Fostering a Culture of Innovation and Developing a Local High-Tech Industry

UF Engineering Innovation Institute

Rodney Guico, Ph.D.
Director of the Florida Engineering Experiment Station Network
Herbert Wertheim College of Engineering

■ Students
  ■ Undergraduate: ~7,000
  ■ Graduate ~3000
  ■ Total: 10,000+

■ Faculty
  ■ ~250 (tenured/tenure track)

■ 15 Degree Programs, 10 Departments
  ■ AEROSPACE ENGINEERING
  ■ AGRICULTURAL & BIOLOGICAL ENGINEERING
  ■ BIOMEDICAL ENGINEERING
  ■ CHEMICAL ENGINEERING
  ■ CIVIL ENGINEERING
  ■ COASTAL & OCEANOGRAPHIC ENGINEERING
  ■ COMPUTER ENGINEERING
  ■ COMPUTER SCIENCE
  ■ DIGITAL ARTS & SCIENCES
  ■ ELECTRICAL ENGINEERING
  ■ ENVIRONMENTAL ENGINEERING SCIENCES
  ■ INDUSTRIAL & SYSTEMS ENGINEERING
  ■ MATERIALS SCIENCE & ENGINEERING
  ■ MECHANICAL ENGINEERING
  ■ NUCLEAR ENGINEERING SCIENCES
Herbert Wertheim College of Engineering
Interdisciplinary Research

- **HWCOE Interdisciplinary Research Institutes**
  - **FICS Research** Florida Institute for Cybersecurity Research
  - **FINS** Florida Institute for National Security
  - **ICE** Institute for Computational Engineering
  - **ICTSE** Institute for Cell & Tissue Science and Engineering
  - **ICW** Warren B. Nelms Institute for the Connected World
  - **INAS** Institute for Networked Autonomous Systems
  - **NIMET** Nanoscience Institute for Medical and Engineering Technology
  - **UFTI** UF Transportation Institute

- **UF Interdisciplinary Research Institutes**
  - Genetics Institute
  - Informatics Institute
  - Institute on Aging
  - McKnight Brain Institute
  - Water Institute

- **UF Shared Research Facilities**
  - Animal Care Services
  - Institutional Review Board
  - Interdisciplinary Center for Biotechnology
  - Research Service Center: Nanoscience Research Facility + Major Analytical Instrumentation Center
Next Generation Engineering Skills from the National Academy of Engineering

- Engineer of 2020; Rising Above the Gathering Storm
  - Strong analytical skills
  - Practical ingenuity, creativity, dynamism, agility, flexibility
  - Excellent communication skills
  - Understanding of business and management concepts
  - Leadership, high ethical standards, professionalism
  - Background in strategic and crisis decision-making
UF Engineering Innovation Institute

- Foster an innovation culture in faculty & students
  - A nexus of innovation from discovery to commercialization
  - Produce innovative leaders to attack big problems

- Programs - Creativity and Entrepreneurship built on Interdisciplinary Research
  - Develop innovative thinking to complement analytical skills
  - Dovetail technology with entrepreneurial educations

- Targeted Outcomes
  - Student innovators who change the world
  - A culture of innovation in faculty and impact to research
  - Technology commercialization leading to economic impact
Targeted Outcomes

Technology Commercialization / Economic Impact
- Early commercialization assessment of research programs
- Increase depth and breadth of commercialized technologies
- Economic impact to Florida & nation - commercialized techs & entrepreneurs

Student Entrepreneurs and Innovators
- Students versed in innovation who aspire to change the world
- Students differentiated from peer institutions by their innovation skills
- Increased retention of undergraduate students

Faculty Impact
- Foster a culture of innovation in faculty
- Impact to research programs – Increase industry collaborative research; Contribute to interdisciplinary research; Grow ties to entrepreneur community
Engineering Innovation

- Discovery / Invention
- Reduction to Practice
- Proof of Concept / Prototype
- Commercial Assessment
- Commercialization

- Undergrad Research
- Interdisciplinary Research Institutes
- Research / Technologies Innovation Reviews - External Advisory Boards
- Innovative Design Curriculum & Experiences (Freshman Design, IPPD, ITV)
- Faculty Innovation Council / Faculty Entrep. Mentoring Prog.
- Engineering Innovation & Entrepreneurship for Engineers Program
- Center-based Innovation Programs
- Integrated Technology Ventures
- Entrepreneur in Residence
- Engineering Entrep. Mentoring & Internships
Faculty Innovation Council

- Optimize rules, regulations, and processes relevant to faculty and student entrepreneurship

- Assemble thought leaders to discuss key issues (SBIR, IP, COI, global trends in research & innovation)

- Evaluate and reward entrepreneurial activity in the course of faculty advancement

- Provide peer mentoring and guidance to get faculty to think and act entrepreneurially

- Act as a sounding board for new initiatives

- Lead seminars and provide one-on-one guidance to other faculty in innovation topics
# Leadership & Innovation Curriculum

11 Courses – Undergrad / Grad / Working Professional
Certificates and Minors
Experiential Programs
Targeting every engineering student

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<td>Innovation &amp; Creativity</td>
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<td>Understanding Core Values</td>
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<td>Working Across Cultures</td>
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<td>Risk &amp; Crisis Management</td>
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<td>Critical Thinking/Problem Solving</td>
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<td>Excellence In Execution</td>
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<td>Basic Finance</td>
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<td>Technology Vetting</td>
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<td>Marketing, Sales &amp; Distribution</td>
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<td>Market Research</td>
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<td>Intellectual Property Management</td>
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<td>Business Planning</td>
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<td>Entrepreneurial Fundraising</td>
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<td>Competitive Analysis</td>
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Joint Innovation and Leadership Curriculum (Undergrad, Grad, Distance Ed.)

- Coursework
  - Engineering Innovation
  - Engineering Entrepreneurship
  - Divergent Thinking
  - Integrated Product and Process Design / Integrated Technology Ventures
  - Sales Engineering Seminar
  - Engineering Professionalism and Ethics
  - Engineering Leadership
  - Advanced Engineering Leadership Development
  - Fundamentals of Engineering Project Management
  - Advanced Engineering Project Management
  - Seminar for the Development of Engineering Faculty and Professionals

- Engineering Innovation and Leadership Certificates and Minor
## Engineering Innovation Course Outline

<table>
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<tr>
<th>Topics</th>
<th>Skill Sets</th>
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<tbody>
<tr>
<td>Introduction to Innovation</td>
<td>Innovation defined; Innovation theories; Innovators’ leadership styles; are innovators born or made; Unleashing the innovator from within; Initiating and guiding creativity; “Creative destruction”; Idea + execution = innovation</td>
</tr>
<tr>
<td>Innovation Methodologies, Practices and Processes</td>
<td>Innovation as a business model; Situational and transformative innovation; Innovation as sustainable competitive advantage; What makes companies creative and innovative; When, why and how innovation fails</td>
</tr>
<tr>
<td>Innovating for Success</td>
<td>Intellectual property management; Innovation as a launch pad for personal and professional success; Successful innovative strategies and tactics; Where innovation lives in a company; Innovation and work teams; Brave Thinkers: Successful innovators as revered leaders</td>
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<tr>
<td>21st Century Innovation: Think and Act Globally</td>
<td>Innovation’s global reach; Operating adaptable, scalable business models; Porter’s Five Forces; Rewards and challenges of global innovation; Innovation’s international value chain; Globalization’s effects; Cultural considerations</td>
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<tr>
<td>Ideation: Turning Ideas into Marketable Products and Services</td>
<td>Innovation as practice-driven methodology; Successful innovation discovers, possibilities, is scalable, expands boundaries, answers needs that don’t yet exist, differentiates products and services, generates financial / economic returns, promotes creativity, tolerates failure and mitigates controllable risks</td>
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## Eng. Entrepreneurship Course Outline

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<tr>
<td>Introduction to Entrepreneurship</td>
<td>Attributes and myths of entrepreneurs, Engineers and entrepreneurship; Mindset of the entrepreneurial leader; Challenges and opportunities in entrepreneurship; National and global trends in technology opportunity and entrepreneurship</td>
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<tr>
<td>Value Creation</td>
<td>Visioning and ideation; Creating and selling the Value Proposition; Capital raising, valuation &amp; dilution; Building the team; Managing stakeholder expectations; Creating a sustainable business model</td>
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<tr>
<td>Building and Growing the Enterprise</td>
<td>Starting the business, Business planning and the Business plan; Market research, Entrepreneurial opportunity feasibility analysis; Comparables, Intellectual Property protection and management; Bootstrapping strategies</td>
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<tr>
<td>Executing with Excellence</td>
<td>Presenting the opportunity; Ethics; Communications and presentation; Building the customer experience; Marketing, sales, and distribution strategies</td>
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<tr>
<td>Financial Strategies</td>
<td>Fundraising strategies; Valuation mechanisms and strategies; Revenue streams; Budgeting; Balance Sheet; Cash Flow Analysis; Income Statement; Pro-forma / financial projections; Debt instruments</td>
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<tr>
<td>Value Harvesting</td>
<td>Exit strategies; Investor and customer presentations; Mergers and acquisitions</td>
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</table>
Integrated Product and Process Design

- Effective product and process design
  - Function & Producibility
  - Cost (within budget)
  - Schedule
  - Reliability
  - Customer Preference
  - Life Cycle

- Multidisciplinary undergraduate team effort
  - 4-8 student members, faculty coach, and sponsor liaison
  - Classroom & Laboratory Experience in two-semesters (6 credits total)

- Authentic industry design and build projects
  - 600 hour scope
  - Hardware, software & process
Integrated Technology Ventures

Virtual companies form to spin off a UF technology

CEO
Inventor (faculty)
CTO (faculty)
Tech. Dev. Team (IPPD)

Develop an alpha proto. & product/ process docs

CBO (faculty)
Bus. Dev. Team (CEI)

Develop BP, mkt. study, investor pres.

Prior art, freedom to operate, patentability

CLO (faculty)
Legal Team (LCL)

Integrated Technology Ventures
Skill-Builders for Engineering Leaders

Engineering Project Management Module

Persuasive Communications Module

Professional Credibility Module

Bill McElroy, P.E., Assistant Director, Engineering Innovation Institute
Herbert Wertheim College of Engineering, University of Florida
mcen@eng.ufl.edu

Contact Hours: 2 hours consisting of two 50-minute sessions
Target Audience: Graduate and undergraduate engineering students

Learning Objectives:
1. Summarize the concept of credibility and identify its foundations;
2. Describe the importance of values and ethics in terms of personal credibility and responsibilities as engineers and engineering leaders;
3. Evaluate key aspects of technical competence and disciplined execution as credibility factors in engineering-based businesses;
4. Assess the consequences of poor engineering.

Session Overview:
Credibility is a critical factor of success for engineers and leaders and is a function of many variables, including time. This module explores the concept of professional credibility, key factors that form or impact it, and implications when foundational components of credibility are shaken from an engineering context. The module will consist of instructor-provided topical overviews, and participant discussions related to examples and exercises that will assist in accomplishing the learning objectives.

Session One: Introduction and pre-assessment

Key Content
The concept of credibility and the character component
The character component of credibility
Values, morals and ethics in engineering

Approach
Brief introductory statements during the first part of the session
Video presentation regarding credibility and brief overview presentation and defining what research indicates are its key components
The four core of credibility brief overview presentation and video summary
Discussion and brief overview (presentation) about key concepts
Discussion and brief overview (presentation) about characteristics and differences of professions vs. occupations, and societal implications with respect to engineering in terms of values, morals and ethics
Discussion and brief overview (presentation) about the concept of the virtuous engineer

For more information, contact Bill McElroy (mcen@eng.ufl.edu) at 352-394-7863.

Innovation and Creativity Module

David Whitney, Assistant Director, Engineering Innovation Institute
Herbert Wertheim College of Engineering, University of Florida

FLEXStation

Re-envisioning an 80-year old charge

Objective - Recruit, retain & grow Florida high tech industry

A Powerful Foundation

1. FLARE: FLEXStation Applied Research Enterprise
2. FLEXNet: FLEXStation Network
3. EII: UF Engineering Innovation Institute

The Florida Engineering Experiment Station Service Model

As the UF Institute for Food and Agricultural Sciences (IFAS) has helped the state of Florida to become a national leader in food production, so the UF College of Engineering will help Florida become a national leader in high tech industries.
UF Innovation Station – Impacts to the Innovation Economy

- **Economic Impact** - High tech-high wage jobs, engineering talent and tech pipeline, creation of startup companies, access to R&D talent & infrastructure, development of an educated workforce.

- **Rebranding the Region** - contributing to a unique innovation economy, intl. visibility and prestige, engaging international thought leaders

- **Impact to Future Generations** - public-private partnerships to build pathways to success from K-12 through careers, crafting lifetime opportunities & serving as role models for future generations.
UF Innovation Station Programs

- **Engineering talent pipeline to startups to large companies** - recruiting fairs, internships / co-ops, capstone design, executives engaging in student education, guiding student teams, projects and start-up companies.

- **Connect UF research and technology to entrepreneurs / investors** for early stage to growth opportunities, linking executive talent with UF startups, access to UF prototyping facilities, faculty expertise to support company growth.

- **Workforce development training** - coding boot camps, tech entrepreneurship, specialized offerings through distance education and hybrid models, up-skill citizens for high tech fields.

- **Match company research and technology needs with UF expertise and infrastructure** - short-term, deliverables focused applied R&D and longer term industry needs in fundamental research.
UF Innovation Station Programs

- **UF Engineering Pipeline** - K-12 outreach service learning experiences to pipeline students to UF and back into the community as role models, connecting UF faculty, students and staff with high performing students face to face and through electronic delivery, research and innovation experiences for accomplished students.

- **Gator Engineering at State College of Florida** - students begin their coursework at SCF, gain UF admission as early as after first semester, and matriculate to UF after completion of core courses.

- **UF Engineering Innovators** pipelines Engineering Innovation Institute students to the region with a minor in Engineering Innovation including coursework and co-op, Minor tuition forgiveness for starting their career in region and mentoring the next generation.
Why Sarasota County

- A vibrant entrepreneurial community
- An incredibly creative community that values diversity of thought
- A unique quality of life attractive to the creative class
- A forward thinking public sector supportive of public/private partnerships
- Academic institutions ready to partner on key programs
- A community that recognizes the value of an educated workforce
Initial Target Industries

Significant benefits to the State of Florida

- Biotech
- Health Care Informatics
- Biomedical Engineering
- Medical Devices
- Aviation / Aerospace
- Homeland Security
- Defense
- Advanced Manufacturing
- Cybersecurity
- IT & Software Development
- Microelectronics
- Telecommunications
- Human Centered Computing
Designed to serve cradle to………..
Innovation Station Staffing – Locally sourced with real world experience

- **Innovation Station Sarasota Staff**
  - **Regional Director Al Carlson** – 16 year CEO of Sun Hydraulics (NASDAQ: SNHY) in Sarasota; SRQ Magazine 2016 Business Newsmaker of the Year
  - **Industry Programs Coordinator Jason Krywko** – Sarasota entrepreneur; Co-founder and CTO of SleekAudio recognized by Popular Science & Cons. Electronics Show
  - **Workforce Development Coordinator Patti Harris** – EE & Eng. Tech degrees; Pursuing PhD in Ed. Leadership; Military service; 12 years teaching science & engineering
  - **K-12 Pipeline Coordinator Julie Breehne** - 15 years in nonprofit / higher education. Assistant director of Eckerd College Program for Experienced Learners
Florida Engineering Experiment Station
UF Engineering Innovation Institute

www.eng.ufl.edu/innovation/

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UF Innovation Station Sarasota County

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