# Ph.D. in Engineering Education Systems and Design (EESD) Arizona State University

Ira A. Fulton Schools of Engineering Arizona State University

We are risk takers, entrepreneurs, makers, and scholars: join our ecosystem of innovation.

## engineering.asu.edu/eesd



## Department of Engineering Education, University at Buffalo Formed August 2018

16 Faculty in Fall 2019

We anticipate hiring 2 additional faculty at open rank in 2019-2020

Check for posting mid-July at ubjobs.buffalo.edu

We will start accepting applications for graduate study this summer

Fall 2019 and Spring 2020 admission

Check our web site

#### Research Projects, Fall 2019

- Open-ended Modeling Problems for Engineering Science Courses
- Developing Homework Problems to increase conceptual knowledge development and sense-making
- Investigating the Role of Problem Typology in Helping Engineering Undergrads Effectively Communicate Their Experience
- Problem Typology as a Foundation toward an Engineering Education
  Problem Database
- Using Subgoal Labeling to Teach Introductory Programming
- Impact of Pre-College Computing Education
- Use of Homework in Problem-Solving Courses

http://engineering.buffalo.edu/engineering-education.html



Institute for STEM and Diversity Initiatives

- Advocating for and nurturing underrepresented student and faculty success inside and beyond the classroom
- Conducting and catalyzing STEM educational research

IDoTeach

- Incorporating engineering in a pre-service STEM teacher education program
- Developing a streamlined engineering degree pathway to facilitate undergraduate engineering majors teaching in the K-12 classroom

Multi-disciplinary B.S. Engineering Degree (new)

NSF Funded STEM Education Projects

 WIDER, REUs, RETs, S-STEMs, IUSE:RED Site – Computer Science Professionals Hatchery

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## Clemson: Engineering and Science Education PhD and Certificate programs



- The Clemson Department of Engineering and Science Education offers a unique experience with engineering education research and science education research in one program.
- ESED will have a faculty position with a search beginning in August 2019 for a start for Fall 2020. Please let your students and colleagues know of the opportunity.
- Contact <u>ESEGradinquiries@Clemson.edu</u>
  or <u>LC@Clemson.edu</u>



**UF** Herbert Wertheim College of Engineering UNIVERSITY of FLORIDA

## NEW DEPARTMENT OF ENGINEERING EDUCATION



The field of Engineering is unique due to its wide breadth of subject areas that incorporate an extensive study of fundamentals as well as a vast body of experiential learning.

Here at the University of Florida's Herbert Wertheim College of Engineering, we are proud to fully establish the **Department of Engineering Education** starting fall 2019.

Faculty in the department will teach general engineering courses, including a first-year design class, courses for a graduate certificate in Engineering Education, and conduct fundamental and applied research in Engineering Education.

Visit us at Booth #317 for a department "Birth" Day cake cutting at 5:15 p.m. on Monday, June 17.

JOIN THE TRANSFORMATION. UF is hiring faculty members across all disciplines.



### Engineering Education Transformations Institute UNIVERSITY OF GEORGIA

#### **EnEd Research**

- Engineering formation in interdisciplinary & interprofessional spaces.
- Online & cross-reality learning
- Diversity & inclusion
- Institutional change
- Mixed-methods research design
- Quality in interpretive research methods.

#### **Professional Dev.**

- Monthly engineering forums.
- Biweekly peermentoring breakfasts
- Biweekly faculty learning community.
- Research & innovation grants

 Research in learning and formation in k-gray engineering to transform engineering education.

Ph.D. In Eng. Ed

 Investigations of engineering work in complex, crossdiscipline, cross-domain settings

#### Joachim Walther, Director & Assoc. Prof.

Nicola Sochacka, Associate Director John Morelock, Associate Director Gin Bacon Talati, Institute Manager Nathaniel Hunsu, Assistant Professor Dominic May, Assistant Professor Racheida Lewis, Assistant Professor

EETI.UGA.EDU



## **Department of Learning in Engineering Sciences**

https://www.kth.se/larande



Through research in technical education and learning the Department of Learning in Engineering Sciences paves the way for educational innovation and new approaches to teaching and learning in science and engineering transforming STEM education nationally and internationally at all levels.

## Louisiana Tech University Integrated STEM Education Research Center

## **Center Priorities**

### Curriculum Design & Development

- Hands-on, project-driven
- Cross-disciplinary
- Student ownership of labs
- Apprenticeship learning
- K-12 Teacher Professional Development
  - Mentoring experiences
  - Cross-disciplinary, project-driven
- Diversity and Inclusion in STEM
- Student Progress & Pathways



## **Graduate Programs**

- PhD Engineering –
  Engineering Education
  concentration
- PhD Computational Analysis and Modeling (CAM) – STEM Education concentration





#### J.B. Speed School of Engineering @ University of Louisville



Center for Teaching and Learning Engineering







Engineering Education Research Group

#### UNIVERSITI TEKNOLOGI MALAYSIA CENTRE FOR ENGINEERING EDUCATION: LOCAL & GLOBAL ACTIVITIES

## Scholarly Innovations, Research & PhD in Engineering Education



More than 20 PhD graduates since 2011 Current students: 16

#### Translating research into practice



JICA-funded PBL for Low Carbon Society with Kyoto Environ. Activities Assoc. & Johor State Edu. Dept



awards

Learning



## Community of practice – enable and support

Champions & Communities of change agents





International Innovative Practices in Higher Education Expo (I-PHEX)

International Engineering Service Learning with Korea &



Champions and trainers (TOT) – World Bank-funded project with MOHE Afghanistan

Contact: khairiyah@utm.my

Training: Effective SCL implementation for Engaging Millennials

EF is the home for the First-Year Engineering Program (FYEP) at Michigan Tech. Enrollment ~1000 each year.

EF includes 10 faculty and a total of ~50 near-peer mentors.

For two decades, FYEP has been a common firstyear program emphasizing active learning

research is supported by

- US Dept of Educ

- National Endowment for Humanities,

Air Force Research Lab,

the KERN Foundation, and

e://www.mtu.edu/e

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the Dow Foundation

Human-centered engineering,

Spatial visualization skills ar

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Enhancing digital science in FYEP, an

Longitudinal assessment of 2017 FYE update.



# University of Michigan Engineering Education Research graduate program accepting applicants. Apply now!

# Engineering Education Research faculty embedded in traditional engineering departments.

Shanna Daly	<i>Cindy Finelli</i> Director	Mark Guzdial	Aileen Huang-Saad	Lisa Lattuca	Joi Mondisa
Mechanical Engineering	Electrical & Computer Engineering; Education	Computer Science & Engineering; Information	Biomedical Engineering	Education; Integrative Systems & Design	Industrial & Operations Engineering
Research Interests					
Design & creativity	Teaching & learning	Computing education	Engineering entrepreneurship	Teaching & learning	Mentoring & underrepresented
Idea generation	Classroom design	Learning sciences	education	Curriculum design & assessment	populations
Returning students	Innovative technology in the classroom	Task-specific programming	Instructional change	Interdisciplinarity	Resilience, grit, & persistence

## http://eer.engin.umich.edu

### eerprogram@umich.edu





NSF Division of Education and Centers Engineering Education Program



### PFE:RIEF Program Fuels Expansion of Engineering Education Research at Montana State University

In 2015, two PFE:RIEF grants to MSU set in motion a series of events that has resulted in an expansive community of researchers studying engineering education. In September of 2016, the "Montana Engineering Education Research Center", or MEERC, was approved by the MT Board of Regents.



PI: Brock LaMeres (ECE) Award No: 1544147 (PFE:RIEF) Title: Research Initiation -

Engineering a Culture of

Engagement



PI: Paul Gannon (ChemE/BioE) Award No: 1544174 (PFE:RIEF)

**Title:** Research Initiation -Effectively Integrating Sustainability into Engineering

MSU Launches New Center to Conduct Engineering Education Research www.montana.edu/meerc



Research at MSU aims to Transform Engineering Education www.montana.edu/meerc



Undergraduate Engineers as Engineering Leaders PI: Nick Lux (Education) Award No: 1720801 (DRK12) Title: Designing a Middle Grades Spatial Skills

PI: William Schell (ME)

Award No: 1664231 (PFE) Title: The Formation of



In the MEERC's first year, affiliates won 4 new NSF EER grants. The MEERC now has \$3.2M of active NSF funding (8 separate EER grants).



PI: Brittany Fasy (CS) Award #: 1657553 (ITEST) Title: Improving the Pipeline for American Indian Students Entering CS Via Storytelling



PI: Shannon Willoughby (Physics) Award No: 1735124 (DRT) Title: Fostering Effective Oral Communication Skills for STEM Graduate Students

The MEERC now has <u>20+</u> active affiliate faculty.

MEERC affiliates have 17 papers at the 2018 ASEE Annual Conference.



# DISCIPLINE-BASED EDUCATION RESEARCH in ENGINEEING go.unl.edu/dber-engineering

WHAT IS DBER? Discipline-based education research (DBER) in engineering encompasses the study of teaching and learning from the perspective of engineering as a whole and the individual engineering disciplines – their domain knowledge, practices, culture, world outlook, and concerns.

WHY IS IT IMPORTANT? Engineering education research helps us understand how expertise is developed and how to transform educational practices to achieve desired learning outcomes and create diverse and inclusive educational systems.

UNL is rapidly expanding its focus on DBER in engineering and has multiple opportunities available for:

- Graduate Students (PhD Specialization in Engineering Education)
- Assistant Professors (Positions Announcement in Fall 2019)
- Post-Doctoral Scholars
- Undergraduate Researchers





Heidi Diefes-Dux Biological Systems Engineering

Grace Panther Civil Engineering

# Department of Engineering Education

Department Chair: Dr. Monica F. Cox cox.1192@osu.edu

> Associate Chair: Dr. Lisa Abrams abrams:34@osu.edu

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## The Leonhard Center for the Enhancement of Engineering Education

25+ years of Excellence in Engineering Education

#### **Mission**

- Catalyze and support innovative teaching, learning, and assessment to ensure that Penn State delivers world-class engineering education
- Develop and disseminate innovative approaches to address challenges faced by engineering undergraduates, graduate students, staff, and faculty

#### **Current strategic focus areas**

- 1. Creating more inclusive and engaging environments for learning, both inside and outside the classroom
- 2. Using entrepreneurship as a metaphor for good teaching
- 3. Researching the peer review process in engineering education
- 4. Elevating writing and presenting skills of graduate and undergraduate students



Tom Litzinger Executive Director



Sarah Zappe Director, Assessment & Instructional Support



Stephanie Cutler Assessment & Instructional Support Specialist



Michael Alley Director, Engineering Communications



Lori Miraldi Director, Engineering Ambassadors Program



PennState College of Engineering







#### **ENGINEERING EDUCATION** RESEARCH CENTER

A Center of the Swanson School of Engineering

## **Mission**

- Enhance the teaching and learning of engineering within the Swanson School of Engineering
- Expand engineering education research efforts at the University

#### **Current Focus Areas**

- Assessment of teaching effectiveness & student learning; measuring learning out of the classroom
- Engaging faculty on innovative pedagogy and creative content through engineering education research practices
- Propagation of evidence based advising and mentoring practices
- Innovation/Entrepreneurship propagation
- Training the next generation STEM faculty member in evidence based teaching and early success practices

For more information:

Contact Mary Besterfield-Sacre at mbsacre@pitt.edu or visit www.engineering.pitt.edu/eerc

Mary Besterfield-Sacre Center Director





Renee Clark Director of Assessment



April Dukes Director of Professional Development and Pitt-CIRTL Coordinator







#### **PROGRAMS and OPERATIONS**

First-Year Engineering Program Graduate Program (MS and PhD) Multidisciplinary Engineering Degree Program INSPIRE Pre-College Engineering Research Student Advising Graduate Certificate (New 2016; Online New 2018) Integrated Research Labs Ideas To Innovation Learning Labs

#### **CAMPUS COLLABORATIONS**

Biomedical Engineering Chemical Engineering Electrical and Computer Engineering Environmental and Ecological Engineering Materials Engineering Mechanical Engineering

#### Honors College Purdue Polytechnic Institute Krannert School of Management College of Education College of Health and Human Services College of Liberal Arts Purdue Athletics

#### INTEGRATING RESEARCH AND PRACTICE



## **Center for the Practice and Scholarship of Education**

Improving engineering education by:

✓ supporting faculty working to improve student learning and enhance instructional effectiveness

✓ assisting faculty engaged in educational scholarship and assessment

✓ facilitating the sharing of ideas and practices within the Institute and the larger educational community,

 ✓ promoting faculty development nationwide through the Making Academic Change Happen workshop (MACH)





#### **The UST Center for Engineering Education offers:**

- a graduate certificate in Engineering Education
- an **undergraduate minor** in Engineering Education
- professional development workshops

ngineering for Educators

The mission of CEE is to prepare future and current P-12 educators to teach **integrated STEM education with an engineering focus**.

http://www.stthomas.edu/cee/

Director: Dr. AnnMarie Thomas apthomas@stthomas.edu

## CARUTH INSTITUTE FOR ENGINEERING EDUCATION

https://www.smu.edu/Lyle/Institutes/CaruthInstitute

PRE K-12 STUDENT & EDUCATOR OPPORTUNITIES

- Dallas Regional Science & Engineering Fair
- Educator Professional Development & Curriculum Design
- Maker-based Instructional Training



Mission - To increase the number and diversity of students who graduate from U.S. schools with both the enthusiasm and knowledge to pursue the engineering careers that are necessary for the U.S. to compete in a global economy.

<section-header>

- Research focus on Engineering Learning & Pedagogical skills
- Faculty development & Leadership

STRONG COLLABORATION WITH SIMMONS SCHOOL OF EDUCATION



## **The LBJ Institute for STEM Education & Research**









# **STEM Education**

Master's & PhD Programs (97 students total)

Past and Current Research

UTeach Engineering (NSF-MSP) Beyond Blackboards (NSF-ITEST) VaNTH (NSF-ERC)

Teacher Training for Engineering IPRO - Programming Standing Up Adaptive Expertise in Engineering K-12 LEGO Robotics

Discourse in K-12 engineering teams National HS Curriculum Project <u>Faculty</u>

David Allen (Chem Eng) Leema Berland (STEM-Ed) Richard Crawford (Mech Eng) Ken Diller (BioEng) Jill Marshall (STEM-Ed) Anthony Petrosino (STEM-Ed) Catherine Riegle-Crumb (STEM-Ed)



# COLLABORATIVE PRO

#### Are you an **engineering** or

Want to enrich your degree with research and training in **engineering education**?

Offered at the Master's and Ph.D. levels through the *Faculty of Applied Science & Engineering* and the *Ontario Institute for Studies in Education*.

Now

accepting applications

Contact: Natalie Leung, natalieyl.leung@utoronto.ca | www.gradstudies.engineering.utoronto.ca



School of Engineering Center for Engineering Education and Outreach

## Improving Education through Engineering





- An interdisciplinary center that includes faculty in engineering, education, child development, and computer science
- Ongoing research in engineering teaching and learning, outreach, and education technology development

Education

Research

**Outreach** 

Engineering

Research

- Highlighted projects:
  - Novel Engineering: Integrating Engineering and Literacy
  - TEEP: Teacher Engineering Education Program
  - ConnecTions in the Making: Elementary Students, Teachers, and STEM Professionals Integrating Science and Engineering to Design Community Solutions



• Ph.D. and M.S. in Engineering Education (in cooperation with Tufts Department of Education)

# ceeo.tufts.edu



## **Uppsala Computing Education Research Group**

June 2019, www.it.uu.se/research/group/upcerg



#### Staff

4 professors

- Mats Daniels, Åsa Cajander, Arnold Pears, Michael Thuné
- 1 Docent
- Anna Eckerdal
- 2 Senior Lecturers
- Anders Berglund, Lars-Åke Nordén
- 1 Lecturer
- Aletta Nylén
- 1 PostDoc
- Anne Peters
- 4 PhD students
- Fayiq Alghamdi, Virginia Grande, Kristina von Hausswolff, Tina Vrieler

### **Research Areas**

- Competencies
- Learning Through Practice
- Pre-University Computing
- Computing and Culture
- Identity Aspects

#### **Scientific Output**

(Since start 1995)6 PhD theses5 Licentiate theses9 Book chapters77 Journal articles202 Conference articles

Upcoming Events IEEE LaTiCE Saigon, March 2020

ASEE/IEEE FIE Uppsala, October 2020



COMnPLAY EASTEM EVENT HOPE NordNICE CDMathCT

1 Research school



# Engineering Education







### **Graduate Program**

Graduate students in this vital and emerging field, have the opportunity to become involved in cutting-edge engineering education research, such as:

- Teaching and learning strategies
  Cognition and metacognition in engineering
- Problem solving and framing
- K–12 engineering education



## **About the Program**

- □ Ph.D. Program started in 2008
- 100% Online Graduate Certificate in Engineering Education
- □ 8 Engineering Education Faculty
- □ **16** Ph.D. Graduate Students currently in the program

#### For more information: www.eed.usu.edu











#### Department of Engineering Education Virginia Tech

- 1967 Division of Engineering Fundamentals
  2004 Establishment of Department
  2008 Establishment of Ph.D. program
- 2000+ General Engineering students (1<sup>st</sup> year)
  40+ Ph.D. students (45 alumni)
- 15 tenure-track / tenured faculty
  5 professors of practice
  - 1 senior instructor + 3 contract instructors
  - 8 advisors

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- 6 administrative personnel
- Currently 38 externally funded projects,

#### / @vtenge

#### CELT CENTER FOR ENGINEERING LEARNING & TEACHING Center for Engineering Learning & Teaching 2019 Highlights



#### "What the hell is process?":

Research and representations of design processes & some teaching example

Keynote Address, Clive Dym Mudd Design Workshop XI, May 31,2019 Cynthia J. Atman, Ph. D.



Reflection Activity Design Framework (part of a toolkit for designing reflection activities) Jennifer Turns, Ph.D.

## <u>atman@uw.edu</u>, <u>jturns@uw.edu</u>



## OFFICE FOR THE ADVANCEMENT OF ENGINEERING TEACHING & LEARNING

Facilitating faculty-student partnerships around achieving educational goals in the College of Engineering

Focal services

- Individual consultations
- Formative course and program assessments
- In-class presentations
- Education resources and expertise

Ken Yasuhara, Director & Instructional Consultant

Congratulations to Jim Borgford-Parnell on his retirement!



