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Department of Engineering - University of Perugia

Proposal for Inclusion in the US National Academy

of Engineering (NAE) Grand Challenge Scholars Program (GCSP)

Approved by

Director of the
Department of Engineering

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Director of the GCSP Program

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Contents

1. Vision

a. Introduction to University and Department of Engineering

University of Perugia is a public university founded in *1308*. In that year, Pope Clement V issued a bull entitled *Super specula*, which granted the Studium of the city the authority to engage in higher education in the fields of Law and General Arts. The bull made Perugia a *leggere generaliter*, giving its degree courses universal validity and recognition. Formal imperial recognition of the University was conveyed in *1355*, when Emperor Charles I granted Perugia the permanent right to have a University and to award degrees to students from all nations.

Today, research, education and consulting activities are provided in the various disciplines, covering nearly all fields of study authorized by the Italian Ministry of Higher Education, by 16 Departments, globally enrolling approximately 23,500 students, 1,100 professors and researchers and 1,000 staff members. The main campus is located in Perugia; further campus locations include Terni, Narni, Assisi and Foligno Umbrian towns.

The **Department of Engineering** has a long tradition of teaching, research, and collaboration with industrial partners. The department offers an innovative syllabus with solid foundations in a wide variety of sub-disciplines and focuses on technological innovation and the sustainability of both the natural and built environments. Enrollment is approximately between 500 and 600 students per year. Department of Engineering organizes the State Exams of Accreditation which is legally required in order to practice the engineering profession in Italy.

Department of Engineering offers three first-level programs and five second-level degree programs within the five years of study, covering the field of computer and electronic engineering, robotics, mechanical engineering, industrial engineering, management engineering, protection and safety of the territory and of the built environment. Students are prepared to meet the demands of the labor market and to satisfy the needs for innovation required, in the domestic and increasingly globalized job markets, by both private and public sectors. To this aim, activity at enterprises or other public/private entities is included in degree programs as curricular activity.

Department of Engineering offers students a strong scientific grounding in core subjects, with a particular attitude for a complex methodological approach and with the opportunity to explore new topics related to almost the totality of the Grand Challenges for Engineering identified by the NAE GCSP. This makes Engineering graduates able to provide innovations worldwide, improving life quality, under a multidisciplinary and integrated approach. These are the values of Department of Engineering of Perugia University, matching with the NAE GCSP aims and values.

In Italian universities, students complete their first level of study in 3 yrs, and complete a second level of advanced study in the subsequent 2 yrs, completing a total of 5 yrs of study. The University of Perugia is proposing a GCSP that extends across this 5 yr duration.

b. Vision for a Grand Challenges Scholars Program

The vision of our National Academy of Engineering (NAE) Grand Challenge Scholars Program (GCSP) is to improve life conditions by means of a sustainable technological development and an outstanding education, being in our opinion the available technology and knowledge the means to advancing a just society.

Life conditions improving implies an increase in health, security and joy of life, mandatory developing new sustainable technologies through innovative engineering designs. This vision is completely aligned with the one of NAE for engineering in the 21st century.

Relevant in this vision is the institutional strategy of Department of Engineering as part of the

Perugia University, based on **knowledge alliances** and **cooperation** (*https://www.unipg.it/files/pagine/1071/UNIPG_ECHE_2014-2020_Erasmus_Policy_Statement.pdf*). The Perugia University has currently 361 inter-institutional agreements with eligible Higher Education Institutions (HEI) and 170 framework agreements with EU and non-EU countries in North America, South America, Africa, Europe, Australia and all main regions of Asia. The institution intends to extend further its connections to foster integration among HEIs, enterprises and other entities, to exchange good practices, knowledge and innovation, enhancing the quality of the high education system and globally advancing the knowledge.

Regarding cooperation, strategic partnerships have already established with Authorities in Italy and Governments worldwide, public/private Institutions and local/foreign Enterprises. The Perugia University commitment is to enhance those collaborations through bottom-up projects and networks (International cooperation) to share and disseminate modern approaches to teaching and training systems and focused on the acquisition of sector-specific competences that will facilitate the social development and employability of all individuals involved.

This strategy will be implemented also in our NAE GCSP program for what concerns technology innovation and scientific knowledge, advancing solutions of the 14 Grand Challenges identified by the NAE. Specific goals of our NAE GCSP are to:

- ✓ Stimulate the GCSP student toward an integrated approach acquiring an inter-disciplines competence beyond that the intra discipline one, with attention to multiculturalism, economic and social awareness issues. In our vision only prioritizing academic excellence, social engagement, and global impact, students are trained to a such global competence, required to pursue positions or careers that can help solve one or more of the Grand Challenges.
- ✓ Build community amongst the GCSP participants through networking events with students, Department of Engineering mentors and GCSP Steering Committee members, realizing a mutual beneficial exchange with other NAE GCSP members, through the GCSP network.
- ✓ Raise awareness of the Grand Challenges in the Department of Engineering, Perugia University and more in general University community, through specific seminars related to the Grand Challenges.

c. Grand Challenge-like topics available to students

Department of Engineering of Perugia University engages in research and training activity (see table 1) related to the 14 NAE Grand Challenges, which are organized into 4 themes, denoted in (), listed below:

1. Make solar energy economical (theme, sustainability)

2. Provide energy from fusion (theme, sustainability)

3. Develop methods for carbon sequestration (theme, sustainability)

4. Manage the nitrogen cycle (theme, sustainability)

5. Provide access to clean water (theme, sustainability)

6. Advance health informatics (theme, health)

7. Engineer better medicines (theme, health)

8. Prevent nuclear terror (theme, security)

9. Secure cyberspace (theme, security)

10. Restore urban infrastructure (theme, security)

11.   Reverse engineer the brain (theme, health)

12.   Enhance virtual reality (theme, joy of living)

13.   Advance personalized learning (theme, joy of living)

14.   Engineer the tools of scientific discovery (theme, joy of living)

The tables below show the first- and second-level degree programs provided by the Department of Engineering, with correspondence with Grand Challenge-like topics noted in the right column.

Table 1. First- and second-level curricula of study, allowing first-level degree program students to further specialize in their second level.

First-level degree	Curriculum	Major(s)	GC topics (#)
Computer science and electronic engineering	Informatics	Fundamentals of computer science in an interdisciplinary way (programming, databases, operating systems, algorithms, graphical interfaces, applications for mobile devices, Internet and Web) and of electronics (devices, circuits, sensors, electronic measurements, electromagnetic propagation), highlighting the synergy with the discipline of automation, robotics and telecommunications.	#6 #9 #11 #12 #13
	Electronic		
Mechanical Engineering	Mechanics	Fundamentals in plan, design and manage complex and/or innovative systems, processes and services from a functional, constructive and energetic point of view, with the choice of materials and related processes	#1 #2 #3 #4 #5 #7 #14
	Business & Management	Management of industrial processes, arrangement and management of the machines in a plant for an optimal utilization, business economics	
Industrial engineering		Fundamentals of disciplines in the ambit of energy, mechanics, materials and electrical engineering to solve complex problems of industrial engineering by applying updated methods, techniques and tools	#1 #2 #3 #4 #5 #14

Second-level Degree	Curriculum	Major(s)	GC topics (#)
Computer engineering	Data Science	software engineering, computer security,	#9 #12

and robotics	Robotics	distributed programming and computational complexity. <u>Data Science</u>: analysis and management of Big Data, visual analytics, business analytics <u>Robotics</u>: computer vision, intelligent mobile robotics, cloud robotics Applications: industrial and for civil sectors, service contexts	#11 #13
Electronic engineering for the internet-of-things	Electronics for Aerospace	electronic infrastructures and technologies for the treatment, transmission and use of signals generated by a multiplicity of devices, distributed over short and large distances.	#6 #12
	Electronics for IoT	Design and production of electronic components and equipment suitable for small scales (low consumption and contexts with high environmental compatibility) and large scales (e.g. use of low-orbit satellite or aerial-scale communication segments, also based on microwave devices).	
Industrial Engineering	Industrial Engineering	Production technologies, production systems and logistics systems; introduction and managing of technological innovation in industrial and service companies; analysis and optimization of combustion processes through fluid dynamic finite element analysis	#14
	Circular design	Re-use of polymeric, construction and steel materials; industrial design aimed at reintroducing the final product into the production process.	#3 #4 #10
Mechanical Engineering	Energy	Sustainable energy systems, thermofluid dynamics, fluid dynamics in machines and energy systems, renewable energy sources, mechatronics of energy systems	#1 #2 #3 #4 #5
	Machines design	Bioengineering, advanced mechanics, engineering design science, industrial production, sensors and instrumentation for thermal and mechanical measurements….	#7 #14
Protection and safety of the territory and of the built environment	Built environment	Industrial facilities and electrical systems management in emergencies; Energy systems and environmental assessment; Telecommunications networks for emergency management; Disaster risk management and law of civil protection; Emergency measures for human health; Seismology and geotechnical earthquake	# 10, #14

		engineering; Measurement and surveying; Seismic vulnerability; Diagnosis and retrofitting; Geotechnical engineering for the preservation of historic sites	
	Territory	Industrial facilities and electrical systems management in emergencies; Energy systems and environmental assessment; Telecommunications networks for emergency management; Disaster risk management and law of civil protection; Emergency measures for human health; Seismology and geotechnical earthquake engineering; Temporary building structures in emergency; Hydraulic risk; Seismic risk of structures; Hydrogeological risk; Geospatial monitoring and GIS	# 10, #14

The NAE GCSP has mapped how the UN Sustainable Development Goals overlap with the NAE Grand Challenges and their themes. Students involved in the NAE GCSP who wish to advance the UN Sustainable Development Goals must work on technical elements, noting achieving these goals requires engineering, innovation, and policy. UN Sustainable Development Goal #17 is Partnerships for the goals, which fits well with the NAE GCSP. The UN Sustainable Development Goals and themes, denoted in(), are given below:

1.   No poverty (theme, security)

2.   Zero hunger (theme, security)

3.   Good health and well-being (theme, health)

4.   Quality education (theme, joy of living)

5.   Gender equality (theme, joy of living)

6.   Clean water and sanitation (theme, sustainability)

7.   Affordable and clean energy (theme, sustainability)

8.   Decent work and economic growth (theme, joy of living)

9.   Industry, innovation and infrastructure (theme, security)

10.   Reduced inequality (theme, joy of living)

11.   Sustainable cities and communities (theme, sustainability)

12.   Responsible consumption and production (theme, sustainability)

13.   Climate action (theme, security)

14.	Life below water (theme, sustainability)

15.	Life on land (theme, sustainability)

16.	Peace and justice strong institutions (theme, security)

17.	Partnerships to achieve the goal (with the NAE GCSP)

2. Steering Committee

An initial NAE GCSP Steering Committee (SC) will be formed to support the implementation and roll-out of the Program. It will be composed of:

1) GCSP Director, appointed by the Dean of the Department of Engineering;

2) President of the Degree programs Council in Industrial Engineering;

3) President of the Degree programs Council in Information Engineering;

4) President of the Degree programs Council in Mechanical Engineering;

5) Coordinator of the master's degree programs "Protection and safety of the territory and of the built environment".

The Steering Committee could be extended to professionals, in the maximum number of four at the discretion of the Steering Committee itself. Professionals can be engaged in works related to the NAE Grand Challenges, from sectors such as manufacturing, engineering, construction, health care, education and research, agriculture and industry, working with public, private, governmental or non-governmental organizations.

The GCSP SC will be responsible for ongoing operation and assessment of the program including recruiting, processing applications, monitoring and assessing of the program. Also student progress and reviewing of students applications are provided by the GCSP SC thanks to a straight interface with scholars' mentors.

The GCSP Director is responsible for leading the program and chairing the steering committee. The GCSP Director will be responsible for communicating with the scholars' mentors. The Director is also responsible for compiling the names and accomplishments of students who receive Grand Challenge Scholar designation upon graduation and reporting this information to the national Steering Committee.

The GCSP Director is responsible for overall administration, operation, assessment, and reporting. Operational duties will include program logistics, scholar selection and monitoring progress of scholars. Assessment duties include assessment of attainment of learning outcomes for the program.

3. Recruiting

Our plan for recruiting NAE GCSP students is based on a goal of reaching a graduation rate of approximately 8 scholars per year by 2024. In the steady-state we anticipate between 8 to 10 participating students spread over the 2nd through 5th years.

The recruitment process consists of marketing to students, soliciting applications, and providing feedback when needed to strengthen applications. The recruitment will explicitly state our goal to have a diverse set of GCSP students, emphasizing that diversity of backgrounds and perspectives brings better engineering collaboration and design.

A great attention will be paid in presenting the GCSP initiative at the events organized by Department of Engineering in the frameworks of the University guidance policy.

GCSP webpages, hosted by the Department of Engineering, will be established with program

requirements, the GCSP application form (see the Appendix: Application Form), model plans of study and contact information for the GCSP Director.

4. Application and selection

Any student of Perugia Department of Engineering in good standing can apply for admission to the program. We expect to admit globally up to 8 - 10 students each year among students in the first and second level degree programs. The application process requires students to submit a statement of purpose, identify the Grand Challenge they will pursue, and identify a plan of study showing how they will complete the five competencies of the program.

Applications will be accepted on a rolling basis and reviewed once each semester for admission. Deadlines and announcements will be established to facilitate student's academic planning schedule. Students may apply at any time during their academic career, showing a viable plan of study to guarantee a minimum participation time in the program.

Application review and selection criteria will include: 1) A coherent plan of study that supports the student's Grand Challenge theme; 2) A plan that addresses all required GCSP framework components; 3) Feasibility that the plan will be completed successfully; 3) Enough participation time in the program according to the approached issue among the NAE Grand Challenges and the features of the proposed plan; 4) The student's motivation as evidenced by their essay. The selection process will strive for an academically strong and diverse cohort of students. The application for our NAE GCSP is attached at the end of this document.

5. Faculty mentors

Department of Engineering has in place a program to recruit, educate, and assign faculty mentors for thesis research, and the majority of Department of Engineering at University of Perugia are focused on projects directly or indirectly related to the Grand Challenges and Sustainable Development Goals, according to our vision as detailed in Section 1.a.

Department of Engineering will be invited to mentor the GCSP students in writing up their findings from the 4 nontechnical competencies. The GCSP Committee will instruct Department of Engineering mentors how to supervise GCSP students to achieve the 4 non-technical competencies, which involves: 1) identifying and discussing with students the connections between their technical research and the GCSP nontechnical competencies that make the difference between researching and actually solving a Grand Challenge; 2) working with students to plan out how they will satisfy their non-technical competencies; and 3) directing students to the GCSP Director for more detailed guidance on how to achieve their non-technical competencies. The GCSP Committee will hold annual department meeting to recruit and educate the Department of Engineering how to complete this mentoring of the GCSP students. The department mentors commit to reviewing and editing the GCSP student deliverables for each of the competencies, each as a section in their thesis. The review will use a rubric to assess whether the written chapter meets the performance criteria required for the competency, and to determine whether there is thematic continuity between the five competencies. If a GCSP student does not have a faculty mentor able to provide the mentoring of the four non-research competencies, the GCSP Committee will provide that mentoring.

6. Funding support

The Program will have no obligated costs. The GCSP Director is selected by Department of Engineering of University of Perugia without any payment, as the overall GCSP Steering Committee that will volunteer their time. Also the Department of Engineering mentors will voluntarily mentor students in thesis research, and the training of the department will occur within the existing budgeted time for adapting best practices. Travel and research project materials will be paid for using the existing budget lines and rules at Department of

Engineering and University of Perugia. Students will provide for any cost incurring in optional activities related to the Grand Challenge Scholar Program (e.g. travel expenses, abroad internships except for the ones within the framework agreements of University of Perugia as detailed below). The Department of Engineering of Perugia University is not requested to fund any of the activities, materials, advisories or services related to the GCSP.

To enrich the NAE GCSP with new recruitment, training, and outreach experiences, the GCSP Director will seek external donors, philanthropic organizations, and awarded financing from International institution supporting these activities.

Inter-institutional and framework agreements already stipulated by University of Perugia could constitute a funding option for abroad internships of students within the GCSP. Specifically the University of Perugia has currently 361 inter-institutional agreements with eligible HEIs covering all Erasmus/LLP Program area, beyond that 170 framework agreements with EU (France, Greece, Germany, Spain, Switzerland) and non-EU countries (Albania, Argentina, Australia, Belarus, Bosnia, Brazil, Canada, China, Colombia, Croatia, Cuba, Ecuador, Hong Kong, India, Indonesia, Iran, Israel, Japan, Kazakhstan, Kosovo, Lebanon, Malaysia, Mexico, Morocco, Mozambique, Palestine, Paraguay, Peru, Russia, Serbia, Singapore, South Africa, South Korea, Taiwan, Turkey, Uruguay, USA, Vatican City, Vietnam). Within these agreement funds are allocated for students abroad internships by EU or Italian Ministry of Education, University and Research and by University of Perugia itself according to the specific agreement.

7. Five GCSP competencies

The Department of Engineering of University of Perugia will create a GCSP experience that is broad, deep and coherent. To obtain breadth, each student will engage in each of the 5 competencies, with the talent competency at a high level of depth, the other non-technical competencies at medium levels of depth. The talent competency in research and creativity will most likely be integrated into the student's thesis, and will define the Grand Challenge focus of their research or creative project. To obtain connectivity between competencies, the student will select a Grand Challenge, and then use that as the focus of talent competency and the focus of the four remaining non-technical competencies. The students can initially work on the talent or the non-technical competencies, and do not need to start with the more technical research or creativity effort.

A unique aspect of the GCSP is the GC Scholar in Residence program. This will bring to GCSP didactic proposal, once each semester one to four days meetings, with voluntary individuals who possess significant experience related to a Grand Challenge (GC). These will be researchers, engineers, entrepreneurs, and leaders from business, government, non-governmental organizations (NGOs), or others working in a GC area. Visitors will meet with students in small groups, panel sessions, and one-on-one sessions, to address: 1) Current research and challenges in addressing one or more GC problems; 2) Challenges in working at the boundary of engineering and non-engineering disciplines, for example, business or entrepreneurial challenges in bringing solutions to market; 3) Global dimensions, in practice, of the Grand Challenges; 4) Other relevant topics such as professional ethics, unintended consequences, responsible conduct or other topics in the visitor's area of expertise, and advice and counseling to students on their GC projects and career plans.

As a part of the GCSP proposal, within the Degree course in Mechanical Engineering, the laboratory course of 64 hours (8 credits) "Grand Challenges in Energy and Sustainability Laboratory" will be scheduled.

a. Talent competency:

Goal: Mentored research/creative experience on a Grand Challenge-like topic.

Activity: Students will complete research as part of their degree requirement, under the

supervision of their major professor, on a Grand Challenge-like topic listed in section 1.c above. The research will be part of a thesis, semester project, summer experience or internship.

Deliverable: A research report should be submitted as a DOCX or equivalent file, named GCSPTalent-YYYYMMDD-student last name, where YYYYMMDD and student last name are the date and student specific information.

Performance criteria: The report should be at least 4000 words, not including a cover page, references, figures and tables, or appendices. The report should have the equivalent of: 1) introduction and motivation to the Grand Challenge-like topic; 2) project or research objectives and questions; 3) review of prior research on topic; 4) methodology; 5) results; 6) discussion of how the findings addressed the Grand Challenge-like topic; and 7) conclusion. The quality of the work will be judged by its grammar, organization, appropriateness, accuracy, thoroughness and documentation; moreover it should be of sufficient quality to satisfy the thesis requirement.

b. Multidisciplinary competency:

Goal: Understanding multidisciplinarity of engineering system solutions developed through engagement.

Activity: Students will investigate how a solution to their Grand Challenge-like topic involves other physical science and social science disciplines through engagement in at least one of the following approved experiences at University of Perugia or other Universities joining the GCSP: course; internship; research experience; workshop; or series of lectures by experts in a topic providing a broad set of ideas beyond their primary disciplinary training suggested by the committee. The student will supplement this experience with: 1) a literature review to document the contributions of other disciplines to the topic; and 2) reflection on how multiple disciplines can coordinate their contributions to advance a solution. Databases that might be used for the literature review include Scopus and Web of Science, as well as Engineering Village (engineering), ERIC (education), GeoRef (geosciences), Agricola (agriculture), Econlit (economics), NEXIS (law), PAIS International (public policy), PsycINFO (psychology), PubMed (medicine).

Deliverable: A multidisciplinarity report should be submitted as a DOCX or equivalent file, named GCSP-Multidisciplinarity-YYYYMMDD-student last name, where YYYYMMDD and student last name are the date and student specific information.

Performance criteria: The report should be of at least 1500 words, not including a cover page, references, figures and tables, or appendices. The report should have the equivalent of: 1) a section identifying how different non-engineering disciplines are approaching solutions to the Grand Challenge-like topic, and 2) a section proposing how the engineering research could coordinate with these other disciplines to achieve a more effective team approach to solving the grand challenge-like topic. The quality of the work will be judged by its grammar, organization, appropriateness, accuracy, thoroughness, and documentation.

c. Viable Business/Entrepreneurship competency:

Goal: Understanding, preferably developed through experience, of the necessity of a viable business model for solution implementation.

Activity: Students will prepare a business plan to conduct research and development or disseminate a solution for the Grand Challenge-like topic. They could learn to prepare the business plan through a university course in business (economics and business organization or industrial plants, etc.) or equivalent experience such as Startup Weekend or entrepreneurship club.

Deliverable: A business plan report should be submitted as a DOCX or equivalent file, named GCSP-Business-YYYYMMDD-student last name, where YYYYMMDD and student last name

are the date and student specific information.

Performance criteria: The report should be of at least 2000 words, not including a cover page, references, figures and tables, or appendices. The report should have the equivalent of: 1) a section establishing a compelling set of products or services relevant to Grand Challenge-like topic; 2) a section explaining the business; 3) a section with a market analysis; 4) a section with a strategy for implementation; 5) a section on the management team organization; and 6) a section on the financial plan and projections. The quality of the work will be judged by its grammar, organization, appropriateness, accuracy, thoroughness, and documentation.

d. Multicultural competency:

Goal: Understanding of cultures, preferably through a multicultural experience, to ensure cultural acceptance of proposed solutions.

Activity: Students will complete a multicultural experience through engagement in at least one of the following approved global, international, or multi-cultural experiences related to their Grand Challenge-like topic: service project, course, internship or research at University of Perugia or other Universities joining the GCSP. Students may participate in a field study experience also through a specific abroad internship or an equivalent experience. Students will use the approved experience to get a knowledge base for effective citizenship in a diverse multicultural society, which will support students to recognize new technological perspectives customized over different cultural frameworks.

Deliverable: A multicultural report should be submitted as a DOCX or equivalent file, named GCSP-Multicultural-YYYYMMDD-student last name, where YYYYMMDD and student last name are the date and student specific information.

Performance criteria: The report should be of at least 1500 words, not including a cover page, references, figures and tables, or appendices. The report should have the equivalent of: 1) a section identifying different cultural perspectives relevant to the Grand Challenge-like topic; 2) a section comparing and contrasting the cultures in how they relate to the Grand Challenge-like topic. The quality of the work will be judged by its grammar, organization, appropriateness, accuracy, thoroughness, and documentation.

e. Social Consciousness competency:

Goal: Understanding that solutions should serve primarily people and society, reflecting social consciousness.

Activity: Students will complete a social consciousness experience through engagement in at least one of the following approved experiences related to their Grand Challenges-like topic: service-learning course; research experience with community focus; internship or volunteer experience with a service organization (governmental, non-governmental, or equivalent). Students will use this experience to perform a preliminary societal readiness assessment in reference to the cultures in how they relate to their Grand Challenge-like topic. The assessment will involve the identification of stakeholders and their crucial areas of conflicts and synergies that might hinder the deployment of the new technology answering the Grand Challenge-like topic. This in order to assess the degree of overall acceptability. Conducting a stakeholder analysis will allow to take into account for their interests, attitudes and perspectives toward the new technology, in order to appraise the degree of acceptability and formulate strategies in a short-mid-term outlook for local communities from different points of view.

Deliverable: A social consciousness report should be submitted as a DOCX or equivalent file, named GCSP-Social-YYYYMMDD-student last name, where YYYYMMDD and student last name are the date and student specific information.

Performance criteria: The report should be of at least 1500 words, not including a cover

page, references, figures and tables, or appendices. The report should have the equivalent of: 1) a characterization of the human or social implications of the problem or solution related to the Grand Challenge-like topic; 2) a reflection of how that characterization may be absent or present in the engineering approach taken to addressing the Grand Challenge-like topic; 3) a section identifying barriers and opportunities to achieving cultural acceptance to proposed solutions of the Grand Challenge-like topic. The quality of the work will be judged by its grammar, organization, appropriateness, accuracy, thoroughness, and documentation.

8. Mentorship, support, tracking, and assessment

a. Mentorship

The Grand Challenge Peer Mentor program will pair experienced GCSP students with new students seeking peer-to-peer informal mentoring. Mentors will have participated in the program for at least two previous semesters, and have been invited to be a mentor by the GCSP Director based on their strong, mature, responsible characteristics suitable for mentoring new students. Mentees will participate in the program for at least two semesters. The goal of the mentor program is to (1) act as a source of networking and support to new GCSP students and (2) provide feedback to the GCSP Director to help identify problems or roadblocks early. The GCSP Director will meet with the mentors once per semester to help prepare them for their role and to solicit feedback to help identify potential problems in the program and improve the program. Peer Mentors may also assist with several of the intramural networking initiatives (such as social media presence).

b. Support and tracking

Department of Engineering will support and track students through a required Grand Challenge Experience course (i.e. one to four days meetings scheduled once each semester), which is a zero credit-hour course each semester within the GC Scholar in Residence program as detailed in section 7. It required of all GC scholars as long as they are enrolled in the program. The course assures that all GC students meet particular GCSP requirements, such as submission of progress reports, submission of reflections and participation in the peer mentor program. Progress reports and reflections are used for monitoring and assessment of individual student's progress, encouraging thematic connectivity across the students' experiences in the program and for collecting data to assess the program as a whole.

GC students enroll in the course continuously (fall and spring semesters) and must maintain a passing grade assigned by their supervisors to remain in the program. The passing grade could be assigned on the basis of completion of the non-course requirements that include: 1) Participation in the Grand Challenge Scholar in Residence Program through attendance at presentations, seminars and other events; 2) Attend required presentations such as capstone or research presentations; 3) Each semester submit a progress report, updated GCS plan of study, and reflection to the GCSP Steering Committee. Progress reports will include any changes to the plan of study which must be approved by the GCSP Steering Committee. Reflections will address how completed experiences connect with the scholar's grand challenge theme.

The GCSP Steering Committee will use student's progress reports and reflections to monitor progress toward completion of plans of study, identify possible areas where intervention is needed, and to assess overall effectiveness of the program.

Students will not receive scholarships. Students have the option to use on-campus honors programs or involvement in clubs and other organizations program to complete all or components of their five competencies.

c. Assessment

Assessment of the student work toward completion of the NAE GCSP will be judged relative

to the goal, activity and performance criteria listed for each of the five competencies. The assessment will occur during the Grand Challenge Experience course (see section 8.b) or at the completion of their degree program.

9. Recognition

The GCSP Director will compile the names and accomplishments of students who receive Grand Challenges Scholar designation upon graduation and convey this information to the national Steering Committee. University of Perugia will acknowledge GCSP graduates with a formal certificate, and will announce the student achievement during graduation ceremonies.

4.

Appendix Application Form

Name:

Major(s):

Intended year of graduation:

Part I - Proposed Plan of Study: Specify how you plan to fulfill each of the following requirements.

Grand Challenge Problem:

Research/Creative Talent:

Multidisciplinarity:

Viable Business:

Multicultural:

Social Consciousness:

Connectivity: Continuous enrollment in Grand Challenge Scholar Experience:

Participation in Grand Challenge Scholar in Residence events and peer mentor program

Part II - Explain in one to two pages (a) what you hope to accomplish through participation in the Grand Challenge Scholars Program and (b) how your plan of study relates to your specific Grand Challenge-like topic and will fulfill the performance criteria.