (2019-2021)

Associate Specialist - University of California Santa Barbara (2015-2019)

Postdoctoral researcher -Ecole de Technologie Supérieure (Canada) / University of California Santa Barbara (2010-2015)

Graduate student - Ecole Nationale Supeérieure de Mécanique et Aérotechnique (ISAE – ENSMA) - University of Poitiers (2006-2010)

Honors and awards

Research

JOM Editor's Choice, 2021

Best Paper Award at EuroSuperalloys, 2018

SEM Hetényi Award: best research paper published in Experimental Mechanics in 2016, 2018

2016 Acta Materialia and 2018 International Journal of Fatigue Oustanding Reviewer Award

Service activities (institutional and professional)

SEM - Membership (2021 - 2026)

TMS - Lifetime membership

Safety Committee, 2022-present

Graduate Recruiting Committee, 2022-present

Panelists for the Collins Scholars (2022) program of the Academy for Excellence in Engineering Education

Publications and presentations (five most recent and important)

C. Bean, J.C. Stinville, A. Naït-Ali, Z. Wu, F. Sun, F. Prima, S. H´emery. Microstructural statistics for low-cycle fatigue crack initiation in α+β titanium alloys: A microstructure based RVE assessment. International of Fatigue, 2023.

J.C. Stinville, M.A. Charpagne, R. Maas, H. Proudhon, W. Ludwig, P.G. Callahan, F. Wang, I.J. Beyerlein, M.P. Echlin, T.M.Pollock. Insights into Plastic Localization by Crystallographic Slip from Emerging Experimental and Numerical Approaches. Annual Review of Materials Research, 2023.

R. Sidharth, J.C. Stinville, H. Sehitoglu. Fatigue and fracture of shape memory alloys in the nanoscale: An in-situ TEM study. Scripta Materialia, 2023.

R.L. Black, T. Garbowski, C. Bean, A.L. Eberle, S. Nickell, D. Texier, V. Valle, J.C. Stinville. High-Throughput High-Resolution Digital Image Correlation Measurements by Multi-Beam SEM Imaging. Experimental Mechanics, 2023.

Jonathan M Hestroffer, Jean-Charles Stinville, Marie-Agathe Charpagne, Matthew P Miller, Tresa M Pollock, Irene J Beyerlein. Slip localization behavior at triple junctions in nickel-base superalloys. Acta Materialia, 2023.

J.C. Stinville, M.A. Charpagne, A. Cervellon, S. Hemery, F. Wang, P.G. Callahan, V. Valle, T.M. Pollock. On the Origins of Fatigue Strength in Crystalline Metallic Materials. Science, 2022.

J.C. Stinville, E. Martin, M. Karadge, S. Ismonov, M. Soare, T. Hanlon, S. Sundaram, M.P. Echlin, P.G. Callahan, W.C. Lenthe, V.M. Miller, J. Miao, A.E. Wessman, R. Finlay, A. Loghin, J. Marte, T.M. Pollock. Competing Modes for Crack Initiation from Non-metallic Inclusions and Intrinsic Microstructural Features During Fatigue in a Polycrystalline Nickel-Based Superalloy. Metallurgical and Materials Transactions A, 2018.

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

DALLAS TRINKLE
Professor and Associate Head

Education

PhD, Physics, The Ohio State University, 2003
BS, Physics and Mathematics, Xavier University, 1996

Academic experience

Ivan Rachel Professor of Materials Science and Engineering, Materials Research Laboratory, and Computational Science and Engineering, 2021-
Professor, Materials Science and Engineering, Materials Research Laboratory, and Computational Science and Engineering, 2018-2021
Senior Research Fellow, Institute for Pure and Applied Mathematics, UCLA, 9-12/2017
Associate Professor, Materials Science and Engineering, Materials Research Laboratory, and Nuclear, Plasma, and Radiological Eng., 2012-2018
Senior Research Fellow, Institute for Pure and Applied Mathematics, UCLA, 9-12/2012
Assistant Professor, Materials Research Laboratory, 2011-2012
Affiliate Assistant Professor, NPRE, University of Illinois, 2009-2012
Assistant Professor, University of Illinois, 2006-2012
Adjunct Assistant Professor, Physics, Ohio State University, 2005-2008

Non-academic experience and consulting

National Research Council postdoctoral associate, Air Force Research Laboratory, Materials and Manufacturing Directorate, Wright-Patterson AFB, January 2004-August 2006
Air Force Research Laboratory, 9/2012-5/2013

Honors and awards

Teaching

Collins Award for Innovative Teaching
Education Innovation Fellow
List of Teachers Ranked as Excellent

Research

TMS Brimacombe Medal
IAS International Visiting Fellow, Univ. Warwick
NCSA Faculty Fellow
Willett Faculty Scholar
TMS/AIME Robert Lansing Hardy Award

Service activities (institutional and professional)

Materials Science and Engineering, Diversity committee, 2022-
Materials Science and Engineering, Curriculum committee chair, 2021-
Materials Science and Engineering, Curriculum committee chair, 2016-2019
Materials Science and Engineering, Curriculum committee, 2014-
Engineering, Diversity Committee chair, 2019-2020

Publications and presentations (five most recent and important)

Numerical calculation of interstitial dumbbell-mediated transport coefficients in dilute crystalline systems with non-truncated correlations. S. Chattopadhyay and D. R. Trinkle. Philos. Mag. (2022).

First-principles core energies of isolated basal and prism screw dislocations in magnesium. Y. Dan and D. R. Trinkle, Mater. Res. Lett. 10, 360–368 (2022).

Exploring the necessary complexity of interatomic potentials. J. A. Vita and D. R. Trinkle, Comp. Mater. Sci. 200, 110752 (2021).

Accelerated molecular dynamics simulations of dislocation climb in nickel. L. T. W. Smith, A. M. Z. Tan, T. D. Swinburne, D. Perez, and D. R. Trinkle, Phys. Rev. Materials 5, 083603 (2021).

D. Qiu, P. Zhao, D. R. Trinkle, and Y. Wang. "Stress-dependent dislocation core structures leading to non-schmid behavior." Mater. Res. Lett. 9(3), 134–140 (2021).

S. J. Honrao, Q. Rizzardi, R. Maaß, D. R. Trinkle, and R. G. Hennig, "Split-vacancy defect complexes of oxygen in hcp and fcc cobalt." Phys. Rev. Materials 4, 103608 (2020)

R. Gao, A. Jain, S. Pandya, Y. Dong, Y. Yuan, H. Zhou, L. R. Dedon, V. Thoréton, S. Saremi, R. Xu, A. Luo, T. Chen, V. Gopalan, E. Ertekin, J. Kilner, T. Ishihara, N. H. Perry, D. R. Trinkle, and L. W. Martin, "Designing optimal perovskite structure for high ionic conduction." Adv. Mater. 32(1), 1905178 (2020).

D. R. Trinkle. Variational principle for mass transport. Phys. Rev. Lett. 121, 235901 (2018).

D. R. Trinkle, Automatic numerical evaluation of vacancy-mediated transport for arbitrary crystals: Onsager coefficients in the dilute limit using a Green function approach. Philos. Mag. 97, 2514-2563 (2017)

R. Agarwal and D. R. Trinkle, Exact model of vacancy-mediated solute transport in magnesium. Phys. Rev. Lett. 118, 105901 (2017)

Recent professional development activities

Attended conferences, seminars, and workshops throughout years.

HUA WANG
Assistant Professor

Education
B.S. Polymer Science and Engineering, University of Science and Technology of China (2012)
Ph.D. Materials Science and Engineering, UIUC (2016)

Academic experience
Affiliate, Institute for Genomic Biology
Affiliate, Materials Research Laboratory
Part-time member, Beckman Institute
Affiliate, Carle College of Medicine
Affiliate, Department of Bioengineering
Member, Cancer Center at Illinois
Assistant Professor, Materials Science and Engineering

Non-academic experience and consulting
2017-2020 Wyss Technology Development Fellow, Wyss Institute
2016-2020 Postdoctoral Fellow, Harvard University (Advisor: David J. Mooney)

Certifications, professional registrations, and patents

Patents
Wang H, **Liu Y**. METABOLIC TAGGING AND TARGETING OF RED BLOOD CELLS. U.S. Provisional Patent Application No. 63/402,413
Liu Y, Mooney D, Wang H. COMPOSITIONS AND METHODS FOR LOCALIZED DELIVERY OF CYTOKINES FOR ADOPTIVE CELL THERAPY. U.S. Provisional Patent Application No. 63/330,562
Wang H, **Bhatta R**, **Han JS**. Modified Exosomes and Methods of Use. U.S. Provisional Patent Application No. 63/333,001

Honors and awards

Teaching
List of Teachers Ranked as Excellent by their Students for Spring 2023 - MSE 474-Biomaterials and Nanomedicine, UIUC

Research
National Inspirational Scholarship (2009)
Scholarship of Dalian Institute of Physics and Chemistry (2010)
National Undergraduate Innovative Research Funding (2010)
National Inspirational Scholarship (2011)
Rili Scholarship (2011)

Service activities (institutional and professional)
Biomaterials Qual Examiner, Summer 2021 - Present
Lecture Selection Committee, AY 23-24

Graduate Recruitment Committee, AY 23-24
Reviewer for OVCR - Campus Research Board. Sep 2023
NSF CAREER Proposal Panel, Sep-Nov 2023

Publications and presentations (five most recent and important)

Han J, **Bhatta R**, **Liu Y**, **Bo Y**, Elosegui-Artola A, Hua Wang*. Metabolic Glycan Labeling Immobilizes Dendritic Cell Membrane and Enhances Antitumor Efficacy of Dendritic Cell Vaccine. Nature Communications 2023, 14, 5049

Wang Y, Wang H*. Lymph Node Targeting For Immunotherapy. Immuo-Oncology and Technology 2023. DOI:https://doi.org/10.1016/j.iotech.2023.100395

Bo Y, Zhou J, Cai K, Wang Y, Feng Y, Li W, Jiang Y, Kuo S, Roy J, Anorma C, Gardner SH, Luu LM, Lau GW, Bao Y, Chan J, Wang H*, Cheng J*. Leveraging Intracellular ALDH1A1 Activity for Selective Cancer Stem-like Cells Labeling and Targeted Treatment via Click Reaction. PNAS 2023, 120 (36), e2302342120

Han J, **Bhatta R**, Wang H*. Bio-adhesive Macroporous Hydrogels for In Situ Recruitment and Modulation of Dendritic Cells. Cellular and Molecular Bioengineering 2023. https://doi.org/10.1007/s12195-023-00770-2

Zhang Y , Cui J, Chen KY, Kuo SH, Sharma J, **Bhatta R**, Liu Z, Ellis-Mohr A, An F, Li J, Chen Q, Foss K, Wang H, Li Y, McCoy AM, Lau GW, Cao Q*. A Smart Coating with Integrated Physical-Antimicrobial and Strain-Mapping Functionalities for Orthopedic Implants. Science Advances 2023, 9, eadg7397

Recent professional development activities

Team Science Leadership Program, IGB, UIUC (2023-2024)
National Cancer Institute's (NCI) Awardee Skills Development Consortium (NASDC) (2023)
ARPA-H Info Session (Fall 2022)
NSF Mock Review Panel (Spring 2021)
NIH Granting Writing Workshop (Fall 2020)

YINGJIE ZHANG
Assistant Professor

Education

PhD in Applied Science and Technology, University of California, Berkeley (2015)
BS in Physics (Summa Cum Laude), Nankai University (2010)

Academic experience

Part-time Faculty, Beckman Institute, UIUC, 2023 - now
Faculty Affiliate, Materials Research Laboratory, UIUC, 2019 - now
Assistant Professor, Materials Science and Engineering, UIUC, 2019 - now

Certifications, professional registrations, and patents

Patents

A. Paul Alivisatos, Miquel B. Salmeron, Yingjie Zhang, Daniel J. Hellebusch, "Photodetectors exploiting electrostatic trapping and percolation transport," U.S. Patent, Publication numbers: US20170148938A1, US10177271B2, Filed on Nov. 23, 2016, Granted on Jan. 8, 2019.

Yingjie Zhang, Fujia Zhao, "Coated electrode, electrochemical sensor and method for detection of hydrogen peroxide," provisional patent approved, Application Serial No.: 63/278,313; non-provisional patent filed (Nov. 8, 2022), U.S. Patent Application No.: 17/983,052.

Honors and awards

Anselmo Macchi Fellowship, University of California, Berkeley
Best Poster Award, MRS Spring Meeting & Exhibit
Dorothy M. and Earl S. Hoffman Scholarship, American Vacuum Society
Graduate Student Award, Materials Research Society
Chinese Government Award for Outstanding Self-Financed Students Abroad

Service activities (institutional and professional)

The Electrochemical Society
Curriculum Committee, 2022-2023
Colloquium Committee, 2019-2022
Undergraduate Recruitment Committee, 2019-2023
Curriculum review committee, Master of Engineering degree program, Grainger College of Engineering, University of Illinois at Urbana-Champaign (2020)

Publications and presentations (five most recent and important)

Ye Xu, Bin Wu, Yingjie Zhang, Zelong Liu, Haokai Sun, Danning Di, "Discrimination between neutrino events and backgrounds using pulse shape information in reactor neutrino experiments," Nuclear Instruments and Methods in Physics Research Section A 610, 590–596 (2009).

Yingjie Zhang, Ruoyang Zhang, Zhishuai Zhang, Haibo Zhu, Feng Song, "Surface polariton generation and fluorescence enhancement using a superlens," Journal of the Optical Society of America B 26, 2337–2341 (2009).

Yingjie Zhang, Ruoyang Zhang, Qingru Wang, Zhishuai Zhang, Haibo Zhu, Jiadong Liu, Feng Song, Shanxin Lin, Edwin Yue Bun Pun, “Fluorescence enhancement of quantum emitters with different energy systems near a single spherical metal nanoparticle,” Optics Express 18, 4316–4328 (2010).

Yingjie Zhang, Dominik Ziegler, Miquel Salmeron, “Charge trapping states at the SiO2-oligothiophene monolayer interface in field effect transistors studied by Kelvin probe force microscopy,” ACS Nano 7, 8258–8265 (2013).

Danylo Zherebetskyy, Marcus Scheele, Yingjie Zhang, Christopher Thompson, Noah Bronstein, David Britt, Miquel Salmeron, A. Paul Alivisatos, Lin-Wang Wang, “Hydroxylation of the surface of PbS nanocrystals passivated with oleic acid,” Science 344, 1380–1384 (2014).

Recent professional development activities

Collins Scholars Program, Academy for Excellence in Engineering Education, College of Engineering (2017-2018)

JIAN-MIN ZUO
Professor

Education

Ph.D. Physics Arizona State University 1989
B.A. Science Nanjing University 1983

Academic experience

5/18-present, Affiliated Professor, Electrical & Computer Engineering, University of Illinois
6/17-6/2020, Distinguished Adjunct Professor, ShanghaiTech University
8/16-present Racheff Professor, University of Illinois
8/10-8/16 Professor, University of Illinois
8/06-7/10 Associate Professor, University of Illinois
5/06-7/06 Invited Professor, University of Lille, France
5/00-5/06 Assistant Professor, University of Illinois
6/98-4/00 Associate Research Scientist, Dept. of Physics, Arizona State University
3/98-6/98 Japan Society for Science Promotion Fellow, Kyushu University, Japan
1991-6/1998 Assistant Research Scientist, Dept. of Physics, Arizona State University
1989-1991 Post-doctoral Research Associate, Dept. of Physics, Arizona State University

Non-academic experience and consulting

Onsager Professor, Norges teknisk-naturvitenskapelige universitet - NTNU (1/17-12/17)
Chair of Excellence, CEA-Grenoble, Nanoscience Fondation, France (2014, 4.5 Months)
Chair of Excellence, CEA-Grenoble, Nanoscience Fondation, France (2011-2013, 1-2 Months per year)
Invited Professor, University of Lille, France, (2006, 2 months)
K.C. Wang Scholarship, Beijing Electron Microscopy Laboratory, China (1996, 1.5 months)
Visiting Scientist, University of Duisburg, Germany (1995, 1 month)
Visiting Scientist, University of Trondheim-NTH, Norway (1995, 2 months)
Foreign Research Specialist, Japan Institute for Metals, Tsukuba, Japan (1993, 1 month)
EMLab Solutions, Champaign, IL, 2019-present
Electron Microscopy Center, ShanghaiTech University, Shanghai, 2017-2022

Honors and awards

Research

IUCr Gjonnes Award
Intel's 2019 Outstanding Researcher Award
Fellow of Microscopy Society of America
Lars Onsager Professorship, 2017, Norwegian University of Science and Technology
Ernst Ruska Prize, German Microscopy Society

Service activities (institutional and professional)

Faculty Awards Committee, 2020-
Advisory committee, 2019-2020
Chair, Faculty Search Committee, 2015-2019
College executive committee, 2016-
DOE external review, Career program, 2020, 2021

Publications and presentations (five most recent and important)

Martin Lonsky, Myoung-Woo Yoo, Yi-Siou Huang, Jiangchao Qian, Jian-Min Zuo, and Axel Hoffmann, "Structural and magnetic properties of Pt/Co/Mn-based multilayers", Physical Review Materials 6 (5), 054413 (2022).

T. Bilyk, H. W. Hsiao, R. Yuan, M. Benchakar, A. Habrioux, S. Célérier, J. M. Zuo, J. Pacaud, and V. Mauchamp, "Plasmon spectroscopy for the determination of Ti3C2Tx MXene few layer stacks architecture", 2D Materials 9 (3), 035017 (2022).

Gangbin Yan, George Kim, Renliang Yuan, Eli Hoenig, Fengyuan Shi, Wenxiang Chen, Yu Han, Qian Chen, Jian-Min Zuo, Wei Chen, and Chong Liu, "The role of solid solutions in iron phosphate-based electrodes for selective electrochemical lithium extraction", Nature Communications 13 (1), 4579 (2022).

Sangmoon Yoon, Hongmin Seo, Kyoungsuk Jin, Hyoung Gyun Kim, Seung-Yong Lee, Janghyun Jo, Kang Hee Cho, Jinseok Ryu, Aram Yoon, Young-Woon Kim, Jian-Min Zuo, Young-Kyun Kwon, Ki Tae Nam, and Miyoung Kim, "Atomic Reconstruction and Oxygen Evolution Reaction of Mn3O4 Nanoparticles", The Journal of Physical Chemistry Letters 13 (35), 8336 (2022).

Tongtong Shang, Dongdong Xiao, Fanqi Meng, Xiaohui Rong, Ang Gao, Ting Lin, Zhexin Tang, Xiaozhi Liu, Xinyan Li, Qinghua Zhang, Yuren Wen, Ruijuan Xiao, Xuefeng Wang, Dong Su, Yong-Sheng Hu, Hong Li, Qian Yu, Ze Zhang, Vaclav Petricek, Lijun Wu, Lin Gu, Jian-Min Zuo, Yimei Zhu, Ce-Wen Nan, and Jing Zhu, "Real-space measurement of orbital electron populations for Li1-xCoO2", Nature Communications 13 (1), 5810 (2022).

Yu-Tsun Shao, Renliang Yuan, Haw-Wen Hsiao, Qun Yang, Yang Hu, and Jian-Min Zuo, "Cepstral scanning transmission electron microscopy imaging of severe lattice distortions", Ultramicroscopy, 113252 (2021).

Renliang Yuan, Jiong Zhang, Lingfeng He, and Jian-Min Zuo, "Training artificial neural networks for precision orientation and strain mapping using 4D electron diffraction datasets", Ultramicroscopy, 113256 (2021).

Recent professional development activities

Teaching college, Engineering College, 2000-2001

From:	Miller, Nolan H
To:	Schmidt, A.J.
Cc:	Newell, Brooke; Flanagan, Karle Ann; Wang, Shaowen; Lehman, Barbara J
Subject:	RE: Letter of Support for +DS programs
Date:	Thursday, August 15, 2024 3:25:47 PM
Attachments:	image001.png

Thanks, A.J.

Barb – please add this email string to the two proposals, Keys 1155 and 1194.

nm

ILLINOIS

NOLAN H MILLER

Daniel and Cynthia Mah Helle Professor in Finance | Department of Finance

Chair, Senate Committee on Educational Policy

Director, Center for Business and Public Policy

Gies College of Business | University of Illinois at Urbana-Champaign

217.244.2847 | nmiller@illinois.edu | http://www.business.illinois.edu/nmiller

From: Schmidt, A.J. <ajs167@illinois.edu>
Sent: Thursday, August 15, 2024 12:31 PM
To: Miller, Nolan H <nmiller@illinois.edu>
Cc: Newell, Brooke <bsnewell@illinois.edu>; Flanagan, Karle Ann <kflan@illinois.edu>; Wang, Shaowen <shaowen@illinois.edu>
Subject: RE: Letter of Support for +DS programs

Hi Nolan,

We have looked over the proposal for

Nuclear, Plasma, and Radiological Engineering plus Data Science

As well as the proposal for

Materials Science & Engineering plus Data Science

We have no issues with either of these proposals as they both follow the standard X+DS template of core courses laid out by the Data Science Education Task Force.

Thank you for reaching out.

Please let us know if you have any further questions or concerns.

Regards,

AJ

A.J. Schmidt, M.S.
(he/him/his)
Data Science Education Coordinator
College of Liberal Arts & Sciences, Office of the Dean
The University of Illinois at Urbana-Champaign

From: Miller, Nolan H <nmiller@illinois.edu>
Sent: Thursday, August 1, 2024 10:37 AM
To: Schmidt, A.J. <ajs167@illinois.edu>
Cc: Newell, Brooke <bsnewell@illinois.edu>
Subject: RE: Letter of Support for +DS programs

Hi AJ,

Just following up on this email. EPC currently has

Establish the Bachelor of Science in Nuclear, Plasma, and Radiological Engineering plus Data Science in The Grainger College of Engineering (key 1155)

Establish the Bachelor of Science in Materials Science & Engineering plus Data Science in the Grainger College of Engineering (key 1194)

They were both in workflow at the time of your previous email, but please confirm that Data Science Education has reviewed them and has no concerns. We will attach your reply to the CIMP records.

Thanks,

Nolan

ILLINOIS

NOLAN H MILLER
Daniel and Cynthia Mah Helle Professor in Finance | Department of Finance
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Director, Center for Business and Public Policy
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From: Schmidt, A.J. <ajs167@illinois.edu>

Sent: Wednesday, May 15, 2024 2:13 PM
To: Miller, Nolan H <nmiller@illinois.edu>; Newell, Brooke <bsnewell@illinois.edu>
Cc: Fagen-Ulmschneider, Wade A <waf@illinois.edu>; Amos, Jenny <jamos@illinois.edu>; Flanagan, Karle Ann <kflan@illinois.edu>
Subject: RE: Letter of Support for +DS programs

Thank you Nolan,

I just wanted to add that I am already working with the people in the various units who are putting together proposals, so this would just be formalizing that process. (I also do not anticipate any further issues with any of the proposals currently in the system since none of them deviate (significantly) from the DS course coursework.)

Regards,

AJ

A.J. Schmidt, M.S.
(he/him/his)
Data Science Education Coordinator
College of Liberal Arts & Sciences, Office of the Dean
The University of Illinois at Urbana-Champaign

From: Miller, Nolan H <nmiller@illinois.edu>
Sent: Friday, May 10, 2024 11:15 AM
To: Newell, Brooke <bsnewell@illinois.edu>
Cc: Fagen-Ulmschneider, Wade A <waf@illinois.edu>; Amos, Jenny <jamos@illinois.edu>; Schmidt, A.J. <ajs167@illinois.edu>
Subject: Letter of Support for +DS programs

Dear Brooke,

As you know, there was considerable confusion last spring surrounding approval of one of the new +DS undergraduate programs that almost caused it to miss the last Senate meeting and get set back a year. The reason for this seems to be that, while the various steps in the approval chain were focused on their own part of the program, nobody was looking at things from a more holistic "data science" perspective. The Data Science Education Council is in the process of being reconstituted, and eventually they will take over this role. In the interim, A.J. Schmidt is Data Science Coordinator and Shaowen Wang is working on putting the council back together. Please ask sponsors to request a letter of support from them (through AJ) to be included with the proposal in CIMP. Ultimately this is in sponsors' interest since A.J. oversees the +DS programs more generally and can see how the various pieces fit together better than any single unit in the approval chain.

Thanks,

Nolan

ILLINOIS

NOLAN H MILLER

Daniel and Cynthia Mah Helle Professor in Finance | Department of Finance

Chair, Senate Committee on Educational Policy

Director, Center for Business and Public Policy

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