



# NAE Grand Challenge Scholars Program Proposal

- Bucharest July 2019 -



## 1. University vision and mission

### 1.1 Introduction

The University **POLITEHNICA** of Bucharest is the oldest and most prestigious engineering school in Romania, with a tradition of 200 years made possible by the efforts of some of the greatest Romanian professors; its specificity relies in creating knowledge through research and technological innovation, as well as through its implementation by means of education and professional training at European level. UPB is a leader and reference in technical higher education, guided by the principles of excellence, inclusiveness, diversity, solidarity, innovation and internationalization.

University POLITEHNICA of Bucharest is structured in 15 faculties, 57 departments, 38 research centers, 70 new research laboratories and 6 interdisciplinary research-training platforms.

During the latest years UPB was the beneficiary of many education and research programs. This fact allowed the university to considerably improve research infrastructure, the teaching system and human resources.

The university research activities are connected in a complete interdisciplinary technological flow, which addresses the study of materials (chemical engineering), electrical engineering, electronics, power engineering and mechanics (e.g., alternative energy sources, environmental protection), and then telecommunications, information technologies and computer science challenges. Living in a time when the world urgently needs experts who understand science and engineering, the University POLITEHNICA of Bucharest extends the power of hands-on problem-solving to institutions around the globe in the effort to explore a new model of university activity — enhancing communities through science.

The values of the UPB are drawn from the desire to bring important contributions to the development of society through the quality and relevance of teaching, research, leadership abilities and the ethics of its graduates.

University POLITEHNICA of Bucharest offers a wide range of study programs for bachelor, master and doctoral degree for more than 28000 students. In addition, through our internationalization strategy, each year more than 800 foreign students are studying

in our university and more than 850 national students are studying abroad. Currently, through Erasmus+ mobility program, the academic staff are engaged in various exchange programs (e.g. Athens program, Bilateral programs) which are meant to produce the following outcomes: enhanced intercultural awareness, increased sense of initiative and entrepreneurship and more active participation in society.

We consider that involving our students and academic staff in various multicultural experiences we not only ensure cultural acceptance but also connect the university to new ideas, opinions and diverse knowledge.

In addition, the intercultural dimension, tolerance and ensuring equal opportunities are of a great importance in the cultivation of our institutional identity.

Consequently, university POLITEHNICA of Bucharest and NAE GCSP share common values, both fostering openness to different cultures through multicultural experiences.

## **1.2 Vision**

University POLITEHNICA of Bucharest (UPB) assumes the mission to train specialists in different technical fields that are able to use valuable scientific, technical and cultural knowledge, to contribute to the technological, economic and social-cultural progress of the Romanian society and the contemporary world. In this regard UPB ensures a performant education, developed and perfected through a complex research activity, continuing the tradition of the Polytechnic School of Bucharest, according to the exigencies and the means offered by the modern information society.

University POLITEHNICA of Bucharest assumes the concept of innovative university, both in terms of human capital formation, which conditions the capacity of innovation of a country, as well as scientific research producing knowledge, technological innovations and adaptations which condition the country's economic growth.

Being aware of its mission, University POLITEHNICA of Bucharest encourages and supports excellence, with the main objective of forming future leaders on several social and professional levels; competitiveness and entrepreneurial spirit; the development of critical, creative and innovative thinking that allows the transformation of potential ideas into clear actions with economic benefits for both community and individuals; enhancing

the quality and relevance of students' knowledge and skills as a continuous effort of academic staff; transfer of entrepreneurship knowledge from teacher to student through formal or informal education.

The knowledge production, mainly through scientific research and transfer of such through education and training, dissemination through information technologies, the use of technological innovation - are the elements that define uniqueness of the university.

In recent years, the relevant international bodies have cultivated the dialogue on higher education as a necessary factor for transnational cooperation, social progress and the welfare of nations. The idea that universities' missions include dimensions beyond the promotion of knowledge and research, such as concerns about personal and professional development of students and the promotion of active and committed citizenship, corresponds to the archetypal model of social responsibility of the University POLITEHNICA of Bucharest. In our vision social responsibility of the UPB is related to sustainable development, responsibility towards Environment, social and economic well-being of the society as a whole through our teaching research, education, public events and activities.

Through the development of the university in relation to our students, as direct beneficiaries of the education services, a new strategy was proposed aiming mainly at:

- Active orientation towards the formation of soft skills, social and relational skills complementary to the formation of cognitive skills;
- Personal development of students, in order to gain more autonomy, originality, creativity and ability to develop skills for adapting to new technological contexts;
- Changing the mindset towards engineering solutions that should better serve the community needs.
- Creating a multidisciplinary education of engineering systems solutions developed through personal engagement.

In addition, our social responsibility strategy reflects the commitment to generate research with impact, increase the awareness for environmental issues and cultivate social consciousness of our students.

UPB is constantly improving the quality and efficiency of the education system, promoting social cohesion, active citizenship and stimulating creativity, innovation and entrepreneurship in education.

This year Polytechnic University of Bucharest has proposed to implement an extensive program for Development and Implementation of an Entrepreneurship program for students, PhD students and postgraduate researchers.

The program is one of the long-term objectives assumed by the university, derived from its mission aimed at "training the engineers able to adapt to the requirements of the market economy and new technologies, having economic and managerial knowledge and promoting the principles of sustainable development and environmental protection" as well as the general objectives and specific objectives of the University's strategy.

Entrepreneurial education is a key element in developing an innovative economy where young people are encouraged to create product companies with added value and jobs. The entrepreneurial program was designed with the purpose of increasing the competitiveness of the Romanian economy through innovation.

The purpose of the program is to create a coherent framework of support for technological entrepreneurship with the focus on promoting and developing links and synergies between technical universities, enterprises, regional authorities and business support players by designing Innovative Entrepreneurship Center of UPB. The entrepreneurship program refers to exchange of experience between quadruple helix actors at both regional and interregional levels to create a long-term strategic engagement to actively support technical entrepreneurship development and capacity building as a building block for business creation and growth.

The continuous thread of our goals remains the same – to educate for a better future, to find solutions through research for a better present, and to positively influence the context of our society.

### **1.3 Vision for Grand Challenge Scholar Program**

The vision of our National Academy of Engineering (NAE) Grand Challenges Scholar Program (GCSP) is to bring future education, research, creativity and innovation in the service of a new sense, within the context of NAE, for a more tolerant, safe, sustainable, healthy world.

To achieve the proposed vision, we are committed to integrate the existing offerings consisting of electrical, electronic, computer science and power engineering expertise in order to advance solutions for 4 Grand Challenges identified by the NAE.

Our action plan is divided in a following set of goals that must be considered in order for our vision to become reality:

- Building the community of GCSP students to ensure continuity and excellence.
- Enriching multicultural experience of our students by constantly involving them in volunteer projects and exchange of experience programs.
- Developing links and synergies between our university, enterprises, regional authorities, business support players and community to refine social responsibility and entrepreneurship competency.
- Motivating our students to use gained knowledge and social consciousness to seek solutions through multidisciplinary approaches for Grand Challenge-like problems.

We consider that engaging students in co-curricular activities will enhance not only their academic background but will also empower them with the knowledge and relevant experiences to address the society's greatest challenges of the 21st century.

## 2. Recruiting

The recruits will be targeted amongst undergraduate students at the end of the second year, enrolled at the University POLITEHNICA of Bucharest. Recruitment will be preceded by information sessions. First year students will have introductory and descriptive seminars for the GCSP during the year. The main purpose of these seminars is to raise the awareness through their publicity. **Second year** students, as they become

more aware of the engineering environment, will be able to apply for the program at the end of the second year. **Third year** students will constitute the main target for **the GCSP program** in accordance to their dissertation interests. During the recruitment, presentations and opened sessions will state the goal of the GCSP program, its Importance, emphasizing the added value of participation in such a project for the future of the student, community, society, global environment.

The selection criteria will be based on a motivation letter and statement purpose in order to establish how self-determined the student is. Furthermore, the motivation of the candidate will be measured by using the cumulative motivation index (cumulative GPA); a minimum GPA of 2.5 is required over the previous year of study. Also, it will be taken into consideration as previous efforts before the GCSP candidacy: the participation in scientific communication sessions, volunteering activities, extra school activities etc.

During the recruitment process a site will be established, hosted by the University POLITEHNICA of Bucharest, which will contain all information, project description, activities, registration records, program requirements, progress of each participant, contact for responsible teachers and program director. The system is beneficial for students exploring various levels of knowledge and collaboration between students and peers.

The GCSP theme will be consistent with the student study program profile. In the first year of the program (year III-bachelor) a broad theme will be defined. In the second year of the program the GC theme will be narrowed and fixed, based on the results of the first year's research. This theme will correspond with the theme of the graduation project of the Bachelor cycle.

**Conclusion:** During the first year of the program, the student has time to choose a theme according to his wishes and mentor that will be more specifically chosen and fixed in the second year.

### 3. Communication Channels

- **The main communication channel** will be represented by a singular **professor from each faculty**.
- **Students Entrepreneurial Society (SES)** will assure the dissemination of the program;
- **Student organizations will secure program promotion amongst students;**
- Social media: **Facebook;**
- Web site: **GCSP program website;**
- Specific **events and fairs**, for e.g POLIfest;
- For students that search a dissertation subject/project, we propose **a coordinator for each participating organization/faculty**, who's main responsibility will be the dissemination and description of the opportunity this project entails;
- On the long term, **program alumni will help with the recruiting part as well.**

### 4. Application & Selection Process

The application process will start at the beginning of the 3<sup>rd</sup> year and requires students to submit a letter of motivation and a statement of purpose, mentioning the Grand Challenge theme and a plan of study showing how they will complete the five competencies of the program.

#### 1<sup>st</sup> step

The application plan is constituted firstly by an **initial online application** which can be made by students **individually**.

### **Application form**

#### **Personal information:**

Name: First name, Surname

Name of organization:

Faculty:

Specialization:

Year of study:

GPA:

#### **Optional section:**

Study interest:

Description of interest (20 words):

Detailed description and motivation for studying (100 words):

**Commitment letter with clear, exposed interest for future program enrolment.**

**A plan that addresses all required GSCP framework components.**

In writing the applications students will benefit from the support provided by SES and tutors from the faculty. The vertical theme (one of the 4 major GCSP themes - see Appendix 1) is chosen according to the study program to which the student is enrolled.

### **2<sup>nd</sup> step**

In the selection phase the Center of counseling and career orientation (which is part of the UPB), will manage the selection of the students through specialized tests. The Center of counseling and career orientation will evaluate the candidates. Necessary abilities for the proper implementation of the program will be evaluated (social capability, communication, leadership qualities, etc.). Taking into account the large number of students enrolled in the UPB, 30000 such a selection process is necessary so that a number of no more than 20 students per UPB to be enrolled in the program to be fulfilled. This activity will be considered step 2 of the selection process.

### 3<sup>rd</sup> step

The third step will consist of an **interview held by professors from the belonging faculty and another professor part of the organization committee**. The length of each interview will be of 20 minutes. The motivation of the candidate for joining the programme is analysed.

#### Aim

Our aim is a total of **20 students per UPB**.

#### Acceptance criteria

- Good results, no more than 1 failed subject;
- Outside the faculty interests: volunteering, contests, performance in the field;
- Previous participation in the Scientific Student Communication;
- Proven interest and enthusiasm;
- Results obtained on the Center of counseling and career orientation tests;
- No other commitments, such as full-time or part-time jobs;
- A minimum GPA of 2.5.

Once accepted in the program, student need to present a developed plan of study that supports the student's Grand Challenge theme including the all required GCSP framework components. This condition will aid students in having a **better performance altogether**, junior students will learn from advanced students, and advanced students will receive help with their workload. During the elaboration of the study plan, every selected student will be assisted by a mentor (see Ch.5)

After each semester of study, year 3 and 4 students enrolled in the GCSP program will present the evolution and progress achieved. Their progress will be evaluated by different criteria: performance, execution, involvement and theoretical realization and practice.

## 5. Mentoring

The program will **accentuate the idea of collaboration between faculty members** in order to disseminate information more efficiently and increase learning through closeness and support.

Therefore, **each student will have a mentor**. Scheduled, monthly meetings with designated mentors will be mandatory.

## 6. Evaluation

Each selected student will have a personalized project that will include the technical theme according to curricula and the set of extracurricular activities aimed at obtaining the 5 transversal competences. At the end of every semester, each participant must hand:

- A feasibility plan completed successfully;
- Pptx 10 slides and 5-minute presentation;
- At least 3 semester participation into courses during the program.

The evaluation is carried out by a commission composed of Students Entrepreneurial Society, Center of counseling and career orientation and mentors. Promotion criteria will be established in the next semester of the program.

Students who fail the admission to the program will have a semester of grace for remediation. After the first semester of the first year of GCSP there is the possibility of being re-examined. Students who fail at the first assessment (end of the first year of the GCSP programme) will have a semester of grace for remediation.

Attention: There is an evaluation at the end of the first year of the GCSP. There is no evaluation after each semester.

## 7. Organization & Administration

Possible events that will need catering (water, coffee, juices, sandwiches, cookies, salads):

- Recruitment meetings;
- Program presentations;
- Team building events;
- Final presentations.

The Administration Board of the UPB names the GCSP Director for a 4-year period.

The director's selection will take into account the following:

- the candidate experience;
- the involvement in similar projects.

The mentor is selected from the teaching staff of the study program that the student belongs to. The mentor has the following attributions:

- mentoring from the point of view of the theme;
- mobility guidance and professional career advice.

From an administrative point of view, SES will perform the guidance of the program and of the student. Every year the GCSP Director presents an activity report in front of the Administration Board.

Scholars Guidance throughout their journey while in the GCSP will be assured:

- Research, mobilities, all necessities for the GCSP program: the mentor
- Administration guidance: SES

**Staff Team SES**

Student Entrepreneurial Society will provide support of a staff team to help in recruitment, application, maintain student portfolio, event planning and organization.

Every UPB faculty will have a responsible teacher who will take care of the program. Each Faculty Department will propose a mentor teacher whose role will be to guide the student in preparing the developed plan for the GCSP program, including the choice of how to complete the fulfillment and accumulation of the 5 GCSP competencies. Mentoring involves the guidance of students in improving their developed plan, in making connections between their technical research and the GCSP non-technical competencies, planning the steps to achieve the non-technical competencies.

Administrative organisation of the GCSP program

- coordination Committee composed of 5 persons nominated by the Administration board of UPB; the Committee will nominate a director; Quarterly meetings for the evaluation of the program;
- the administration of the program (student management, results centralization, etc.) will be ensured by the Student Entrepreneurial Society.
- financing activities: insured by the UPB through own funds, Erasmus programme, dedicated programs of the Ministries of National Research and Education, sponsoring from companies.
- representatives of the GCSP programme from UPB will attend the Global Challenges Summit and the annual Grand Challenges Scholars Program meeting.

## 8. Five GCSP competencies

- **in order to achieve the five competencies** students will choose one topic from the GCSP list **from the proposal document**
- **students will engage in different activities in order to obtain all of them**

### **8.1 Mentored Research ( from 3<sup>rd</sup> year to 4<sup>th</sup> year)**

#### **Talent competency/ creative experience on GCSP topic**

Students will learn the “how to do research” on a GCSP topic as a part of their studies, under the supervision of their Bachelor’s teacher. The research activity will be realised during the entire period of 3<sup>rd</sup> and 4<sup>th</sup> year of study/

Indicator : Final paper at the end of the 4<sup>th</sup> year which will be evaluated by a jury established for each study program.

Presentation pptx-10 slides at the end of each semester.

### **8.2 Multidisciplinarity (2 semester out of 4)**

Understanding multidisciplinarity of engineering systems solutions

Students will need to investigate a solution for their GCSP topic by involving and connecting the technical disciplines with the social disciplines. Students will engage in specific GCSP suggested courses in ethics, culture, bussiness or other courses related to the student’s chosen topic.

Indicator :

1. compulsory internship of at least 2 weeks in the second semester of the 4<sup>th</sup>, in the high-management area of a company (ensures an understanding of the decision-making, organization, planning processes within a company) ;
2. attend at least 2 courses in related/optional fields ;
3. written report of max. 20 pages on how multiple disciplines can contribute to achieving his or her goal.

According to the UPB regulation, students can choose disciplines that exist in other study programs.

### **8.3 Entrepreneurship (1 semester of mentorship and/or classes)**

Understanding through experience the necessity of a business model for the solution implementation.

Students will develop a business plan to conduct their GCSP project. Students will engage in business courses or participate in business events or mentorship with a teacher specialised in this field in order to learn how to create a business plan. Activity will be directed by the SES department ;

Indicator:

1. participation in the Entrepreneurship Initiation course, accredited under the UPB ;
2. a business report of 10-15 pages presenting the business plan for the project evaluated by the viability of it.

#### **8.4 Multicultural (at least two experiences completed)**

Understanding multiculturalism, through a multicultural experience

- Students will be required to take part in the ERASMUS programme (minimum 1 semester) within a UPB partner University affiliated to the ERASMUS programme
- Students will participate at the minimum a short duration (2 weeks) to universities in Asia/Africa/South America that allow for particular multicultural experiences towards European space (based on existing collaborations with universities in the respective areas)
- Knowledge of a minimum of 2 foreign languages (of which English is mandatory) at the end of the program.
- Students will learn how engineering solutions to grand challenges depend on the socio-cultural economic contexts of different parts of the world.

Indicator:

1. one Erasmus mobility;

2. one Asia/Africa/South America mobility ;
3. 2 foreign language certificates

### 8.5 Social Consciousness

Understanding that the project should serve primarily society and people, reflecting social consciousness.

- Students will complete a course or participate in a group dedicated to assisting people and society affected by the GCSP topic and understand how society is affected by the potential problem of the topic the student chosed. Students should focus on characterization the social implications of the GCSP topic, developing solutions to a better social impact of the GCSP topic.
- Students will participate in a voluntary activity according to the regulations of volunteering activities in the UPB.

Indicator :

1. volunteering certificate
2. poster on social consciousness.

## 9. Recognition

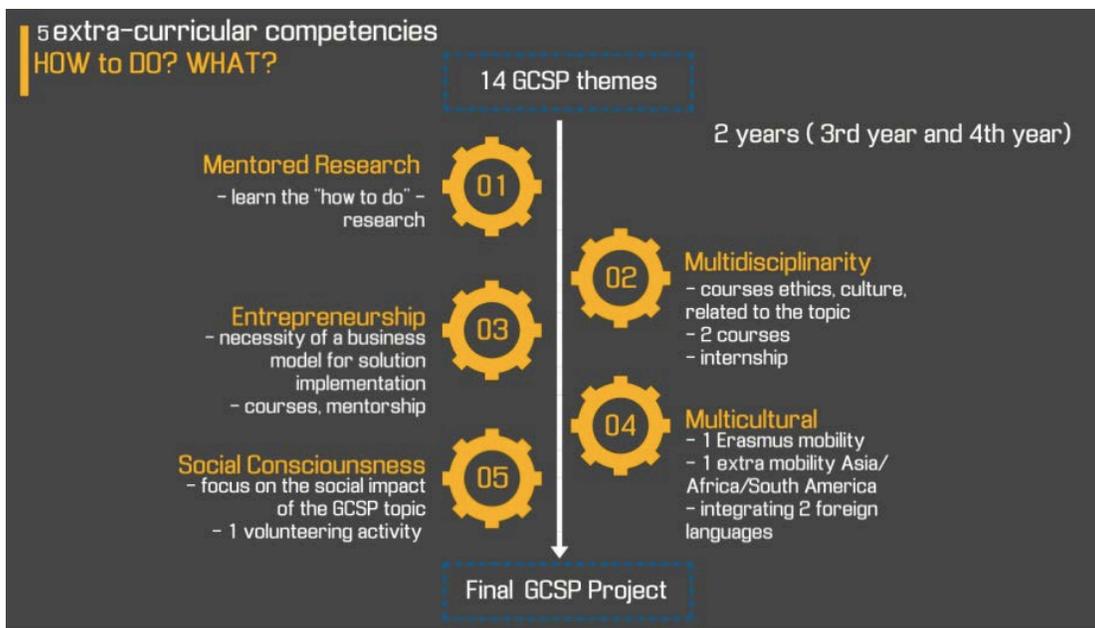
Names and accomplishments of the students who receive **the GCSP designation** will be compiled during graduation. During the GCSP program, selected students will be required (in accordance with the specifics of the faculty of which it belongs) to execute a technical project appropriate to the requirements of the faculty of which it belongs. The project will also need to be focused on one of the GCSP themes and together with the extracurricular activities carried out to provide the student with the technical part and the 5 transversal competences targeted by the GCSP program.

University POLITEHNICA will **equated the bachelor research** during the fourth year of study (first semester of the 4<sup>th</sup> year) and **the Bachelor project** with the technical project

for all the GCSP graduates. Graduates will still need to make the final presentation at the end of the 4<sup>th</sup> year. **Once they enter the program, students will receive a recommendation letter from the faculty.**

### Appendix 1

Vertical Theme – 4 GCSP themes (Health, Sustainability, Security, Joy of Living) – the most appropriate for the UPB being SUSTAINABILITY



### Appendix 2

- 5 competencies with the appropriate indicators for the GCSP proposal

