Engineering Education Research

Engineering Education and Centers Division
Engineering Directorate
National Science Foundation

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The Division of Engineering Education and Centers (EEC) seeks to enable a world-leading system of engineering education, equally open and available to all members of society, that dynamically and rapidly adapts to meet the changing needs of society and the nation's economy.

Accomplish this mission primarily through support of research in engineering education and human resource development.
Enginers in School and Workforce

K - 12

4 yr. college

Graduate

2 yr. college

Workforce

= 1,000,000 people

= 1,000,000 engineers
What is Engineering Education Research?

The Innovation Cycle of Educational Practice and Research

Educational Practice
- which help improve
- answers insights that result in

Educational Research
- which lead to
- questions ideas

Educational Practice
- identifies and motivates

Adapted from Booth, Colomb, and Williams, 2008
What is Engineering Education Research?

- Hypothesis or question driven
- Uses appropriate methodologies
- Explanatory power
- Theory-based
- Generalizable and/or transferable

Input: Teaching

Evaluation: Scholarly

Output: Impact

Pedagogical Axis

Impact Axis

Scholarly Teaching

Pedagogical

Extended

Input

Output

Evaluation

Local

Pedagogical

Extended

Input

Output

Evaluation

Local

Scholarly

Teaching

Impact

Scholarly

Teaching

Research

Specific to a given context

Extended

Extended

H(\omega)
Engineering
Education
Research
Increasing our understanding of how engineering students learn and the capacity that supports such discovery.

Understanding how to increase the diffusion and impact of engineering education research.

Understanding engineering education in broader, organizing frameworks such as innovation, globalization, complex engineered systems, or sustainability.

Diversifying pathways to and through engineering degree programs.

Contact: Alan Cheville rchevill@nsf.gov

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503584
Particular Target Group: Veterans

- 2008 Act significantly expands benefits to veterans
  - 36 months of tuition limited to maximum in state tuition for state university.
  - Monthly Housing Allowance
  - $1000 for Books and Supplies
- 2.1 M veterans are eligible (est.)
- 46% of veterans use benefits for four year college
- Veterans are different than typical students:
  - Likely older than most students
  - May have families to support
  - May initially feel uncomfortable in new academic setting
  - Sensitive about being mistaken for ROTC students
  - Must make rapid progress in degree completion
  - Most likely transfer or part-time students
  - Vast majority are mature and disciplined
  - 98% US citizens
Research Initiation Grants in Engineering Education (NSF 11-507)

Allow faculty to expand engineering education research competencies

- Address boundary-spanning challenges in engineering education.
- Develop expertise in engineering education.
- Develop interdisciplinary partnerships.
- Explore the theoretical basis, research methodologies, and epistemologies of synergistic discipline(s).

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http://nsf.gov/funding/pgm_summ.jsp?pims_id=503603

$150,000
2 years
Ethics Education in Science & Engineering (11-514)

- Research and educational projects to improve ethics education in all of the fields of science and engineering that NSF supports.
- Proposals must focus on improving ethics education for graduate students in those fields, although the proposed programs may benefit advanced undergraduates in addition to graduate students.

Contact: Sue Kemnitzer skemnitz@nsf.gov

Transforming Undergraduate Education in STEM (TUES 10-544)

On the development side of the research & development continuum.

- Program run in EHR/DUE.
- Supports efforts to create, adapt, and disseminate new learning materials and teaching strategies.
- Work should reflect advances both in STEM disciplines and in what is known about teaching and learning; i.e. based on research.
- Focus on producing STEM graduates- long-term potential for national impact is a factor in reviews.
- Three types: Type 1- local scope, Type 2- regional scope, Type 3- national scope.

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5741
Nanotechnology in Undergraduate Education (10-536)

NUE projects enable individuals and programs to integrate nanoscale engineering into their curricula.

- Interdisciplinary collaborations are an important element of the program.
- Projects should make a case for impact on students and explain how impact will be evaluated.
- International collaborations are encouraged.
- One proposal per PI and per institution- engineering only.

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13656
Human Resource Development
Research Experience for Undergraduates (09-598)

Supports engaging undergraduate students in research through both sites and supplements.

- Research experience must be well defined with cohort learning experiences in sites.
- Special opportunities with DoD, DoE, international experiences, ethics, and RET program.
- Cross-cutting NSF program.
- Costs other than participant support are limited.
- Both sites (*) and supplements are available.

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http://nsf.gov/funding/pgm_summ.jsp?pims_id=5517
Research Experience for Teachers (11-509)

Supports development of K-12 & community college STEM teachers in research

- Provides summer support for teachers to engage in research.
- Successful proposals support development of participating teachers.
- Costs other than participant support are limited.
- Available in ENG and CISE.
- Both sites (*) and supplements are available.

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5736
Cross-Cutting Programs
Focus on initiating research projects that will broaden participation of under-represented groups

- Research Initiation Grant- no prior NSF funding allowed, minimal funding (< $50K) from other sources.
- Opportunity to increase the diversity of researchers through research support early in their careers
- Encourages support of under-represented groups, engineers at minority-serving institutions, and persons with disabilities
- Supports synergy of research and opportunities to broaden participation of under-represented groups.

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503160

$175,000  2 years
Integrative Graduate Education and Research Traineeship - IGERT (10-523)

Fundamentally transform graduate education in new interdisciplinary research areas.

- IGERT is a flagship NSF program addressing needs of the future in People and Ideas
- Funds graduate students and education, not research
- Intended to catalyze a cultural change in graduate education
- Facilitates graduate student development in addition to new knowledge generation.
- Facilitates diversity in student participation and preparation.

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http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759
Faculty Early Career Development- CAREER award (11-690)

Support and promote early career faculty in developing integrated research and education programs

- Development of new faculty with integrated research and education programs
- Foundation-wide activity
- NSF’s most prestigious awards for teacher-scholars who most effectively integrate research and education

Contact: Cognizant Division Program Officer (see web site)

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214
Questions?