An NSF Engineering Research Center: A Complex, Interdependent System

Leadership & Management
Research for Discovery/Innovation
Students, Faculty, Staff, Small Firms

Vision & Strategic Plan
Educating for Creativity & Innovation
Graduates Knowledge Innovations Curricula

Funds, Equipment, Facilities
Partnerships for Innovation
Industry/Users & Innovation Partners

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Engineering Research Centers: Education & research in a system/discipline frame

1984 - present

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ERC Strategic Framework: It’s not an ERC if you don’t do all three

System Requirements
- Identify Societal/Market Needs, Define System & System Requirements & Barriers
- Integrate Fundamental Knowledge into Enabling Technology

Fundamental Research
- Identify Society/Market Needs
- Define System & System Requirements
- Integrate Fundamental Knowledge into Enabling Technology

Enabling Technology Research
- Testbeds
- Systems Research
- Technology Elements

Technology Base
- Fundamental Knowledge
- Knowledge Base
- Systems

Technology Integration
- Technology Elements
- Environment/Marketplace

Products & Outcomes
- Environment/Marketplace
- Requirements
- Testbed(s)

Barriers
- Barriers

Testbeds
- Testbeds
Implementation

Mature ERC Education Program

Precollege
- Curriculum: core & advanced
- Modules / e-modules
- Internships
- Degree/certificate programs
- Research Experience for Undergrads (REU)
- High School Young Scholars
- Workshops, Seminars
- Engineering camps, fairs, lab tours
- International experiences
- Mentoring
- Research Experiences for Teachers (RET)
- Websites

Undergrad

Graduate
- Internships
- Degree/certificate programs
- Research Experience for Undergrads (REU)
- Short Courses
- Workshops, Seminars
- International experiences
- Mentoring
- Research Experiences for Teachers (RET)
- Websites

Professional

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Gen-3 ERCs Convert “Valley of Death” into “Challenge Basin”

- Resources
  - Research at Universities
  - NSF overall
  - ENG overall
  - ERCs

- Level of Development
  - Existing Research Resources
  - Translational research
  - Innovation Partners/Facilitators
  - Innovation Infrastructure
  - Existing Commercialization Resources

- New Products Sold by Companies

Adapted from chart by Deborah Jackson, ERC Program Director
Engineering Research Center Products

Curricula 1984-2013
New Courses 717
New Modules/Course materials 1,273
New Textbooks 188
New Degree/Certificate Programs 140
ERC graduates 12,000

Innovation 1984-2013
Patents Awarded 382
Licenses Issued 669
Spinoff Companies 171
Employees 1500

Argus II Retinal Prosthesis

61 ERCs (1985 – 2014) Joining Discovery to Innovation for 30 Years
Engineering Research Center Products

>12,000 degrees awarded

Graduates in Industry

- Ability to Develop Technology
- Ability to Integrate Knowledge and Technology to Solve Problems
- Depth of Technical Knowledge
- Contribution to Firm’s Technical Work
- Ability to Work in Interdisciplinary Teams
- Breadth of Technical Knowledge
- Overall Preparedness to Work in Industry

* Percentage of industrial supervisors rating the former ERC students/graduates hired by their firms as “Better Than” or “Much Better Than” equivalent hires without ERC experience