fulton undergraduate research initiative
Agenda

- Introductions
- What is research?
- FURI History
- FURI Goals
- FURI Program
- FURI Eligibility
- FURI Proposal
- Other opportunities
Academic and Student Affairs: Undergraduate Student Engagement

- **Involve and empower** students to shape the learning experience
- **Provide opportunities for** students to get involved in activities and *succeed*
- **Help students find their** passion
- **Help shape** future plans

“Education is the kindling of a flame, not filling the vessel.” - Socrates
Why are you here?

Looking for research?

Trying to find a mentor?

What is research anyway?

What are you passionate about?
What is research?

- Performing a methodical study to prove a hypothesis or answer a question
- Follows a systematic series of steps and a protocol
- Establish facts, solve new problems, develop new theories
- Applied research focused on a particular problem
Research Options

- **Fulton Undergraduate Research Initiative**
- Non-FURI research with faculty
- Honors thesis
- Senior design/capstone project
- Independent study (XXX 499 courses)
- **Research Experience for Undergraduates (REU)**
Why Should You Get Involved in Research?

- Experience solving real-world problems
- Investigate possible career paths
- Get to be mentored by a faculty member outside of class
- Get a competitive advantage for graduate school or jobs/internships
- Gain skills such as: project management, analyzing data, independent work, critical thinking skills, presentation skills
- If you are accepted to the FURI program, you get paid to conduct research!
FURI History

• FURI is possible because of the contributions of Mr. Ira A. Fulton

• Began in Spring 2005 with 34 students

• Has grown to 159 students in Spring 2015
FURI Goals

- To enhance your engineering undergraduate experience by providing **hands-on lab experience**
- To develop **skills in presenting** your research project to colleagues and the community
- To provide opportunities to **travel** to professional conferences to present research
- To gain a unique experience to prepare you for your **future career and/or graduate school**
Research Program

- Funding to conduct research with a faculty mentor for up to two semesters at $1500 per Fall/Spring/Summer semesters
- Can apply for budgets up to $400 per semester to fund research supplies
- Faculty mentors will receive $500 for mentoring each student (up to 5 students per semester)
- Student can pursue their own research idea or join a faculty’s research project
- Travel Grant funds available for students accepted to present their research at a conference.
- This counts as 5 hours per week in the ASU HR system.
Student Profile: A Passion for Science Fiction

Gerald, mechanical engineering

- Travelled to two national conferences to present his research. FURI travel grant funded one conference
- Designed, built and obtained a provisional patent for a novel device
- Currently working on licensing the device
- Attributes mentor with success in the field

FURI was the most valuable aspect of my undergraduate experience, even more so than classes
Student Profile: **Stepping Stones to Career Success**

Natasa, mechanical engineering

- Currently conducting graduate work at ASU’s Solar Power Laboratory
- Built a strong relationship with her mentor who helped her reach research goals
- Other involvement:
  - Honors College
  - Student-athlete
  - K-12 outreach
  - E2 camp mentor

*My mentor taught me that research can be both tedious and rewarding, but can also serve as a stepping stone to future career plans*
Next Application Cycles

- For Summer 2015, Fall 2015, and Spring 2016
  - Due online by noon on March 3, 2015
FURI Symposium

- An opportunity to present your research and share your findings with peers, your mentor, and the community
- Will submit an abstract describing your research
- Will prepare a poster summarizing your research
FURI Eligibility

- 2nd semester student through seniors
- Must be an Ira A. Fulton Schools of undergraduate student
- Must be in good academic standing (i.e. not on probation)
- Mentors must be faculty in the Ira A. Fulton Schools of Engineering
- Mentor must not be on sabbatical, on leave or on vacation during the majority of the FURI mentoring time period.
FURI Student Obligations

- Meet with your mentor regularly
- Submit mid-semester and final summaries outlining your progress on your research project
- Prep for the Symposium
  - Get portrait taken by Fulton Communications
  - Submit 100 word abstract
  - Submit poster for printing
- Present at the FURI Symposium
- Complete a FURI evaluation form at the end of the semester
Steps in the FURI Process

1. Assess Interests
2. Learn about research
3. Find Faculty Mentor
4. Write and submit proposal
Finding a Mentor

- Your mentor can be in a different discipline or campus
- Review School and faculty research websites
- FURI website: Research Opportunities
- Review FURI Abstract books
- Talk to different faculty about their research
- Ask current FURI or other research students
- Visit faculty during office hours
- Request an appointment with faculty to discuss opportunities
Six Ways to Get a Return Email

- Perfect your subject line
- Tell them why you chose them
- Show that you’ve done your homework
- Highlight uncommon commonalities
- Make your request specific – keep it short and sweet
- Express gratitude

Source: Adam Grant, Wharton professor
How to Apply - At A Glance

- Update/create your **resume**
- Prepare your **proposal**, 2 page maximum, 1 additional page for references
- Include a **bibliography** for your research references
- Create a **timeline** of activities for each semester
- Create a **budget** with estimated research supplies for each semester
- Prepare your **personal statement**, 1 page
- Include a copy of your academic **transcript**
- Review your proposal with your faculty mentor and receive his/her approval
- Submit your application online on March 3, 2015 by the deadline
  - *no exceptions to the deadline*
Researchers Write

- Lab reports
- Research reports
- Grant proposals
- Policies, procedures, protocols
- White papers
- Professional journal articles
- Textbooks
- Conference papers
- Speeches
- Articles for the popular press and company newsletters

Source: Penny Hirsch, Northwestern University
Update Your Resume to Find your Research “Job”

- Have your resume updated **before** you contact faculty – this helps faculty get to know you
- Highlight prior research experience
- List any internships and/or relevant jobs with **transferable skills**
- Use action verbs like: analyzed, hypothesized, determined, managed, etc.
- Highlight team work and/or supervisory experience
- Indicate any leadership experience (officer in student organization, leading class project, etc.)
- Can you do extracurricular activities without suffering in your classes?
What will you put on your resume?

- Previous research?
- Part-time jobs?
- Volunteering?
- Leadership roles?
Get Help With Your Resume

- Polytechnic Career Preparation Center
  CareerPreparation@asu.edu, 480.727.1411, Polytechnic Academic Center Building (CNTR) Suite 110

- Tempe Engineering Career Center
  engineering.careers@asu.edu, 480.965.2966, Tempe Centerpoint (CTRPT) Suite 107

- Tempe Career Services careerservices@asu.edu, 480.965.2350, Tempe Student Services Building (SSV) Suite 329
Transcript

- Are you on academic probation
- Have you withdrawn from a core class?
- Do you have a pattern of withdrawing from classes?

**Tip!** Address any transcript problems in your personal statement. Don’t leave the committee confused!
Proposal

- Two pages maximum, excluding references cited
- Formatting should be 10-12 point font, single spacing with 1 inch margins
- Work with your faculty mentor to understand the research project
- Read related literature about the research topic
- Think about what you plan to work on, why it’s important, and how you plan to conduct your research

- Decide how to organize your proposal – which sections will you include?
- Understand your audience – FURI Committee is comprised of several Engineering disciplines
- Realize your proposal will be persuasive writing
The Proposal Should Include

- **Objective statement** – states the overall objective of the research project, including a research question or hypothesis to be investigated.

- **Background/literature review** – describes the importance of the proposed work, previous research already conducted on this topic (including citations to prior research in this area is highly recommended), and alignment to one of the five the Fulton research themes.

- **Research plan** – describes the tasks that will be conducted in order to complete the research project.

- **Impact of research** – describes what benefits to society would result from the successful competition of this project and how the proposed project is related to at least one of the five Fulton themes.
Proposal Organization-Examples

Example 1
- Statement of Problem
- Objectives
- Plan of Action
- Expected Outcomes
- References

Example 2
- Research Question
- Background
- Methodology
- Practical Applications
- Expected Results
Description of your Research

- Describe your expected outcomes
- Who else is involved in the project? How will you define roles?
- Be sure your research question is not too large or too small to be completed in the semester(s) you are applying for
- If research includes human subjects, include IRB information
- If this is a continuation of research already in progress, describe your progress to date
- Describe how your research aligns with one of the Fulton research themes
Fulton Research Themes

- Education
- Energy
- Health
- Security
- Sustainability

Tip! Clearly articulate how this research fits within one or more of these themes
Cite your resources!

- List five references
- Use primary sources, such as PubMed and Google Scholar (not Wikipedia)
- Use a consistent format in citing references
- List research relevant to current proposal

**Tip!** The committee has no preference on style, but urges you to be consistent with whichever writing style you choose.
A few places for finding research sources…

- Google Scholar
- PubMed
- ASU Library
  - ASU Library Research Database
Timeline

- An overview of the specific steps of your research
- Help the committee determine the feasibility of your project
- Be sure your timeline is in line with the funding semester(s) you’ve requested
- Provide details
- Do not add FURI deadlines
- Be realistic

**Tip!** Your first step should not be “conducting a literature review.” Didn’t you do that while preparing your proposal?

**Tip!** Work backward from your final steps to your initial steps. It makes the planning process easier!
<table>
<thead>
<tr>
<th>Task Name</th>
<th>Description</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety review</td>
<td>Review safety precautions</td>
<td>5 days</td>
<td>Mon 1/7/13</td>
<td>Fri 1/11/13</td>
</tr>
<tr>
<td>Fabrication tool training</td>
<td>Train how to etch deposited material for transistors fabrication</td>
<td>5 days</td>
<td>Mon 1/14/13</td>
<td>Fri 1/18/13</td>
</tr>
<tr>
<td>single gate nanowire transistors fabrication</td>
<td>Fabricate single gate transistors on GaAs nanowire</td>
<td>15 days</td>
<td>Mon 1/21/13</td>
<td>Fri 2/8/13</td>
</tr>
<tr>
<td>single gate nanowire-based transistor characterization</td>
<td>Measure devices for VDS and VGS response.</td>
<td>10 days</td>
<td>Fri 2/8/13</td>
<td>Thu 2/21/13</td>
</tr>
<tr>
<td>Stacked nanowire transistors fabrication</td>
<td>Fabricate stacked gate transistors on GaAs nanowires</td>
<td>30 days</td>
<td>Fri 2/8/13</td>
<td>Thu 3/21/13</td>
</tr>
<tr>
<td>Stacked nanowire transistors characterization</td>
<td>Measure devices for VDS and VGS response. In addition, validate the function of an inverter.</td>
<td>10 days</td>
<td>Mon 3/18/13</td>
<td>Fri 3/29/13</td>
</tr>
<tr>
<td>Data analysis</td>
<td>Organize and plot the data</td>
<td>5 days</td>
<td>Mon 4/1/13</td>
<td>Fri 4/5/13</td>
</tr>
<tr>
<td>wrap up research and Write research summary and prepare poster for symposium</td>
<td>Organize and plot the data</td>
<td>5 days</td>
<td>Wed 4/3/13</td>
<td>Tue 4/9/13</td>
</tr>
</tbody>
</table>
## Goals vs. Objectives

<table>
<thead>
<tr>
<th></th>
<th>Goals</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meaning:</strong></td>
<td>The purpose toward which an endeavor is directed.</td>
<td>Something that one's efforts or actions are intended to attain or accomplish; purpose; target.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>I want to achieve success in the field of genetic research and do what no one has ever done.</td>
<td>I want to complete this thesis on genetic research by the end of this month.</td>
</tr>
<tr>
<td><strong>Action:</strong></td>
<td>Generic action</td>
<td>Specific action</td>
</tr>
<tr>
<td><strong>Measure:</strong></td>
<td>Goals may not be strictly measurable or tangible.</td>
<td>Must be measurable and tangible.</td>
</tr>
<tr>
<td><strong>Time frame:</strong></td>
<td>Longer term</td>
<td>Mid to short term</td>
</tr>
</tbody>
</table>

Source: http://www.diffen.com
Budget

- Talk with your faculty mentor to discuss possible supplies needed to carry out your research
- Search for estimates for proposed supplies
- Update budget worksheet (it’s in the application!)
- Include the item, the estimated cost, and the justification for needing item
- Funds cannot be spread over several semesters
- Item is property of faculty after end of research term
## Spring 2013

<table>
<thead>
<tr>
<th>Budget Request</th>
<th>Cost</th>
<th>Budget Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-slip Lining Foam</td>
<td>$200</td>
<td>Padding needed for inside of metal coupling and braces for comfort and to resist torque-slip</td>
</tr>
<tr>
<td>ICP-MA Measurements</td>
<td>$200</td>
<td>Analysis of neutron exposed batteries.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$400</strong></td>
<td></td>
</tr>
</tbody>
</table>
Personal Statement

- What drives you? Why do you want to do research?
- How does this connect to your next steps, your next plans?
- Describe your personal goals and how this research relates to your goals
- Describe why this research is important to you
- Explain how your technical skills will assist with the research (i.e. laboratory skills, programming, machining, etc.)
- The FURI Committee uses the personal statement to get to know your goals, aspirations, and why this research is important to you
- **Tip!** This is where you can explain anything that might seem odd or confusing to the committee.
Planning
Organizing
Writing
Feedback
Re-writing
Final editing
Good proposals are not written...they are rewritten.
Evaluation of Proposals

- Evaluated by FURI faculty committee
- Each application and proposal is reviewed by two reviewers
- Applications then reviewed by entire committee
- Funding levels vary per semester
- Process is competitive
- Approved proposals depend on number of proposals received, the quality of the proposals, and amount of available funding
Evaluation Criteria

- The **research question or hypothesis** to be investigated is well-thought out and described.
- There is a **clearly defined research plan** that describes the tasks that will be conducted in order to answer the research question.
- The **timetable** is descriptive and correlates to the research plan defined in the proposal.
- The **proposal** provides a concise review of research previously published relevant to the proposed work with appropriate citations.
Evaluation Criteria-Continued

- The **personal statement** demonstrates that the student is motivated and aligns with the proposed research activities.
- The **resume** demonstrates an ability to achieve goals and participation in activities.
- The **overall transcript** illustrates good academic standing and the student’s ability to manage the course load and research.
- The proposal explicitly states how the research aligns with at least one of the **five Fulton research themes**.
- The **proposal support letter** strongly endorses the student’s abilities and preparation for the project and demonstrates a clear commitment toward the student’s project as a mentor.
Next Steps

Find a Mentor

- Explore research areas
- Update/create resume
- Contact potential faculty mentors
- Faculty can have up to 5 FURI students per semester

Finalize Your Proposal

- Meet with your faculty mentor
- Learn about the research problem
- Write your proposal
- Prepare your supporting documents
- Review with your mentor
- Mentor submits letter
- Submit by the March 3, 2015 noon deadline
Ways we can help you!

- **Find a Mentor: Research Student-Mentor Mingle:** Meet faculty members who are seeking student researchers and chat about opportunities over light refreshments. **Sign-up here!**
  - Tuesday, February 3, 11 am – 1 pm, Poly-Santan 330 (drop-in when you can!)
  - Wednesday, February 11, 2-4 pm, Tempe-ECF 130 (drop-in when you can!)

- **FURI Application Assistance:** Need an extra set of eyes to look over your application? Pop in for assistance from the FURI staff and current FURI students during these times:
  - Friday, February 27, 12-5 pm, Tempe-ECF 130
  - Monday, March 2, 12-5 pm, Poly-Santan 330
Travel Grant

- Fulton undergraduate students who has been accepted to present their research findings is eligible
- Students will need to complete the Travel Grant Application form at least two weeks prior to the intended travel date
- If approved, you will work with FURI office to finalize your travel paperwork
- Travel costs $700-$1000

- Students will be required to present their research at the FURI Symposium
- Applications are competitive and not guaranteed – search for funding from other sources!
- An article will be written about your travel grant experience
You’ve heard the spiel. Questions?

Anything else?
Other Opportunities

- **Fulton Student Organizations** - over 55 organizations involved in technical training, competitions, outreach, service, professional development, and other activities

- **Grand Challenge Scholars Program** - endorsed by ASU and the National Academy of Engineering. Includes:
  - Research
  - Service learning
  - Interdisciplinary coursework
  - Entrepreneurship
  - Global experience/courses

- **Engineering Projects in Community Service (EPICS)** - social entrepreneurship program where teams design, build, and deploy ideas to solve engineering-based problems for charities, schools and other not-for-profits

- **Study Abroad** - connect with various study abroad opportunities, including Engineering faculty-directed summer programs
Need a study space? Creative room? Tempe-ECF 130 is the spot!

Monday- Thursday
8 am – 9 pm
Friday
8 am – 5 pm
FURI Office (ECF 130, Tempe Campus)

Email furi@asu.edu

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Associate Director-Undergraduate Student Engagement
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Cortney.loui@asu.edu
480-965-3765
Questions?