College of Engineering & Honors College Thesis Mixer
College of Engineering and HC Thesis Mixer

Carlos Jensen

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OSU Honors College

• 1500 Students in HC
  ➢ 595 COE students in HC
• All schools in COE are represented
• Over 90% of HC graduates who apply to law, medical, or graduate schools are accepted

Current COE Majors in the Honors College

- Manufacturing Engineering
- Energy Systems Engineering
- Nuclear Engineering
- Environmental Engineering
- Ecological Engineering
- Industrial Engineering
- Civil Engineering
- Bioengineering
- Elect & Computer Engineering
- Chemical Engineering
- Computer Science
- Mechanical Engineering
- General Engineering

Oregon State University
College of Engineering
Teaching
- Electricity and Magnetism
- Semiconductor Processing
- Electrical Engineering Fundamentals

Research
The application advanced magnetic materials to the development novel devices for signal processing, communications and data storage.
Interested in developing new instrumentation to characterize magnetic materials.

Thesis Topic Ideas/Opportunities
- Build the world’s best Kerr (magnetic) microscope.
  - Design and build optics, hardware, software.
- Help set up and commission a Superconducting Quantum Interference Device (SQUID) magnetometer.
- Much, more!!! magnets? Come see me.
Teaching
- ECE 416/516: Fundamentals of Semiconductor and Semiconductor Device Physics
- ECE 417/517: Transistors
- ECE 415/515: Materials Science of Nanotechnology

Research
- Development of novel thin film materials for microelectronic device applications.
- High speed metal/insulator/metal (MIM) tunnel diodes for IR energy harvesting
- Atomic layer deposition (ALD)
- Semiconductor processing & devices
- Thin film transistors

Thesis Topic Ideas/Opportunities
In-situ microwave anneal enhanced ALD
- ALD benefits
  - Atomic monolayer thickness control
  - High conformality with no pinholes
  - Low temperature
- ALD drawbacks
  - Impurity incorporation
GOAL: Enhance ALD film quality at low thermal budget

John F. Conley, Jr.
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Teaching
- Optical Electronic System
- Guided Wave Optics
- Special Topics: Integrated Photonics
- Electric and Magnetic Field

Research
- Integrated photonic devices and systems for high bandwidth, energy-efficient optical interconnects
- Optical biosensors for healthcare, food safety, and environmental protection
- Highly secure, dynamic free space optical communication for defense application

Thesis Topic Ideas/Opportunities
- Training undergraduate students in photonics design covering multidisciplinary areas: silicon photonics, semiconductor device physics, RF design, and thermal management
- Working with postdoc scholar and PhD students in optical biosensors for drug detection and food safety using diatom photonic crystals
- REU opportunities available: You will get paid!
Teaching

- *Intro to Artificial Intelligence (CS 331)*
- *Machine Learning for Species Distribution Modeling (FW 599)*
- *Use and Abuse of Data: Critical Thinking in Science and Everyday Life (BDS 211)*

Research

My research is at the intersection of machine learning and ecology.

I am part of the computational sustainability community, trying to find ways that computer science can contribute to promoting the health of the Earth’s ecosystems and bringing interesting new problems back to computer science.

Thesis Topic Ideas/Opportunities

- Methods for inferring species interaction networks from incomplete data
- Methods to predict species distributions from remotely sensed imagery
Teaching
CS325: Algorithms
CS175: Communications
Security & Social Movements
CS515: Algorithms
CS523: Advanced Algorithms

Research
Used to be algorithms ...
Now, how to protect vulnerable people online (esp. environmental and social justice activists)

Thesis Topic Ideas/Opportunities
Does monitoring social media (e.g. by law enforcement) using keywords put people at differential risk based on their identity?
Probably ... but let’s prove that it is the case.
Teaching
- Virtual Reality and Augmented Reality
- Software Engineering

Research
Dr. De Amicis’ research focuses on the design and evaluation of three-dimensional (3D) user interfaces, devices, and interaction techniques, with a focus in the area of design, creativity, and analytics.

Thesis Topic Ideas/Opportunities
- Time perception in immersive environments
- Physiological driven 3D interaction
- Travelling in Immersive environments
- Learning in Mixed Reality Environments
- Building inspirational virtual environments.

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Teaching
- Social and Ethical Issues in Computing
- Probabilistic Graphical Models
- Artificial Intelligence
- Intro to Programming II

Research
Machine learning / data science
- Spatial and Spatio-temporal data analysis
- Looking for weird things in data
- Explaining machine learning algorithms

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Thesis Topic Ideas/Opportunities
- Discovering unusual spatial regions (for bird migration, soil composition, house prices, property taxes, etc.)
- Activity recognition from sensor data
Teaching
- Introduction to CBEE
- Polymer Science & Engineering
- Transport Phenomena (3rd Yr CBEE)
- UHC Colloquia –
  - Plastics for Poets (Sp)
  - Energy IQ (W)
  - STEM Outreach (Sp)

Research
Anything related to POLYMERS!
- Plastics Processing and Recycling
- Biomaterials
- Environmental Sustainability
- Engineering Education
- K-12 Outreach

Thesis Topic Ideas/Opportunities
- Waste Plastics to Fuel (Pyrolysis/Gasification)
- Hydrogels for Delivery of Botanicals
- Fire Resistant Roof Design for Wildfire areas
- 3D printing – new materials (with Plural AM)

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Teaching

- Biological processes
- Reactor design
- Soil mechanics
- Numerical methods
- Foundation design

Research

We work largely in the fields of biological process engineering (CK) and geotechnical engineering (ME). The former includes bioreactor design, characterization, optimization and cost analysis. The latter focuses on granular mechanics, engineering of problem soils, and numerical simulation. Our work overlaps in the area of using biological processes for soil improvement.

Thesis Topic Ideas/Opportunities

- Bioreactor design and cost analysis of preparing microorganisms for bio-cementation to stabilize coastal dunes
- Bio-cementation of fine-grained soils, specifically liquefiable silts
- Development of a smartphone application for the digital logging of boreholes (ME only)
Teaching Examples

Bioengineering
BIOE 440 – Bioconjugation and Protein Modification

Chemical Engineering
CHE 411 – Mass Transfer Operations

Research Interests

Bioactive Surface Coatings

Genetic Code Expansion

Thesis Topic Ideas/Opportunities

- Patterning of hyperbranched polymers & proteins
- Organic synthesis of water-soluble branching agents
- Immobilization of “click-ready” proteins by GCE
- Biocompatibility and pathogen capture at surfaces
- Experiences of women and minorities in Engineering
- <insert your awesome research idea here...>
Teaching

• Fate and Transport of Contaminants in the Environment
• Groundwater Remediation
• ENVE Capstone Design

Research

• Biological processes for the treatment of hazardous wastes.
• Fate and transport of organic contaminants in the environment.
• Field, laboratory, and modeling studies of aerobic and anaerobic processes for treating chlorinated solvents and emerging contaminants.

Thesis Topic Ideas/Opportunities

- Aerobic cometabolism of complex mixtures of chlorinated solvents and 1,4-dioxane in groundwater.
- Encapsulation of microorganisms and slow release substrates for treating emerging contaminants in groundwater and wastewater.
- Biological and chemical treatment of polycyclic aromatic hydrocarbons (PAHs) in contaminated sediments and soils.
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**Milo D. Koretsky**

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**Research – Engineering Education**

Integrating technology into effective educational practices and promoting the use of higher-level cognitive and social skills in engineering problem solving.

**Thesis Topic Areas**

- **Software Development**
  - programming educational technology

- **Student Learning**
  - in Virtual Laboratories through student-faculty interactions, model development, etc.
  - in Concept-based Instruction
  - What can we learn from experts?

- **Organizational Change Strategy**
  - What are ways we can get other people to use evidence-based educational innovations?

2018 UHC Outstanding Thesis Award:
Chris Hinkle, “Toward Professional Practice: Student Learning through Participation in Engineering Clubs”
Teaching
- Intro to Environmental Engineering
- Environmental Engineering Sr. Lab
- Biological Processes in ENVE

Research
Biological treatment processes for wastewater and stormwater

Thesis Topic Ideas/Opportunities
- Evaluate the effectiveness of plants to remove stormwater contaminants
- Evaluate the propagation/removal mechanisms of antibiotic resistant bacteria from a research raingarden (OGSIR facility)
- Determine how FOG/food waste composition affects biogas purity

Tyler S. Radniecki
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Teaching

CHE311, Thermodynamics (200+ students)

CHE444/544: Thin Film Materials Processing (40 students)

CHE452/552: Electrochemical Energy System (10~20 students)

Research

Energy storage: lithium/sodium batteries

Energy conversion: fuel cell, water splitting, CO₂ reduction

Thesis Topic Ideas/Opportunities

1. Aqueous sodium-ion batteries
Teaching

- Bioreactors
- Process design
- Bioengineering Laboratory
- Sustainable Engineering

Research

We are seeking as student to work in the area of microbiologically induced corrosion of cement. The research has a basis in characterization of the mechanical aspects of cement and the microbial communities that form biofilms on cement. We are primarily seeking a student interested in using genetic techniques to characterize microbial biofilms such as metagenomics and real-time polymerase chain reaction.

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https://doi.org/10.1016/j.scitotenv.2019.133815
Teaching

- Structural Dynamics
- Earthquake Engineering
- Plastic Design and Analysis
- Steel Design

Barbara G. Simpson

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Research

- Develop innovative structural systems that improve building performance and reduce the effects of natural hazards on the built environment
- Resilient design and retrofit of building structures
- Advanced computational and experimental methods to characterize structural response, including next-generation computational modeling, optimization, and simulation

Thesis Topic Ideas/Opportunities

1. Feasibility study of “spine” and rocking frames in terms of initial costs and performance
2. Speeding up structural analyses for hybrid simulation
3. Development / testing of learning modules or multi-hazard engineering (earthquake, tsunami, etc.) for K-12 students
Teaching
- Hydrology
- Hydraulics
- Wave Mechanics
- Environmental Modeling

Research
Improving our understanding of the hydrosphere through public participation

Thesis Topic Ideas/Opportunities
- Studying changing patterns of snow distribution in the Pacific Northwest
- Understanding how uncertainty in hydrological observations affects predictions of water availability
- Strategies for maximizing participation in citizen science efforts
- Designing optimal strategies for sampling hydrological data

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Pedro Lomonaco
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Teaching

• Ocean Engineering
• Coastal Infrastructure

Research

Wave generation and propagation in the laboratory
Behavior of coastal and offshore structures
Wave energy
Offshore wind energy
Fluid-structure interaction
Realtime hybrid (numerical-experimental) simulation

Thesis Topic Ideas/Opportunities

Analysis and modelling of wave forces on coastal structures
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Teaching
- Fluid Mechanics
- Heat and Mass Transport
- Ecological Engineering Lab
- Dimensional Analysis
- Turbulent Mixing
- Writing and Synthesis

Research News

Farmland Is Also Optimal for Solar Power
Scientific American, 12 Sep 2019
The conditions of sunlight, temperature, humidity and wind that make cropland good for agriculture also maximize solar panel...

Agrivoltaics proves mutually beneficial across food, water, energy nexus
Phys.org, 03 Sep 2019
Building resilience in renewable energy and food production is a fundamental challenge in today's changing world, especially in...

Can solar panels handle the heat of a warming world?
Grist, 01 Sep 2019
Get your daily dose of good news from Grist. Subscribe to The Beacon. This story was originally published by CityLab and is...

Thesis Topic Ideas/Opportunities
1) What approaches can we use to extend the availability of our most critical resources?
2) What are the impacts and consequences of #1?
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- 3D Printers
- Laser/plasma cutters
- CNC routers
- Arduinos/RasPy/etc.
- Available Workspace
- Professional support
- Online repository

The Open-Source Published Environmental/Agricultural Sensing (OPEnS) Laboratory

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Purpose
Addressing climate change requires new tools for observation and management. The OPEnS Lab combines cutting edge technologies and makes them available to the OSU, the USA, and globally. OPEnS will create Maker lab space at OSU and a synergistic forum for environmental sensing technology.

Thesis Topic Ideas/Opportunities
- low cost precision ag sensors
- Novel environmental monitoring
- Improve data logging/processing
Teaching

- Neutronics Analysis II
- Society Aspects of Nuclear Technology
- Characterization and Qualification of Materials for Extreme Environments

Research

- Fundamental understanding of materials’ performance under extreme conditions.
- Development of advanced materials for enhanced radiation resistance and mechanical performance.
- Application of surface modification methods to improve the materials performance under service conditions.

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Thesis Topic Ideas/Opportunities

- Modeling the microstructure evolution of materials under laser-based surface treatments.
- Development of electrochemistry based methods for corrosion and stress corrosion cracking tests.
Membrane Nanotechnology for Sustainable Water Supply

1. Optimizing membrane drinking water treatment process
2. Aerobic granular membrane bioreactor for wastewater treatment/reclamation
3. Osmotic membrane photobioreactor for wastewater treatment and microalgae harvesting
Teaching
- Design of Experiments (OSU)
- Data Analytics in Healthcare (OSU)
- Optimization (NC State)
- Probability and Combinatorics (NC State)
- Game Theory (NC State)
- Calculus (University of Nevada)

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Research

Theory
- Bilevel Programming
- Predictive Analytics
- Optimization
- Algorithms
- Simulation

Applications
- Personalized Medicine
- Patient Triage/Routing
- Influenza Mutation
- Score Development
- Data Mining

Thesis Topic Ideas/Opportunities
- Dynamic patient routing
- Tandem drone delivery
- Early warning systems for fast acting diseases using EHR data
- Optimization in machine learning
Teaching

- ME 373: Mechanical Eng. Methods
- ME 461/561: Gas Dynamics
- ME 599: Software Dev. for Eng. Research

Research

- Computational science
- Combustion
- Fluid flow

Project Ideas

- Reduce/simplify models for the combustion of fuels
- Simulate combustion, flames, and fires
- Develop Python software for testing combustion models against experimental data
- Simulate fluid mixing in the ocean
Teaching
- Numerical Methods (ME373H, ME526)
- Fluid Mechanics (ME331)
- Computational Fluid Dynamics (ME667)
- Turbulence Modeling (ME564)

Research
Development and application of predictive numerical techniques to understand and predict multiphysics, turbulent flows. Applications include mixing processes in environmental flows, fluid structure interactions for small-scale air/hydrofoils, particle-laden turbulent flows, sprays in propulsion systems. Use of parallel computing and data science techniques to analyze fluid flows.

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Thesis Topic Ideas/Opportunities
- Role of turbulence in causing surgical site infections through dispersion of skin-cell bacteria in a real operating room
- Prediction of pollutant residence times in environmental flows
- Wavelet-based data compression and analysis to quantify clustering of inertial particles (droplets in clouds, solid particles in reactors)
Research Interests
• Human-robot interaction
• Haptics
• Socially assistive robotics
• Robots in art/entertainment
• Robots in education

Teaching
• Measurement and instrumentation systems

Thesis Topic Ideas/Opportunities
• Understanding human-robot teamwork
• Analyzing robot performers
• Encouraging motion with robots
• Understanding robotic social touch

Robots: Oregon State University
Presenter: Prof. Naomi Fitter, School of MIME
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Robotics club
Undergraduate Research
PhD and MS Programs

Robots in the real world!