

Nanotechnology Undergraduate Education (NUE) in Engineering

PROGRAM SOLICITATION

NSF 11-524

REPLACES DOCUMENT(S):

NSF 10-536



National Science Foundation

Directorate for Engineering
Engineering Education and Centers

Directorate for Social, Behavioral & Economic Sciences
Division of Social and Economic Sciences

Directorate for Education & Human Resources
Division of Undergraduate Education

Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

April 20, 2011

IMPORTANT INFORMATION AND REVISION NOTES

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), [NSF 11-1](#), was issued on October 1, 2010 and is effective for proposals submitted, or due, on or after January 18, 2011. Please be advised that the guidelines contained in [NSF 11-1](#) apply to proposals submitted in response to this funding opportunity. Proposers who opt to submit prior to January 18, 2011, must also follow the guidelines contained in [NSF 11-1](#).

Cost Sharing: The PAPPG has been revised to implement the National Science Board's recommendations regarding cost sharing. Inclusion of voluntary committed cost sharing is prohibited. In order to assess the scope of the project, all organizational resources necessary for the project must be described in the Facilities, Equipment and Other Resources section of the proposal. The description should be narrative in nature and must not include any quantifiable financial information. Mandatory cost sharing will only be required when explicitly authorized by the NSF Director. See the PAPP Guide Part I: *Grant Proposal Guide (GPG)* [Chapter II.C.2.g\(xi\)](#) for further information about the implementation of these recommendations.

Data Management Plan: The PAPPG contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: <http://www.nsf.gov/bfa/dias/policy/dmp.jsp>. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

Postdoctoral Researcher Mentoring Plan: As a reminder, each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See [Chapter II.C.2.j](#) of the GPG for further information about the implementation of this requirement.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Nanotechnology Undergraduate Education (NUE) in Engineering

Synopsis of Program:

This solicitation aims at introducing nanoscale science, engineering, and technology through a variety of interdisciplinary approaches into undergraduate engineering education. The focus of this year's competition is on nanoscale engineering education with relevance to devices and systems and/or on the societal, ethical, economic and/or environmental issues relevant to nanotechnology.

Related funding opportunities are posted on <http://www.nsf.gov/nano>. Research and education projects in

nanoscale science and engineering will continue to be supported in the relevant NSF programs and divisions.

Cognizant Program Officer(s):

- Mary Poats, Program Manager, Directorate for Engineering, Division of Engineering Education and Centers (ENG/EEC), 585 N, telephone: (703) 292-5357, fax: (703) 292-9051, email: mpoats@nsf.gov
- Michael E. Gorman, Program Director, Directorate for Social, Behavioral and Economic Sciences, Division of Social and Economic Sciences (SBE/SES), 995 N, telephone: (703) 292-7318, fax: (703) 292-9068, email: mgorman@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.041 --- Engineering
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources

Award Information

Anticipated Type of Award: Standard Grant

Estimated Number of Awards: 10

Anticipated Funding Amount: \$1,900,000 pending the availability of funds. Each award will be up to a maximum of \$200,000 for two years.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

The lead PI must hold a faculty appointment within a College/Department of Engineering or College/Department of Engineering Technology within the submitting US academic institution.

Limit on Number of Proposals per Organization: 1

Only one (1) proposal may be submitted by a US academic institution, College/Department of Engineering or College/Department of Engineering Technology as the lead institution with the following exception: A US academic institution may submit a second proposal as the lead institution, only if it is focused on the societal, ethical, economic and/or environmental issues relevant to nanotechnology.

Limit on Number of Proposals per PI: 1

An individual may serve as the Principal Investigator (PI) or co-Principal Investigator (co-PI) on no more than one proposal.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- Letters of Intent: Not Applicable
- Preliminary Proposal Submission: Not Applicable
- Full Proposals:
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- Cost Sharing Requirements: Inclusion of voluntary committed cost sharing is prohibited.
- Indirect Cost (F&A) Limitations: Not Applicable
- Other Budgetary Limitations: Not Applicable

C. Due Dates

- Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

April 20, 2011

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

One nanometer (one billionth of a meter) is a magical point on the dimensional scale. Nanostructures are at the confluence of the smallest of human-made devices and the largest molecules of living systems known today. Nanoscale science and engineering here refer to the fundamental understanding and resulting technological advances arising from the exploitation of new physical, chemical, and biological properties of systems that are intermediate in size, between isolated atoms and molecules and bulk materials, where the transitional properties between the two limits can be controlled. During the last few years, novel structures, phenomena, and processes have been observed at the nanoscale (from a fraction of a nanometer to about 100 nm) and new experimental, theoretical, and simulation tools have been developed for investigating them. These advances provide exciting opportunities for scientific and technological developments in nanoparticles, nanostructure materials, nanodevices, and systems.

Nanotechnology is the creation and utilization of functional materials, devices, and systems with novel properties and functions that are achieved through the control and restructuring of matter at the atomic, molecular and macromolecular levels. A revolution has begun in science, engineering, and technology based on the ability to organize, characterize, and manipulate matter systematically at the nanoscale. Far-reaching outcomes for the 21st century are envisioned in both scientific knowledge and a wide range of technologies in most industries, healthcare, conservation of materials and energy, biology, environment, and education. Fundamental research in nanoscale science and engineering (NSE) underpins innovation in critical areas ranging from manufacturing to medicine.

NSE has technological, economic, environmental, social, and ethical dimensions that may change the world in which we live. Increased understanding and appreciation of the potential for nanoscale science and engineering will be needed to create an informed citizenry and a competitive workforce.

The Nanotechnology Undergraduate Education (NUE) in Engineering program aims to integrate nanoscale science, engineering, and technology into the undergraduate engineering curricula. The NUE program provides funding for projects that will address the educational challenges of these emerging fields and generate practical ways of introducing nanotechnology into undergraduate engineering education with a focus on devices and systems and/or on social, economic, and ethical issues relevant to nanotechnology. Given the worldwide expansion of research and education in nanoscale science and engineering, international collaborations that advance underlying nanoscale science and engineering education goals and strengthen U.S. activities are encouraged.

II. PROGRAM DESCRIPTION

Program Goals

Advances in nanotechnology research provide new opportunities in undergraduate education. With their focus on imaging and manipulating the atom, the ultimate building block of matter, nanoscale science and engineering provide a multitude of new interdisciplinary teaching opportunities for engaging interest and for broadening vision by students of science, engineering, and technology. Nanoscale science and engineering thus permit new strategies for enhancing science and engineering literacy, preparing the workforce for emerging technologies, and attracting a diverse group of talented students to the workforce of tomorrow. The FY 2011 solicitation is focused on nanoscale engineering education with relevance to devices and systems, and/or on the societal, ethical, economic and/or environmental issues relevant to nanotechnology.

Nanoscale engineering provides creative opportunities for invigorating undergraduate engineering education through new courses and research experiences. It blends engineering, chemistry, physics, biology, mathematics, computer science, materials science, geology, behavioral and social sciences, and design. As such, it provides new opportunities for faculty collaboration, both in teaching and in research, that cross traditional disciplinary and departmental boundaries. Some examples of nanotechnology-based topics that can be introduced into the curriculum include scanning probe methods, devices using nanotubes, bottom-up and top-down syntheses of nanoscale materials, self-assembly, nanobiotechnology, environmental aspects of nanotechnology, applications of nanotechnology to information technology, properties and fundamental phenomena in nanoscale materials, computational methods for modeling nanoscale materials, nanoscale devices, nanoscale systems, design principles at nanoscale, and the societal, ethical, economic and environmental implications of nanotechnology. See <http://www.nsf.gov/nano> for additional examples.

NUE in Engineering projects are intended to enable individuals, departments, programs, or campuses to integrate nanoscale engineering into their curricula. Integration could take the form of a new course or courses, or modification of existing courses so that a substantial portion of the course content is based on nanoscale engineering. Integration could include a module or modules in courses that focus on issues of environmental or social change and new developments in nanoscale engineering, or a new course or series of courses that include those focuses. Proposals involving any part of the undergraduate engineering curriculum are eligible. International collaborations that advance the underlying NUE in Engineering goals and strengthen U.S. activities are encouraged.

Project Characteristics

NUE in Engineering emphasizes new approaches to undergraduate engineering education through interdisciplinary collaborations. These collaborations could lead to, but are not limited to:

- A freshman course introducing the basic phenomena and processes at the nanoscale, the unifying principle of matter at the nanoscale, connections to other disciplines, and application areas of societal relevance;
- New examples of undergraduate nanoscale engineering courses that are presented through the development of laboratory and demonstration experiments, manuals and other written materials, software, and web-based resources;
- Development and dissemination of new teaching modules for nanoscale engineering of relevance to engineering education that can be used in existing undergraduate courses;
- Incorporation of undergraduate research opportunities in nanoscale engineering into the curriculum at any level; and
- Development of courses or curricular enhancements related to nanoscale engineering and technology and environmental or social change.

Proposals similar to those defined by this solicitation may also be submitted to the NSF Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES) program managed by the Division of Undergraduate Education (DUE). The same proposal, however, cannot be simultaneously submitted to both NUE in Engineering and the TUES program.

III. AWARD INFORMATION

It is estimated that 10 standard grants totalling \$1,900,000 will be awarded pending the availability of funds. Each award will be up to a maximum of \$200,000 for two years.

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.

PI Limit:

The lead PI must hold a faculty appointment within a College/Department of Engineering or College/Department of Engineering Technology within the submitting US academic institution.

Limit on Number of Proposals per Organization: 1

Only one (1) proposal may be submitted by a US academic institution, College/Department of Engineering or College/Department of Engineering Technology as the lead institution with the following exception: A US academic institution may submit a second proposal as the lead institution, only if it is focused on the societal, ethical,

economic and/or environmental issues relevant to nanotechnology.

Limit on Number of Proposals per PI: 1

An individual may serve as the Principal Investigator (PI) or co-Principal Investigator (co-PI) on no more than one proposal.

Additional Eligibility Info:

NUE in Engineering proposals must be submitted by US universities and two- and four- year colleges (including community colleges) accredited in, and having a campus located in the US that have a College/Department of Engineering or a College/Department of Engineering Technology with undergraduate programs in disciplines usually supported by NSF. Projects may be proposed by individual investigators or by groups from a College/Department of Engineering or a College/Department of Engineering Technology. The lead Principal Investigator must hold a faculty appointment in a College/Department of Engineering or a College/Department of Engineering Technology. Collaboration as appropriate with individual investigators or groups from other Colleges/Departments with undergraduate programs in disciplines usually supported by NSF, in a non-lead role are permitted. NUE in Engineering proposals involving more than one institution must be submitted as a single administrative package with the managing Principal Investigator (PI) from the lead institution. Synergistic collaboration among researchers and collaborations or partnerships with industry, government laboratories and foreign institutions are encouraged when appropriate. Non-US institutions may participate in project activities using their own resources.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov. Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (<http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf>). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

Additional review criteria described in Section VI. A. should be addressed when preparing a proposal.

1. COVER SHEET

The NSF organizational unit to which proposals should be directed is EEC - Nanotechnology Undergraduate Education in Engineering. The proposal title should begin with component acronym: "NUE".

2. PROJECT DESCRIPTION

The project description for NUE in Engineering proposals should contain the following components:

- a. Goals and Objectives. The goals of the project should be stated clearly and concisely in relation to the goals of the NUE component.
- b. Results of Prior NUE Support. In addition to results of prior support as required by the GPG or NSF Grants.gov Application Guide, institutions participating in prior NUE awards must describe the relationship of that award to this new proposal.
- c. Detailed Project Plan. The project plan should be the longest section of the Project Description. It should include description of the project's features, clearly delineating the plan to introduce or enhance nanotechnology in the undergraduate curriculum and its relevance to engineering education. The plan should include:

Background on the proposed project describing how it builds on nanoscale and pedagogical research;

Statement describing the expected impact of the project on the undergraduate curriculum at the participating institution(s) and, if applicable, elsewhere;

Number and percentage of undergraduate students who would be impacted by the project at the participating institution(s), and the extent to which under-represented groups would be served;

Plans for institutionalization of projects; and

References to required letter(s) of institutional and departmental commitments to the project noted under

Supplementary Documents (see below).

- d. Experience and Capability of the Principal Investigator(s). Briefly describe the experience and capability of the PI(s). Include a brief description of the rationale for including the specific faculty members and institutional units within the project. State the role of each and cite the expertise that each will contribute to the project.
- e. Evaluation Plan. All projects must conduct their own formative and summative (third-party) evaluation and all projects must participate in an NSF-supported program evaluation. Describe criteria to be used in evaluating the quality and impact of the project, how the project's impact on student learning will be assessed, and the process for collecting and analyzing information at the proposer's institution or from others involved in testing of course materials developed.
- f. Dissemination of Results. Describe plans to communicate the results of the project to other professionals in the science, technology, engineering, and mathematics (STEM) and education communities, both during and after the project. Describe the information or materials to be disseminated (e.g., computer presentations, laboratory manuals, software, multimedia materials); how the material will be made available to other institutions; the means of dissemination (e.g., faculty development workshops, journal articles, conference presentations, electronic networks, media); and the procedures for determining the success of the dissemination effort. Describe procedures to be used to maintain the quality and currency of any material developed, to provide support for faculty users, and to publicize the availability of materials.

Investigators are encouraged to use the National Science, Technology, Engineering, and Mathematics Education Digital Library (NSDL), as part of their dissemination efforts, see <http://nsdl.org>. To ensure that educational materials can be indexed and cataloged within the appropriate collections of NSDL, standard metadata elements and tags should be embedded in web-based products, e.g. documents, animations, simulations, and modules. A variety of review and user annotation procedures are also under development as NSDL services. Information about metadata standards is available from the Dublin Core Metadata Initiative at <http://dublincore.org>.

3. SUPPLEMENTARY DOCUMENTS

Letter(s) describing the intellectual commitment to the project of institutional and academic department(s) signed by a senior academic officer (dean or above) with authority to implement the activities listed in the proposal (if awarded) must be included as a Supplementary Document(s). The letter(s) should be referenced in the Project Description and outline the school's and department's commitment to the project and how the project may effect a lasting change at the institution. If these signed statements are not included in the Supplementary Documents section, the proposal will be returned without review.

Because this program does not require preliminary proposals, potential PIs are encouraged to contact Program Officers, Mary Poats or Michael Gorman listed in this solicitation before submitting a proposal. The Program Officer will help the PI determine whether the proposed work is appropriate for NUE in Engineering.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

C. Due Dates

- Full Proposal Deadline(s) (due by 5 p.m. proposer's local time):

April 20, 2011

D. FastLane/Grants.gov Requirements

- For Proposals Submitted Via FastLane:

Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: <https://www.fastlane.nsf.gov/fastlane.jsp>.

- For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is

submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria:

In addition to the above, the following elements will be used by reviewers and NSF staff in evaluating all NUE in Engineering proposals:

- Does the proposal focus on nanoscale engineering education with relevance to devices and systems and/or on the societal, ethical, economic and/or environmental issues relevant to nanotechnology?
- Are the goals and measurable expected outcomes defined and are they appropriate to the scope, scale, and state of the project?
- Does the proposal describe a convincing rationale and appropriate methods that are grounded in the engineering education knowledge base?
- Is there a clear work plan that is aligned with the expected outcomes?
- Is the project likely to produce high quality results that contribute to the undergraduate engineering education knowledge base?
- Is the project likely to have an impact on engineering education, student learning, and faculty practice?
- Are expected results (e.g. modules, curricula) defined and appropriate?
- Is the evaluation plan likely to produce useful, formative and summative information?
- Are the plans for project assessment and institutionalization beyond the faculty members involved in the proposal sound?
- To what extent are creative, interdisciplinary approaches to undergraduate engineering education fostered?
- What is the likelihood that the project will engage students and faculty at participating institutions (and, if applicable, elsewhere) in creative opportunities for undergraduate nanoscale engineering education?
- What is the potential impact on developing a diverse workforce and enhancing engineering and science literacy and the

scale of the potential impact?

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (GC-1); * or Research Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the *NSF Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report will delay NSF review and processing of any future funding increments as well as any pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational) publications; and, other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and

outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Mary Poats, Program Manager, Directorate for Engineering, Division of Engineering Education and Centers (ENG/EEC), 585 N, telephone: (703) 292-5357, fax: (703) 292-9051, email: mpoats@nsf.gov
- Michael E. Gorman, Program Director, Directorate for Social, Behavioral and Economic Sciences, Division of Social and Economic Sciences (SBE/SES), 995 N, telephone: (703) 292-7318, fax: (703) 292-9068, email: mgorman@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, National Science Foundation Update is a free e-mail subscription service designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the [NSF web site](#).

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this new mechanism. Further information on Grants.gov may be obtained at <http://www.grants.gov>.

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NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 40,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

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The National Science Foundation Information Center may be reached at (703) 292-5111.

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To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- Location: 4201 Wilson Blvd. Arlington, VA 22230
- For General Information (NSF Information Center): (703) 292-5111

- TDD (for the hearing-impaired): (703) 292-5090
- To Order Publications or Forms:
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The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

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