

Universidade Federal de Minas Gerais - UFMG
School of Engineering

National Academy of Engineering Grand Challenge Scholars Program

Proposal

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School of Engineering, Federal University of Minas Gerais NAE Grand Challenges Scholars Program

Vision

The School of Engineering of the Federal University of Minas Gerais (EEUFMG) is nearly a century old, with a vast history of impressive achievements, all accomplished under the slogan *Scientia et Labor* (Knowledge and Work). Its building complex, located on the Belo Horizonte Pampulha campus, has an area of approximately 65,000 m². EEUFMG is recognized both nationally and internationally for its competence and capacity in teaching, scientific and technological research and extension programs (<https://www.eng.ufmg.br/portal/>).

EEUFMG's academic community currently consists of 308 highly qualified faculty members, 150 specialized staff members, and 8000 students (undergraduate, graduate, specialization, and extension). The school's administrative structure is comprised of a general board and 13 departments. The academic structure consists of 11 undergraduate boards (11 different Engineering modalities: Aerospace, Chemical, Civil, Control and Automation, Electrical, Environmental, Mechanical, Metallurgical and Materials, Mining, Production, and Systems), 10 *Stricto Sensu* Graduate Program Boards, 11 *Latu Sensu* Graduate Courses, and an Intensive Industrial Labor Preparation Course (CIPMOI).

All departments of EEUFMG are equipped with modern teaching and research laboratories, encompassing 98 areas of research, supported by the most prominent national and international funding agencies. To date, EEUFMG has 242 registered patents and a respectable publication rate in periodicals and conference papers, having reached 782 publications in 2018. In addition, EEUFMG is consistently developing and implementing key extension projects (more than 300 to date) and is committed to the generation of knowledge, the technological development of the country, as well as participatory and socially responsible action towards society.

The core aim and constant challenge of EEUFMG is to educate engineers so as to provide them with highly technical and creative skills, following the basic precepts of social and environmental responsibility and the critical spirit of their own achievements. EEUFMG seeks to offer society, especially the state of Minas Gerais, the best and most modern academic standards and to contribute decisively to the scientific, technological, economic, and social development of Brazil.

The Grand Challenges for the UFMG School of Engineering GCSP

The grand challenges for EEUFMG GCSP were chosen by understanding the priority demands for our city, our state, and our country, as well as the competencies conferred upon EEUFMG, especially as regards the capability of contributing to these specific projects. All of them can be classified as belonging to one or more of the NAE Grand Challenges for Engineering: Sustainability (A), Health (B), Security (C) and Joy of Living (D), as indicated in the list below. The social insertion of projects is deemed to be essential, since these projects must represent a permanent exercise of the application of engineering knowledge and skills aimed at improving people's living conditions, especially those whose fundamental needs have not yet been met. The EEUFMG GCSP challenges include:

- I. Recover and improve urban infrastructure–(A), (C), (D)
- II. Provide access to water, respecting its various uses, and treat wastewater–(A), (B)
- III. Develop clean and safe energy solutions–(A), (C), (D)
- IV. Develop sustainable mindsets and solutions–(A), (B), (C), (D)
- V. Develop resources for advanced personalized learning–(D)

UFMG and the School of Engineering's Academic Programs and Resources aligned with the development of GCSP competencies

EEUFMG is creating a GCSP, since the institution is concerned about educating even better engineers, who are technically prepared, able to think differently, and capable of transforming an idea into a viable solution, as well as engineers committed to human beings and to the development of solutions to tackle society's primary demands and challenges in order to shape a better world for all.

A successful GCSP would help EEUFMG build new approaches and methodology for the engineering courses, with a view of integration, focused on developing solutions to problems that are of concern worldwide. This department creates an opportunity to cooperate, as well as to develop multicultural and multidisciplinary competence, social competence, and commitment. EEUFMG is currently being fine-tuned to meet the new national guidelines for engineering courses in Brazil, published on January 2019. We believe that the GCSP experience will represent a pilot program focused on transforming the methodology, the mindset, and the education and technological tools used in all of the 11 UFMG engineering courses.

EEUFMG, along with UFMG, offers many institutional academic opportunities to undergraduate and graduate students alike, aimed at providing a broad diversity of academic education.

GCSP at EEUFMG intends to build a formative pathway from this existing framework to smoothly connect scholars with available resources, and to build their GCSP curriculum within their undergraduate curricula, seeking to meet the five core principles of critical competencies, as outlined by the National Academy of Engineering (NAE): Research, Interdisciplinary Curriculum, Entrepreneurship, Global Dimension, and Service Learning.

In addition, EEUFMG's flexible curriculum structure defined for UFMG undergraduate courses has already established that the course curriculum should offer students the possibility of attending a Complementary Training Coursework-CTC. The CTC should cover themes related to the undergraduate course, but in a topic that represents a frontier of knowledge uncovered by the original curriculum, as shown in Figure 1. This flexible structure will allow us to implement the multidisciplinary GCSP curriculum within EEUFMG, as required by the program. With eleven engineering degrees, it is feasible to provide many course options, including some from other academic units. In addition to the coursework, some new academic activities have been proposed to meet the GCSP objectives. Students selected to participate in the program will be instructed by their mentors to submit their specific GCSP Complementary Training plan to their course board for approval. This GCSP Complementary Training will allow students to develop the training skills demanded by the program in an applicable manner, preferably in partnership with a company or community, with the focus on the Grand Challenges Engineering Program.

Other important resources include EEUFMG's normative definitions, which establish a minimum workload of complementary academic activities to be performed by students in each course. These stipulations intend to value such activities as participation in research initiation / research and development, extension initiation, teaching development, participation in social projects, participation in junior companies, participation in competitions, among others, to be integrated within the student's curriculum. This last resource allows for the improvement of skills development, such as research talent, viable entrepreneurship, and social awareness, in addition to multidisciplinary competence, which is also commonly required in many of these activities. These resources allow us to define how to implement the GCSP curriculum at EEUFMG.

Programs managed by the Office of International Affairs – DRI

The Office of International Affairs of the Federal University of Minas Gerais (UFMG) presents itself as an instance to articulate international academic and scientific relations, seeking to attract, implement, and monitor projects and inter-university agreements. Its mission is to position UFMG in the international arena, in order to strengthen the university's interaction with institutions abroad, ensuring the cosmopolitanism of academic activities. Within a specific space to handle and mediate UFMG relationships with other universities abroad, the International Relations Department (DRI) has added strategic efforts aimed at inducing

internationalization, in an attempt to create programs and projects that facilitate international cooperation within UFMG's various segments.

Currently, the DRI manages agreements with numerous universities from different countries and each year welcomes hundreds of students and a wide range of foreign university missions, among other activities. UFMG, through the DRI, integrates an important consortium of academic and scientific cooperation with countries in Asia, Africa, Latin America, North America, Australia, and Europe, seeking to develop mutual cooperation in the areas of new technology, teaching, research, and extension.

Undergraduate and graduate students have the opportunity to participate in any of these international programs or missions by participating in the selection process for a specific opportunity.

The EEUFMG's GCSP will guide students participating in the program to prepare for an international experience in any of these DRI programs, even if only for a short period of time, and will seek to broaden DRI's opportunities, tailored to their skills and competencies, seeking cooperation with partner companies, as required by the GCSP multicultural competency. The program is already working to establish other partnerships, such as with Engineers Without Borders (EWB), which already counts on a portfolio of international projects for social demands, experience, and a structure that enables students to participate in them, whether live or via video conferencing. All internationalization experience is valid for working with the competencies within a global dimension.

Scientific Initiation Program - SIP

PRPq - Dean of Research manages the UFMG SIP Programs, such as the PBIC (Scientific Initiation Grant Program), with grants from funding agencies, and the Voluntary Scientific Initiation Program (SIP). Talent and intelligence do not choose social class, which implies in the importance of having SI scholarships so that all potential students can live this experience. This initiative will develop talent and other competencies, depending on the project.

Junior Enterprises

This initiative, already consolidated in EEUFMG, and much appreciated by students of all Engineering areas, provides an excellent opportunity for training aimed at the third competence: entrepreneurship. Clearly, the GCSP curriculum should provide other academic activities within this subject, but this is a very organized student initiative that provides a holistic experience, from corporate policy and business model definitions to the ability to innovate at low cost in both the developed solutions and the management of their projects with appropriate methods.

Competitions

Competitions are also much appreciated and sought after by students who can take part in them, as they represent major engineering and innovation management and development challenges. Several school teams have many times received awards in some of these competitions, such as Baja SAE and Formula SAE. These competitions are fully geared towards the GCSP competencies: multidisciplinary and talent. The new solidary competition, focused on the challenge of solving the problems of communities, also contributes to the Social Consciousness competency.

Student Council

The Student Council officially represents the student body at the Administrative Boards of the Course, the Departments, and EEUFMG. However, the Student Council must also promote integration among the students of the course itself and create links between them and EEUFMG. Participation in this council intends to develop representation skills, legal skills, respect and tolerance for differences, as well as the perception of various points of view, all of which can contribute to the GCSP Social Consciousness competency.

Engineering in Solidarity

Engineering in Solidarity is a non-profit association made up of EEUFMG students, whose main objective is to promote social movements and projects in order to humanize EEUFMG and positively impact society through actions that mobilize the academic community. This association is fully focused on the formation of the Social Consciousness competency, a GCSP Social Consciousness competency.

CIPIMOI

CIPIMOI is a professional qualification program established in 1957 by EEUFMG. Its main objective is to educate people to work in the area of Civil Construction (Master of Works, CAD Designer), Welding Technology, and Low Voltage Electricity (Low Voltage Building Installer Electrician). This program, in which students participate as course instructors, contributes to the training of the GCSP Social Consciousness competency – as well as develops talent for the engineering teaching function.

Our students enjoy participating in all of these activities, which give them opportunities to develop many abilities and competencies in engineering to solve challenging problems by developing solutions and abilities in both project management and teamwork. Students will be attracted to GCSP because this program amplifies these opportunities and offers a multidisciplinary curriculum and a systematic approach to prepare them to address the Grand Challenges for Engineering, all the while supporting them with mentoring and resources. Building a partnership with Engineers Without Borders (EWB) will further support our program with more opportunities in projects to develop solutions for poor communities throughout Brazil.

GCSP curriculum

The GCSP at EEUFMG intends to build a formative pathway from this existing framework to smoothly connect scholars with available resources and to build their GCSP curriculum within their undergraduate curricula, seeking to meet the top five core principles of critical competencies, as outlined by the NAE:

1. **Talent Competency** (mentored Research/Creative experience on GCSP topic)
2. **Multidisciplinary competency** (understanding multidisciplinary of engineering systems solutions - Curriculum)
3. **Viable Business/ Entrepreneurship competency** (understanding of viable business model for solution implementation).
4. **Multicultural competency** (planetary mindset/consideration of cultural issues to ensure acceptance of proposed engineering solutions)
5. **Social Consciousness competency** (understanding that Engineering should serve people and society).

In addition, as mentioned earlier, EEUFMG's flexible curriculum structure defined for UFMG undergraduate courses has already established that course curricula should offer students the possibility to pursue a Complementary Training coursework in an area related to some specific frontier of knowledge, a portion of which allows for the student's own freedom of choice. Complementary training must be taken outside his major, with subjects from other engineering degrees. This feature will allow us to implement the multidisciplinary GCSP curriculum within EEUFMG, as required by the program, given that, with eleven engineering degrees, it is feasible to provide many course options, including some courses from other academic units. Some new academic activities have been proposed to meet the GCSP objectives. Students selected to participate in the program will be instructed by their mentors to submit their specific GCSP Complementary Training plan (which corresponds to the GCSP curriculum, in accordance to the NAE Grand challenge chosen) to their course board for approval, as broad approval for student participation is already under discussion with the Board of Undergraduate Course Coordinators. This Complementary Training will allow students to study subjects that converge with their research and development project, preferably in partnership with a company or community, developing the training skills demanded by the program in an applicable manner, all the while maintaining the focus on the Grand Challenges of the engineering program.

A general structure of the eleven engineering degrees at UFMG School of Engineering may be seen at Figure 1. The Complementary Training Coursework is shown as a possibility to the student roadmap on the course.

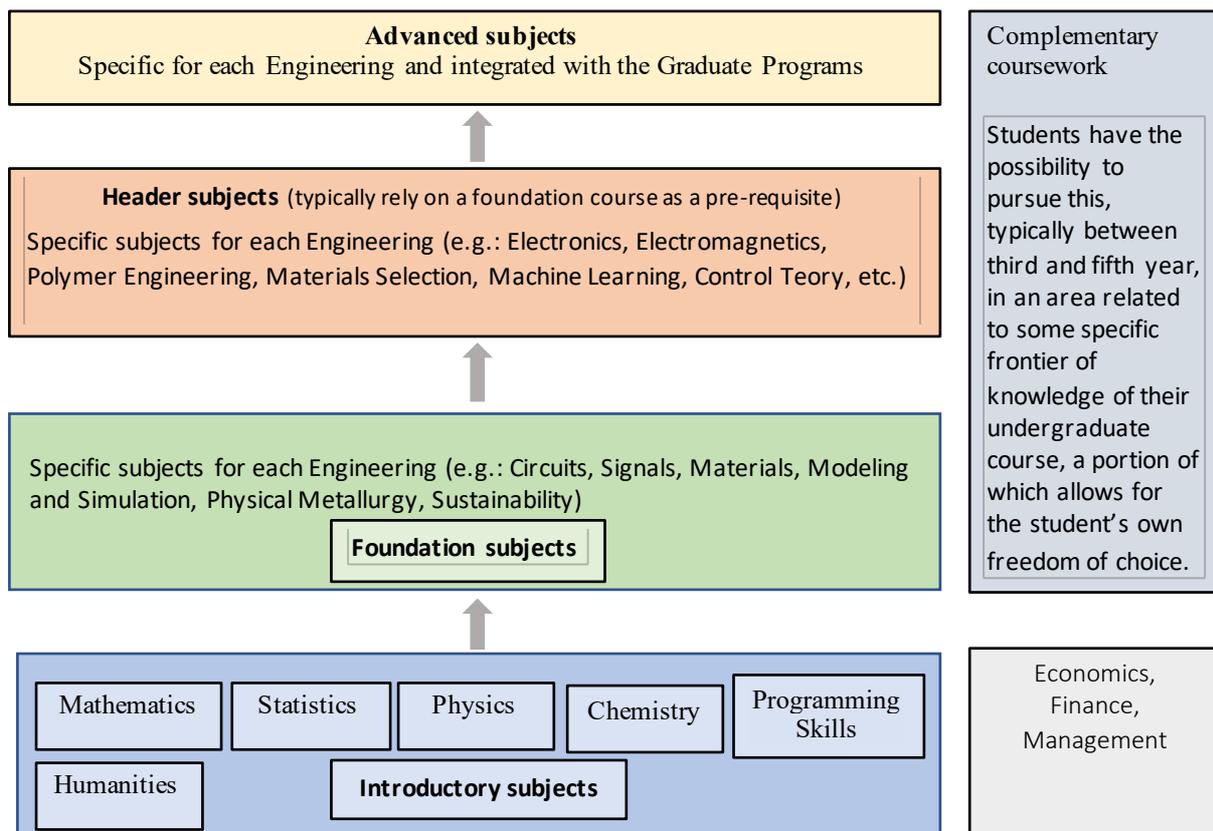


Figure 1: General structure of Engineering Degrees at UFMG Scholl of Engineering

Other important resources include EEUFMG's normative definitions, which establish a minimum workload of complementary academic activities to be performed by students in each course. These stipulations intend to value such activities as participation in initiation to research / research and development, extension initiation, teaching development, participation in social projects, participation in junior companies, competitions, among others, to be integrated within the student's curriculum. This last resource allows for the improvement of skills development, such as research talent, viable entrepreneurship, and social awareness, and multidisciplinary competence is also commonly required in many of these activities. These resources allow us to define how to implement the GCSP curriculum at EEUFMG.

Constraints and Obstacles to GCSP at EEUFMG

Perhaps the greatest difficulty will be to encourage students' willingness to cooperate in multidisciplinary projects, where openness to different points of view, different methodological approaches, as well as different tools and technologies is required. However, it will be an excellent opportunity for us to move forward in such an important aspect towards the full exercise of Engineering.

In addition, we will need to seek partnerships that make financial resources available for part of the program activities, as grants through funding agencies at this time in Brazil is quite limited.

GCSP Steering Committee

Program oversight will be carried out by a steering committee made up of teachers from various (all) departments and led by a director of the steering committee of the EEUFMG GCSP, who will report to the Dean of EEUFMG. This committee will consist of the Assistant Dean of EEUFMG; the director of the program; representatives from the four mentor group areas, which also bring together interested teachers from all of the Engineering courses; and the president of the Board of Undergraduate Engineering Courses.

This committee is expected to streamline the multidisciplinary nature of the GCSP by enabling the steering committee to dynamically lead and innovate the program curriculum, keeping it up-to-date and aligned with both NAE recommendations and the profile and structure of EEUFMG. This committee should keep the multidisciplinary curriculum of the program up to date to ensure cohesion and connectivity regarding the grand challenges and competencies to be developed as defined by the NAE. The steering committee will be responsible for receiving the admitted students, guiding them as regards the curriculum and skills, and helping them find a mentor and theme for their research project, which should be aligned with the grand challenges defined above.

It will also be a responsibility of this committee to develop a Program Reference Guide for mentors and advisors, defining roles and guidelines that ensure affinity with the program's objectives.

The evaluation and reports produced by the mentors for each scholar will be compiled by the director of the steering committee, enabling her/him to produce an overall program report each semester as well as at the end of each year.

In addition, the program director, with the support of the committee, should interact with the UFMG Dean of DRI, seeking concrete alternatives for student participation in international programs, as well as building partnerships with institutions and companies that may be financially beneficial to the initiative.

Selection of Scholars

The selection of scholars for a given academic year will take place once a year, always at the second academic semester of the previous year. The applications will be reviewed by the steering committee, who will make recommendations accordingly. All admitted students will be matched with a faculty mentor, most likely the mentor that worked with the student throughout the application process. The students are eligible to apply from the end of their second-year course, to

start at the GCSP program from their third year on, which means they will have three years to complete their program.

The EEUFMG GCSP will select, initially, 30 students per year, 15 students per semester. This means that 15 students will begin their GCSP program on March and 15 on August. Among these, 12 will be engineering students and up to 3 students from other courses, including Computer Science, Physics, Chemistry, Mathematics, Architecture, Geology, or Geography. If no student applications from these other courses are received, the vacant positions will be allotted to engineering students.

Application and Selection Timeline

The process and the timeline for the selection of scholars are presented in Table 1.

Table 1: Application and Selection Timeline (revised)

Second Academic Semester (August – November)
<ul style="list-style-type: none"> • Steering Committee will work with the Board of Undergraduate Engineering Courses and other pertinent UFMG offices to promote EEUFMG GCSP program applications. • Steering Committee will hold GCSP outreach and enlightenment lectures at EEUFMG. • Contact with companies and State agencies looking for the program’s support.
<ul style="list-style-type: none"> • Online Applications from September, 1st to 30th.
<ul style="list-style-type: none"> • Mentors of GCSP will be available for a period, to support scholar candidates with their proposals.
<ul style="list-style-type: none"> • Application Form <ul style="list-style-type: none"> ○ Student identification and undergraduate course ○ Syllabus for application based on the Grand Challenge chosen by the student, including: <ul style="list-style-type: none"> ▪ Research and/or development of first proposal ▪ Interdisciplinary Curriculum plan ▪ Entrepreneurship activities ▪ Global Dimension activities ▪ Service-Learning activities ○ Paragraph describing the motivations for choosing the grand challenge and the alignment of the proposal presented for the development of the program requirements linked to the chosen challenge. ○ Two GCSP Mentor Appointments ○ Letter from the student undergraduate course board attesting to the fact that the GCSP studies can be included in this student’s curriculum as complementary education.
<ul style="list-style-type: none"> • Selection of scholars completed by October, 31st.
First Academic Period (March – June)
<ul style="list-style-type: none"> • New GCSP scholars begin activities.
<ul style="list-style-type: none"> • New GCSP scholars can revise their proposals until March 31st.

The Five GCSP Curricular Components based on GCSP competencies

Talent Competency (1)

All students selected for the program should participate in an Academic Immersion Activity, related to the Grand Challenge chosen by them. This activity includes visits with immersion for a period of time in a given community, city, company, school, and so forth, where it would be possible to identify a given problem or demand to be solved. Students will be invited to form multidisciplinary groups to take part in that immersion, always being mentored by at least one teacher/mentor of the GCSP Program. The aim is to raise awareness, give them an opportunity to identify a problem, discuss this with the community or group, gain acceptance and confidence of the group to propose specific research or development in an attempt to achieve a positive result for the community, even if only a partial benefit. The research and/or development project that each student will propose should be chosen from this immersion, trying to share the problem and the responsibilities, based on each student's specific competencies, working in collaboration to reach a viable solution.

Multidisciplinary Competency (2)

Suggested subjects are addressed for each Grand Engineering Challenge of this GCSP program, but some others may also be chosen, as suggested by the student mentor, in accordance with each specific project. The steering committee and the mentors will continue discussing this challenge, and updated suggestions will be formulated as the program evolves.

Each student should choose one of the Grand Challenge and **select** subjects from Table 2 (minimum of 180h), in addition to those that are Required (60h), that are inherently multidisciplinary. These subjects may also be used to satisfy the student's specific course degree requirement of a minimum of 240h, in accordance with all normative definitions established by UFMG and within the EEUFMG curriculum structure or the academic unit of the student.

Table 2: Interdisciplinary Curriculum

Basics for all students at the GCSP (minimum of 60h required)	
GCSP Program Introduction (New) (15h) (Required)	Electronics, Metrology and Instrumentation Fundamentals (New) (30h) (Optional)
Sustainability Principles (New)(15h) (Required)	Innovation and Problem Solving (New) (15h) (Required)
EMA083 Mechanical Drawing (60h) (Optional)	Ethics in Engineering (New) (15h) (Required)

Engineering Modeling and Simulation (New) (30h) (Optional)	EPD064 - Technology and Society (60h) (Optional)
General Rural and Urban Internship (60h) (Optional)	Object Oriented Programming Fundamentals (New) (30h) (Optional)
Grand challenge I: Recover and improve urban infrastructure	
ETG011 Transport Systems Analysis	EHR007 Applied Hydrology (60h)
ETG051 Urban and Regional Transportation Planning (60h)	ESA612 Wastewater Treatment (60h)
ETG036 Urban traffic (60h)	ESA009 Environmental control (60h)
ETG037 Public transport (60h)	ESA014 Water Supply Treatment (60h)
EHR018 Water Resources Engineering (45h)	ESA126 Air Pollution Control (60h)
Academic Immersion I* – Cities (60h) (New)	EPD048 Production management topics: Environmental Management (60h)
Grand challenge II: Provide access to water respecting its various uses (and treat wastewater)	
ENG090 Water Reuse (60h)	Aqueous Speciation and Reactions (New). (30h)
EHR007 Applied Hydrology (60h)	EQM056 Industrial Processes I (60h)
ESA014 Water Supply Treatment (60h)	EMN026 - Engineering Geology and Applied Hydrogeology – (60h)
EHR018 Water Resources Engineering (45h)	ESA125 Control of Soil and Groundwater Pollution (60h)
ESA613 Industrial Effluent Treatment (60h)	ESA612 Wastewater Treatment (60h)
Academic Immersion II* - Water (60h) (New)	
Grand challenge III: Develop clean and safe energy solutions	
EEE024 Alternative Energy Fundamentals (60h)	ENG033 Topics in Mechanical Engineering C: Solar Technology- Fundamentals and Applications (60h)
ELE045 Electric Power Generation (60h)	ENU002 Energy Issues (60h)
EHR020 Hydroelectric plants (60h)	ENG091 Environmental Sanitation Product and Energy Recovery (60h)
EEE934 Electric Energy Storage (PPGEE) (60h)	Materials for Energy Generation and Accumulation (30h) (nova)
Academic Immersion III* – Energy (60h) (New)	
Grand challenge IV: Develop sustainable mindset and solutions	

EMT074 Materials science (60 h)	ENG090 Climate Change and Carbon Market (30h)
ENG033 Liquid Biofuels	EMT094 Selection of Materials and Process (New) (30h)
Sustainable Chemical Processes (New) (45h)	Processes Applied to the Treatment of Solid Waste and Aqueous Effluents (for Material Recovery) (30 h)
Recovery of Degraded Areas and Future Uses (New) (30h)	ELT071 Home Automation (30h)
Academic Immersion IV* - Sustainability (60h) (New)	EMN017 Sustainable Utilization of Mineral Resources (60h)
Grand challenge V: Develop resources for advanced personalized learning	
DIP FAE988 Didactics and Teaching: Teaching as Object of Study (60h)	Engineering subject in desired area
DIP FAE956 Educational Technologies (60h)	Engineering subject in desired area
MTE 025 Didactics (60h)	Engineering subject in desired area
Academic Immersion V – Learning (60h) (New)	

***Academic Immersion** comprises a combination of visits or an internship in a company or municipality. During this time, the students and his/their mentor will identify relevant problems or technical issues to be addressed by their GCSP projects.

Viable Business/Entrepreneurship Competency (3)

GCSP scholars should participate in some experiences that help to promote their ability and competence in the process of translating ideas, invention, and innovation into a viable solution.

To understand and apply the understanding of local and global economics in design, each GC scholar must participate **in one** of the entrepreneurship components listed in Table 3.

Table 3: Entrepreneurship Activities

ENG 075 OPEI - Project, Entrepreneurship, and Innovation Workshop
EPD034 Product Development System
EQM049 Process Design
Innovation for Sustainability (New)
EPD901 Innovation Organization
Take part in the administrative board of a Junior Enterprise for a semester
Take part in an (Inter)national competition

Multicultural Competency (4)

To enhance global awareness and multicultural experience, a GC scholar should participate in one of the experiences listed in Table 4.

Table 4: Global Dimension Experiences

Study abroad through an international study program.
Make an Internship abroad with a global focus.
Participate in projects focused on a global program, with some experience with foreign people even if through online meetings. EWB would help with some opportunities for this.
Participate in a vacation course, even if at UFMG, with the participation of foreign students that come to our university.
Participate in a GCSP international event, presenting personal experience in the program.

For the chosen option, the GC scholar should justify how the proposed study program/internship/project/experience will: a) cultivate global awareness, b) foster sensitivity to multiple perspectives, c) improve communication skills in a foreign language, and d) facilitate community development.

Social Consciousness Competency (5)

GC scholars should participate in the **one of the experiences**, listed in Table 5, to promote and deepen their social consciousness and motivation so as to bring their technical expertise to develop solutions that serve to make life better for all people, mainly of those who need it most.

Table 5: Service-Learning Experiences

ENG092/ENG061 Academic Engineering Internship
ENG085 Internship Curriculum Program
Participate in the CIPMOI as an instructor of a course.
Participate in the Solidarity Engineering initiative or in a Solidarity Competition.
Participate in an EWB – Engineer Without Borders project

Assessment, Tracking, and Recognition

Scholars will meet at least twice per term with their Grand Challenge mentor. The mentor will document their progress and achievements through an online version of their GCSP portfolio. A tracking sheet will be available to help the mentors and students. Each scholar will post his/her work for review by his/her faculty mentor, which will be accessible to the steering committee for periodic review, twice a year. In addition, the GCSP steering committee will meet periodically with the

faculty mentors to review the progress and ensure that all scholars continue to meet program requirements.

After each year of the program, the steering committee will organize a poster presentation to showcase students' work, recognizing their contributions to the important issues laid out by these challenges.

Final evaluations of the individual student's program will be conducted by that student's faculty mentor and the steering committee.

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Final evaluations of the individual student's program will be conducted by that student's faculty mentor and the steering committee.

A ceremony will be conducted by the steering committee, the Dean, and the Assistant Dean of the School of Engineering to award the GCSP certificate of participation to students who satisfactorily complete the five curriculum components of the program and to award the best projects.

Appendix I

Faculty Mentor: Roles and Responsibilities

It will be the responsibility of the Steering Committee to develop a Program Reference Guide for mentors and advisors, defining roles and guidelines that ensure affinity with the program objectives. Some of these have already been defined, as described below.

The first group of mentors will be formed by the GCSP organizing committee, who have taken part in all discussions about the present GCSP proposal. Other mentors may be included as needed.

All mentors will take part in a teaching studies group, supported by an education area teacher, to develop mentoring skills for the GCSP proposals. This group will formulate its own methodology and ideas to guide students on how to build the five GCSP competencies.

The mentors should meet with their student group at least once at the beginning of each semester and once at the end of the semester, allowing them to track and document each student's progress. This follow-up should be supported by a standardized semiannual activity report to be developed by each student and by a teacher assessment form for each student, including each student's expectation

and plan for participation in foreign programs, for example. They should also provide support to their students in the annual poster presentation.

Each year, some mentors will be invited by the steering committee to support student candidates during one day of the scholar’s selection process.

Appendix II

Table 6: Summary of the Grand Challenges Scholars Program’s Required Components and Options for completion

Curricular Components	Requirements
Multidisciplinary Curriculum	Each student should select four subjects from Table 2 that are inherently multidisciplinary. These subjects may also be used to satisfy the student’s specific course degree requirement, in accordance with all normative definitions established by UFMG and the EEUFMG curriculum structure, or the academic unit of the student.
Viable Business/ Entrepreneurship	To understand and apply the understanding of local and global economics in design, each GC scholar must participate in two of the entrepreneurship components from Table 3.
Multicultural Dimension	To enhance global awareness and multicultural experience, a GC scholar should participate in one of the experiences listed in Table 4.
Social Consciousness	GC scholars should participate in the one of the experiences listed in Table 5 so as to promote and deepen their social consciousness and motivation to bring their technical expertise to develop solutions that serve to make life better for all people, mainly of those who need it most.
Talent Mentored Research	All students selected for the program should participate in an Academic Immersion Activity (page 13), related to the Grand Challenge chosen by them. The research and/or development project that each student will propose, should be chosen from this immersion, trying to share the problem and the responsibilities, based on each student’s specific competencies, working in collaboration to reach a viable solution.

Appendix III

Sample GCSP Program Form

Table 7: GCSP Program Form

RESEARCH						
Year			1	2		
Term	Number	Units				Notes
MULTIDISCIPLINARY SUBJECTS						
Year			1	2		
	Number	Units				Notes
ENTREPRENEURSHIP						
Year			1	2		
	Number	Units				Notes
GLOBAL DIMENSION						
Year			1	2		
	Number	Units				Notes
SERVICE LEARNING						
Year			1	2		
Term	Number	Units				Notes

Appendix IV

List of course descriptions (Course Catalog)