



# WPI

## Approach to Curriculum



# About WPI



Private, founded in 1865

Focus on

- Engineering
- Science
- Management

Granting

- BS, BA
- MS, MEng
- PhD

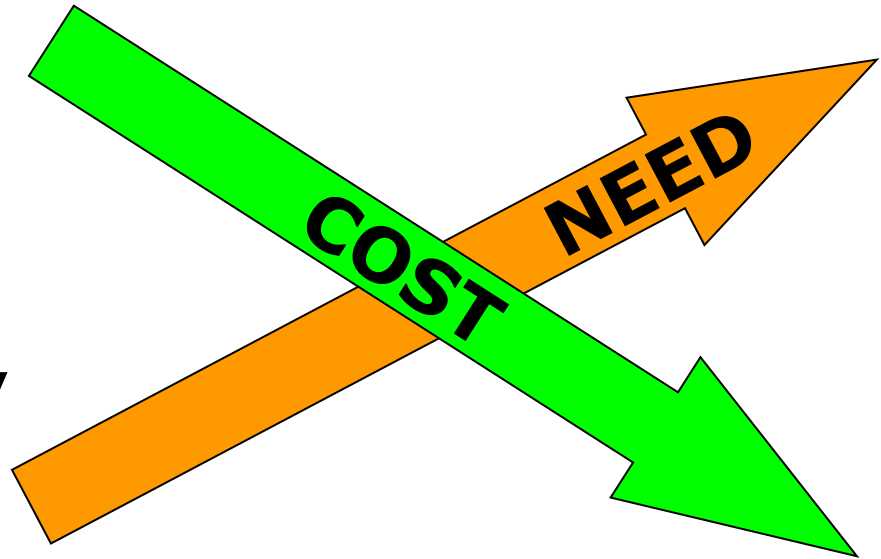
60+ disciplines

# The Robotics Equation

---

Sensors,  
Computing devices,  
Actuators,  
Communications

Defense & Security,  
Medicine & Elder care,  
Consumer,  
Manufacturing,  
Logistics,  
Entertainment



# Robotics Education Gap

---

“Making useful robots,  
Making robots useful”

Industrial Robotics  
Technology

AA, AS @  
Community College

Mechatronics &  
Robotics  
Engineering

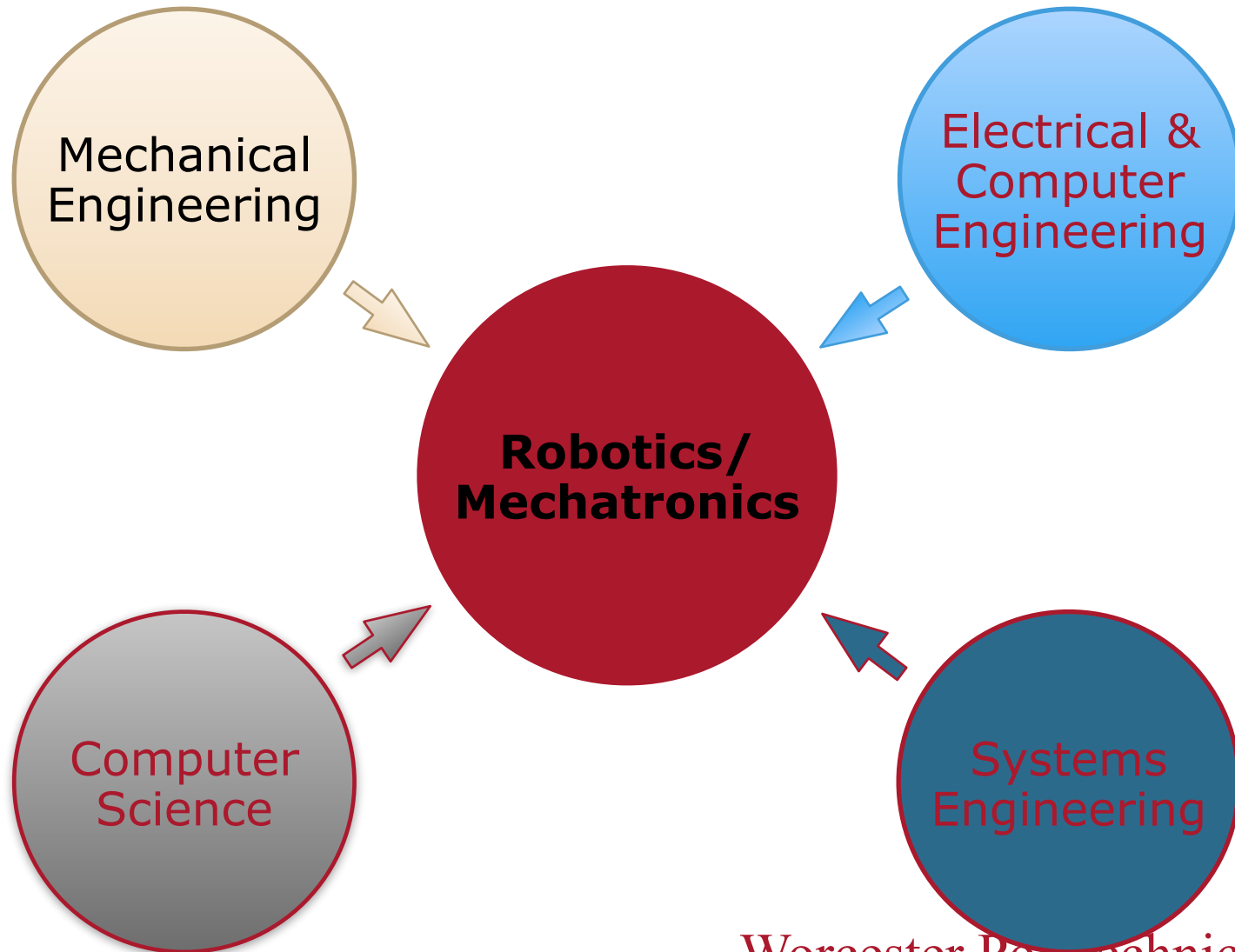
Robotics Research

PhD @  
Large Research  
University

“Don’t know what robots will do in 10 or 30 years.  
But we can educate the engineers to make them.”

# Robotics education

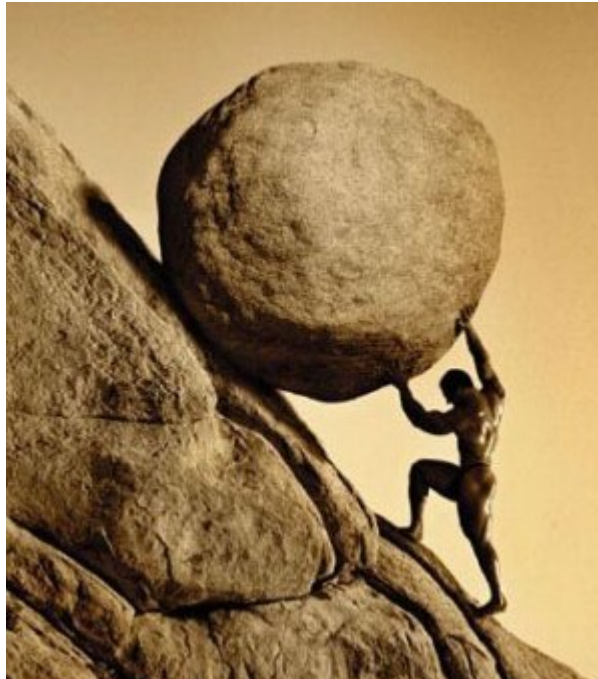
---



# How Hard Can It Be?

---

Creating a new program is a lot of work



Why bother?

<http://coconutheadsets.com/wp-content/uploads/2009/12/sisyphus.jpg>

# The Education Business

---

Understand the business you are in

*"But we're non-profit."*

*"Yeah, right."*

Must have revenue  $\geq$  expense

Invest: \$ / energy / time / people / space

Return: \$ / tuition / funding / prestige / ...

New program is an **Academic / Social / Business Decision**

# Breakthrough Concept

---

- Can't just add Robotics courses
- Rip out middle engineering courses
  - CS: Data Structures, Algorithms, ...
  - ECE: Signals, Microelectronic Circuits, ...
  - ME: Dynamics, Machine Design, ...
- Slice curriculum horizontally, not vertically
  - Each course includes CS, ECE, ME concepts → No silos
  - Organize around Actuation, Sensing, Manipulation, Navigation
- *Unified Robotics 1-4*
- Disclaimer: Cannot cover exact same material, so ...
- Don't even try!



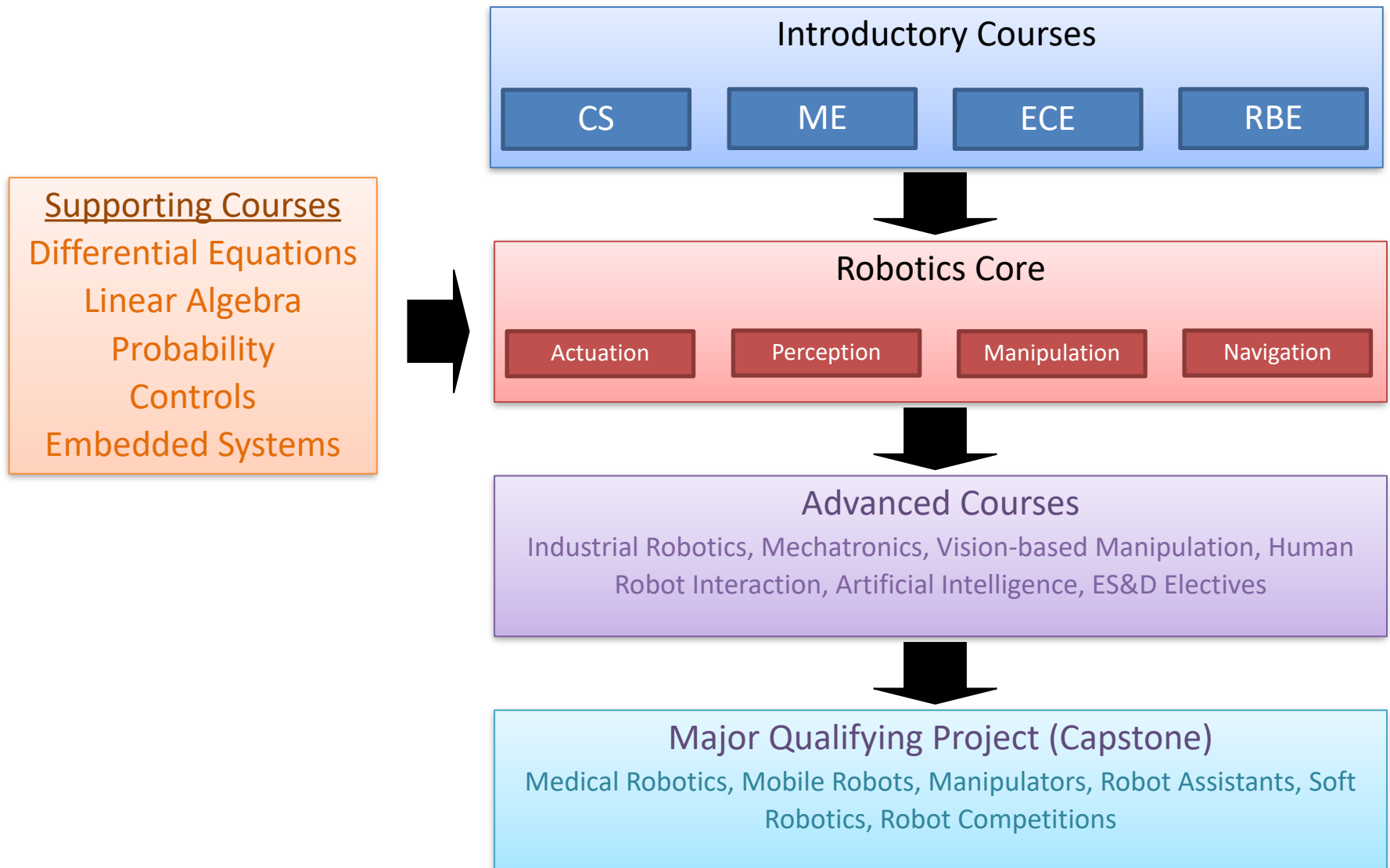
# Program Objectives

---

Provide graduates with:

- **Foundation** in Computer Science, Electrical and Computer Engineering, Mechanical Engineering, and Systems Engineering.
- **Practical skills** to design and construct robots and robotic systems to address human needs and desires.
- **Entrepreneurial** background and spirit to make their ideas become reality.
- **Insight** to understand the social and ethical implications of robotics in society.

# Curriculum

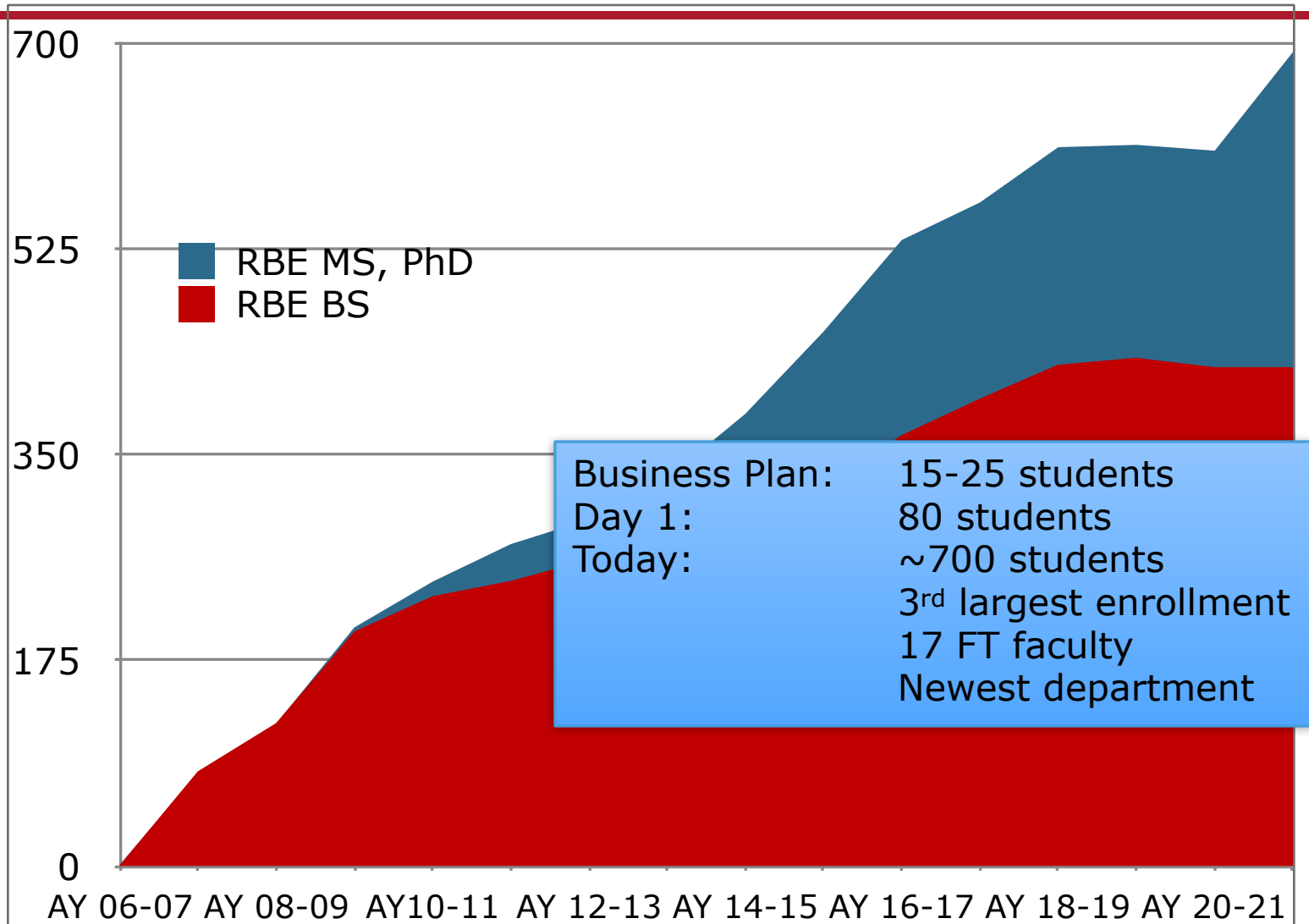


# Student Challenges

---

- Diversity of student backgrounds
- Timing of (discipline-specific) background courses
- Specialization

# Enrollment



# Lessons Learned

---

- Robotics is a highly viable major
- Need vision & passion... & a business plan
- Bottom-up approach better than top-down
- Top-down approach better than bottom-up
- Well-designed curriculum evolves
- Stick to your principles
- Be open to compromise on anything else
- Communicate & cooperate
- Students – and faculty – will work hard
- **Be bold & Have fun!**

*For  
faculty  
buy-in*

*For  
curriculum  
design*

# Resources

---

- Carlotta Berry (Rose-Hulman): [berry123@rose-hulman.edu](mailto:berry123@rose-hulman.edu)
- Greg Lewin (WPI): [glewin@wpi.edu](mailto:glewin@wpi.edu)
- Ray Li (NYU): [rui.li@nyu.edu](mailto:rui.li@nyu.edu)
- Melissa Morris (Embry-Riddle): [Melissa.Morris1@erau.edu](mailto:Melissa.Morris1@erau.edu)
- James Mynderse (LTU): [jmynderse@ltu.edu](mailto:jmynderse@ltu.edu)

[https://github.com/  
WPIRoboticsEngineering/FoMRE-ASEE-2022](https://github.com/WPIRoboticsEngineering/FoMRE-ASEE-2022)

