What is Research?  
(according to the National Science Foundation)

**Research** is defined as systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research is classified as either basic or applied according to the objectives.

**Basic research** is defined as systematic study directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind.

**Applied research** is defined as systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

**Transformative research** is defined as research driven by ideas that have the potential to radically change our understanding of an important existing scientific or engineering concept or leading to the creation of a new paradigm or field of science or engineering. Such research is also characterized by its challenge to current understanding or its pathway to new frontiers.

What can you get out of doing undergraduate research?

• An experience that gives you new perspective on your field, new ideas, and new ways of thinking
• Habits of asking questions about the way things work and thinking about how they could work better
• A small sample of what it is like to be in graduate school
• A professional relationship with a faculty advisor and/or an advanced graduate student
• A reference letter for a job or graduate school
• Perhaps a publication
• Perhaps independent study credit
• Perhaps hourly pay
When is it appropriate to start research as an undergraduate?

• When you find a technical area that interests you.

• When you’ve had enough foundational courses so that you can understand (with a little guidance):
  – why you’re doing the research
  – what the results of the research will mean

• When you’re motivated enough to commit the necessary time to the research without adversely impacting your coursework.

• When, if you haven’t had all of the foundational courses, you’re willing to spend the extra time to teach yourself much of what you need in order to do your research.
How do you find an advisor for your undergraduate research experience? (Part 1)

(Start the process early, even if you’re not ready to start the research yet!)

- Check with your department about what programs exist to help you find an advisor (e.g., PURE in ECE, CS)
  - If your department doesn’t have one, think about starting one!

- Determine if your department has a senior thesis option that will provide a research experience and what the requirements are for being eligible to participate

- Apply to ISUR (Illinois Scholars Undergraduate Research Program in the College of Engineering)
  (https://wiki.engr.illinois.edu/display/isur/Home)

- Apply to Research Experience for Undergraduates (REU) programs, here or at other schools

- Find an advisor on your own…
Department-Based Opportunities

- **Every** department encourages student initiative to get involved with research. Specific information is available on the respective department’s webpage. Examples include:
  - **Aerospace Engineering** offers a summer Undergraduate Research Opportunity Program (UROP)
  - **Civil Engineering** has a CEE REU Program encouraging undergraduate students to develop a proposal with a faculty member
  - **Electrical and Computer Engineering** Professor Cangellaris invites top students to a research meeting once a year and the department as a whole encourages all students to get involved in research (also PURE in ECE & CS)
  - **Industrial and Enterprise Systems Engineering** hosts a variety of events where professors talk about undergraduate research and encourage students to contact professors
  - **Materials Science & Engineering** offers MSE 398 to get technical elective credit for research and will find top students lab positions
  - **Physics** encourages independent research composed of projects arranged between the student and faculty member, also summer Research Experiences for Undergrads (REUs) and working at national laboratories
How do you find an advisor for your undergraduate research experience? (Part 2)

• Be entrepreneurial, be professional, and do your homework on faculty that do research in the area in which you’re interested:
  – Go to the web pages of faculty to find out about the kinds of research they do (plus, some faculty indicate on their home pages what courses students should have and what research past undergraduate students have done)
  – Read some of their research papers, even if you don’t understand many of the terms or equations
  – Go to the office hours of faculty with whom you might want to work and talk to them about it
  – Talk to graduate students that you encounter as Teaching Assistants or in other venues about their research and opportunities in their labs
  – Send a **professional** e-mail asking for an appointment that starts with “Dear Professor …” and says more than “I want to do undergraduate research.”
Time Commitments and Presentation Opportunities

• Collaborate with your faculty or graduate student advisor to come up with a plan to work regularly toward your research goal and be sure to follow through

• Explore opportunities to present your research
  – Departmental forum
  – Undergraduate Research Symposium (spring semester, proposals due 2/7 this year) and ISUR Poster Session
  – Conferences