Interreg Sudoe

EUROPEAN UNION

NANOSTAR

European Regional Development Fund

Research and innovation

Student booklet

Mission design challenge

NANOSTAR consortium

Cooperation depends on you
www.interreg-sudoe.eu
http://nanostarproject.eu

INTRODUCTION

This NANOSTAR challenge consists in the **predesign of a nanosatellite/small satellite space mission to the Moon**. The satellite, equipped with a scientific payload, will perform observations and measurements of the Moon's surface at a close distance during a fly-by.

This is a competitive challenge, in which **multidisciplinary teams of students** from the NANOSTAR universities will have to develop and present their design solutions to satisfy a set of mission requirements. Students will be assisted by expert faculty and learn how to create a space mission cooperatively in the framework of concurrent engineering.

This document contains the **competition rules and fundamental information** for the students on how to participate. The application form, the set of mission requirements and constraints, and additional links and information can be found at the **NANOSTAR website**: http://nanostarproject.eu.

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HOW TO PARTICIPATE IN THE COMPETITION

Students participate to the NANOSTAR challenges in teams. You can **register with your friends or ask to join a team of other students**: the idea is to learn together as you develop your system solution. We encourage the participation of **multidisciplinary, mixed teams of about 5 women and men**. You can participate with your university colleagues or form an international group that spans several NANOSTAR institutions.

Each team will be **assigned an advisor** who will be your point of contact with the NANOSTAR network. **To solve any doubts**, you will be able to ask questions anytime to the **Support Faculty** of the NANOSTAR institutions: together, they offer an ample expertise on space systems that is at your disposal. You may reach each the Support Faculty following the indications given by your advisor.

The **internal organization** of the team and the role definition of each member is completely up to you, but we provide some recommendations and advices in the following pages.

At the end of the competition, you will be asked to hand in a **design file** with the definition of your solution, a **preliminary design report**, and to showcase your results in a **presentation**. An **Evaluation Committee**, composed of members from all NANOSTAR institutions, will evaluate the received designs and select the **winning proposal**. The awarded design will be extended and serve as **the baseline for the future NANOSTAR challenges**, which will focus on the detailed **development and testing of parts of a nanosatellite and related facilities**.

To formalize your participation in NANOSTAR, you will need to **fill in the application form on the NANOSTAR website as soon as possible**, so that we can provide you with help materials and include you in the discussion groups.

COMPETITION RULES

The **following rules** detail several aspects of the NANOSTAR design competition. They are intended as a means to **articulate your participation** and **maintain the fairness** of the competition.

1. Bachelor-, Master- and Doctoral-level students of technical or managerial disciplines can be part of a Team and participate in the NANOSTAR competition (post-docs and employees acting within the scope of their employment, or contract, may not compete).
2. Students shall communicate immediately any changes to their student condition if this affects the eligibility for the participation to the NANOSTAR challenges.
3. A competing Team can be composed by 3-10 students, with 5 students being the preferred number. The number of students in a Team will be taken into account in the evaluation of the project.
4. Each Team will nominate a Team Leader, which will act as point of contact of the team with the NANOSTAR Evaluation Committee.
5. A competing Team is considered Multidisciplinary if its members cover at least two different disciplines (e.g. aerospace and telecommunications). Multidisciplinarity is encouraged and will be taken into account in the evaluation of the project.
6. A competing Team is considered Mixed if it contains at least one man and one woman. Mixed Teams are encouraged and this will be taken into account in the evaluation of the project.
7. A competing Team is considered Interinstitutional if it spans two or more NANOSTAR institutions. Interinstitutional Teams are encouraged and this will be taken into account in the evaluation of the project.
8. A student can only be part of a single team. Participation in more than one team is not allowed.
9. Participation in the NANOSTAR competition is voluntary and not remunerated.
10. To be part of the competition, a Team must submit the application form found in NANOSTAR website before the deadline detailed in this document.
11. To be eligible for evaluation, all deliverables associated to the work of a Team must be submitted through the NANOSTAR website strictly before the deadline detailed in this document.
12. The deliverables associated to the work of the Team must describe a preliminary design, according to the ECSS-E standards. There are three deliverable items:
    a. A preliminary design report, of maximum 50 pages (excluding title pages and appendices).
    b. A link to an online video where the Team presents the work, of maximum 15 min.
    c. An IDM-CIC file with the final design, of maximum 10 MB.

    More details can be found in the Section “Student Deliverables”. The templates provided on the NANOSTAR website shall be used to prepare the first deliverable.
13. The official communication language in NANOSTAR is English. All communications, emails, documents and deliverables must be in English.
14. Each team will have an Advisor, assigned by the project consortium and belonging to the NANOSTAR institutions. The Advisor will serve as point of contact with the NANOSTAR Support Faculty to answer student questions and doubts.

15. Project Evaluation will take place by an Evaluation Committee formed by members of all NANOSTAR institutions. For more information on the project evaluation, see Section “Project evaluation” of this document.
16. The decision of the Evaluation Committee will be announced to the students on the NANOSTAR website.
17. The decision of the Evaluation Committee is final and cannot be protested.
18. Participation in the challenge implies the acceptance of these rules, as well as the regulations of your institution(s).
19. By participating, you accept that your work, part of your work, and photographs, videos or interviews of you and your Team may be used by the NANOSTAR network for communication and dissemination purposes and as the baseline of future student challenges.
20. Any Team where at least one of its members is found infringing them, acting on ill will or against the spirit and fairness of the NANOSTAR competition, or otherwise making an irresponsible usage of the institutional resources, will be disqualified from the competition.
21. Any changes to these rules, the mission requirements and constraints, the evaluation criteria, or the deadlines, will be announced to the students through the NANOSTAR website

STUDENT DELIVERABLES

The student Deliverables are three:

- **Preliminary design report**
- **Video presentation** of your Design (showing a remote/virtual oral presentation)
- **IDM-CIC file** with the final design

All documents will be in English. Refer to the sections below for a more detailed description.

PRELIMINARY DESIGN REPORT

The report should contain **all your work and results**. Producing a good report is no easy task, as it happens with other types of technical documentation. The NANOSTAR preliminary design report template details the recommended structure and contents of this report and can be downloaded from the NANOSTAR website.

The preliminary design report document shall be presented as a standard pdf file and should not exceed, under any circumstances, a **50 pages limit (excluding title pages and appendices).** This is considered the first deliverable.

PRESENTATION VIDEO

The presentation video shall not last more than **15 minutes**. The video ought to **feature all Team members explaining their work and the highlights of the final design**. The video shall be uploaded to an online platform, and the link to the video (which must not be password protected, etc.) will be considered the second deliverable

IDM-CIC FILE

The software IDM-CIC, produced by CNES, allows to define several aspects of a space system, and is widely used in preliminary design. The **IDM-CIC file detailing your system and its mechanical design** is considered as the third deliverable. More information on IDM-CIC and tutorials on its usage can be found on the NANOSTAR website.

PROJECT EVALUATION

The Evaluation Committee is **composed by one member from each NANOSTAR institution**, and will apply the same criteria to the evaluation of all student proposals.

After the submission deadline, the NANOSTAR Evaluation Committee shall convene and **evaluate all the valid submitted projects** to determine the **winning proposal.**

Evaluation will be carried out **based on:**

- Compliancy with the top-level requirements of the mission
- Project consistency, risk analysis, and physical soundness
- Maximization of the mission figures of merit (refer to the mission requirements document)
- Solution innovativeness
- Document quality
- Presentation quality
- Team management and organization
- Team size, multidisciplinarity, gender balance, and interinstitutionality
- Correct usage of NANOSTAR resources, tools, and methodology.

AWARDS

The **winner** of the competition will be **unveiled at the NANOSTAR Award Ceremony.**

All participating students will receive a **Participation Diploma** from NANOSTAR as proof of the work carried out in the Design Challenge.

The **First Prize Team** (and up to a Second and a Third Prize teams, under the discretion of the Evaluation Committee) will receive **Award Diplomas stating their result in the competition.**

Several **ancillary diplomas** will be awarded under the discretion of the Evaluation Committee:

- Best oral presentation
- Best predesign document
- Most innovative mission
- Best management practices

The First Prize Team will be offered the chance to act as the **Lead Systems Engineering Team** to coordinate the future NANOSTAR challenges, where their design solution will serve as the baseline to develop and test several subsystems of their nanosatellite across the NANOSTAR institutions.

Other awards to the winning Team, which may comprise economic and/or material prizes (e.g. attendance to an International Conference to present their work, or a visit to a space center) will be defined soon and announced on the NANOSTAR website.

Results of the competition, including photographs, videos, and interviews with the winners will be featured on the **NANOSTAR website and communicated through the NANOSTAR institution media.**

IMPORTANT DATES

Registration open:	February 11, 2019 – April 11, 2019
Deliverable submission deadline:	May 11, 2019
Evaluation period:	May 12-30, 2019
Winner Announcement:	May 31, 2019
Awards Event:	Date and venue to be announced

PRACTICAL INFORMATION

Below you can find some **general recommendations** for a successful work-flow during the design challenge:

- Remember that **the main point** of the challenge is to **learn** how to design space systems and **create a great collaborative work**. Read and ask!
- While each person in the Team will probably have **a defined area of expertise**, it would be a great mistake to blindingly do one's tasks alone: there are **multiple interactions** between the subsystems of a nanosatellite and identifying them requires the collaboration of all members in the team.
- Agree early on **how you are going to work together** in your team, who is responsible for what, and the general organization of the work: meetings, work plan, responsibilities, task allocation etc.
- Design work is inherently **iterative**: you will start with a loose idea of what to do. As you advance and iterate within your Team, things will gradually become more defined.
- Be sure you **understand well the top-level requirements** and their implications before you start.
- In preliminary design, engineers want to acquire **a wide and consistent overview** of the system, without delving in detail: simple analyses, well-reasoned estimations, similar-mission data, and good margins are usually sufficient at this point.
- Remember that **tables, graphs, and bulleted lists** are far more effective for conveying certain types of information than long paragraphs.
- Use the **tools and methodology of NANOSTAR** network to your advantage: they can notably simplify your efforts in obtaining a successful design.

Good luck!

SUPPORT FACULTY, TOOLS AND METHODOLOGY

All the information on the NANOSTAR **software tools, facilities, Support Faculty, and methodology** can be found at the NANOSTAR website: http://nanostarproject.eu.

CONTACTING THE EVALUATION COMMITTEE

For any **issues or doubts** of the competition, your Team Leader can contact the evaluation committee, following the indications found on the NANOSTAR web page.