Nano Satellite Outreach Program (NSOP)

What is NSOP?

NSOP was created to engage undergraduate students in the universities to **design**, **develop**, **test**, **launch,** and **operate** Nano-satellites

NSOP Objectives

1. Provide a platform for the students to get involved in the process of space systems development and operations.

2. Prepare future Emirati workforce to support UAE's ambitious Space Exploration missions.

3. Provide a platform for MBRSC to test new technologies and support research and development.

4. Promote innovative partnerships between MBRSC, universities, and industry in the UAE.

Program Success Criteria

Education

Allocate Emirati students in each subsystem of the spacecraft who must:
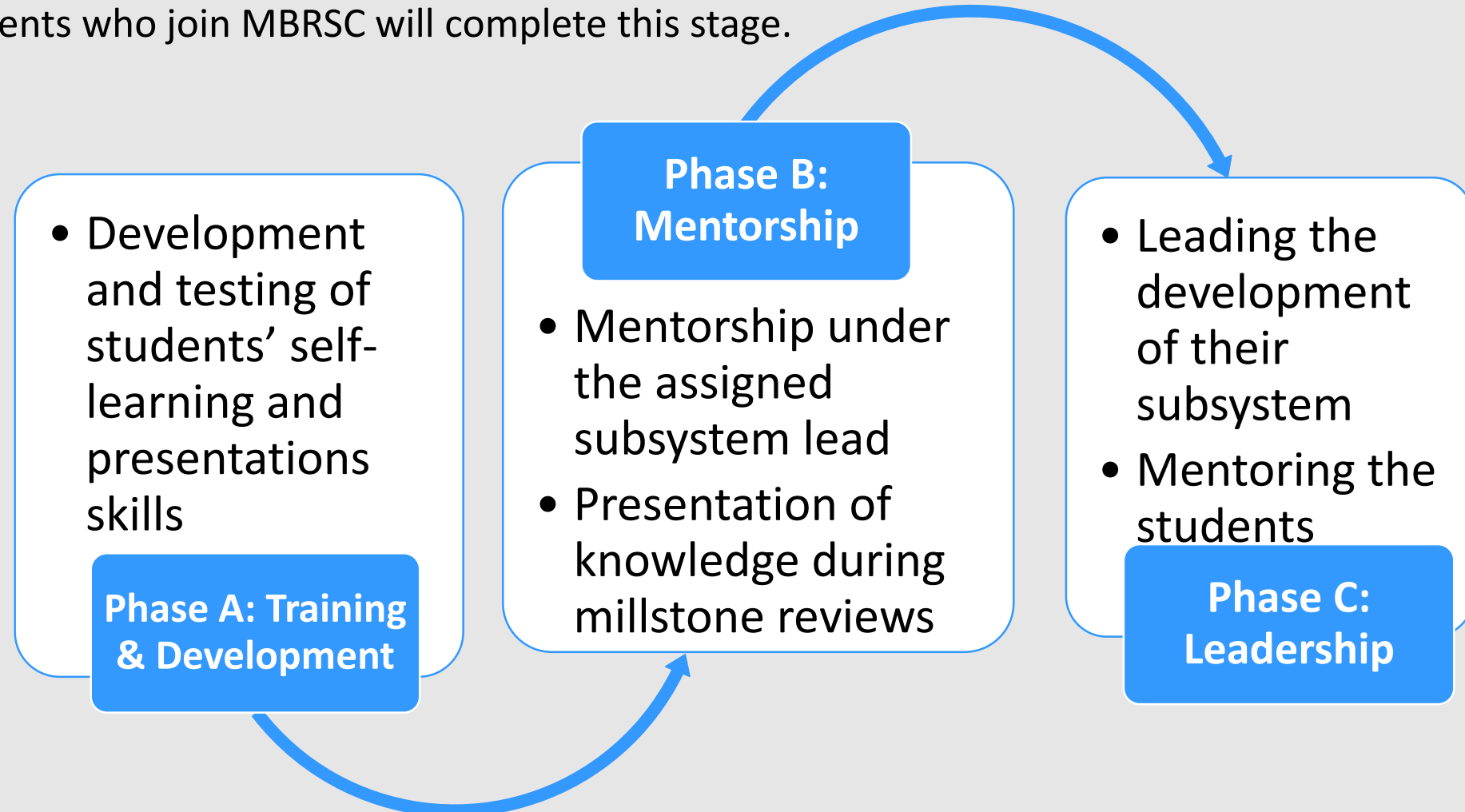- Participate in the design and testing phases of the program (i.e. up to CDR)
- Present their work in the mission's milestones reviews

Engineering

1. The mission must pass all milestones reviews successfully
2. The in-house team must develop at least one subsystem, in addition to the payload
3. The CubeSat must pass all testing required by the launch provider and should integrate successfully within the launch POD

Training Plan

- Each iteration will go through phases one and two for all students.
- For phase three, only students who join MBRSC will complete this stage.

Phase A: Training & Development

- Development and testing of students' self-learning and presentations skills

Phase B: Mentorship

- Mentorship under the assigned subsystem lead
- Presentation of knowledge during millstone reviews

Phase C: Leadership

- Leading the development of their subsystem
- Mentoring the students

Roles & Responsibilities

MBRSC Role

- MBRSC is responsible for mission development and success
- MBRSC is responsible for student training and mentorship
- MBRSC allocates tasks to each student to ensure achievement of both mission and senior design project requirements

University Role

Student Role

Roles & Responsibilities

MBRSC Role

University Role

- Minimum requirements:
    1. Each student must be assigned to an advisor
    2. The university must count the project as their senior design project
    3. The university must allow the team to use their facilities as required

- Advisors are required to attend all mission milestones reviews
- Advisors are to review the students' work from the university perspective

Student Role

Roles & Responsibilities
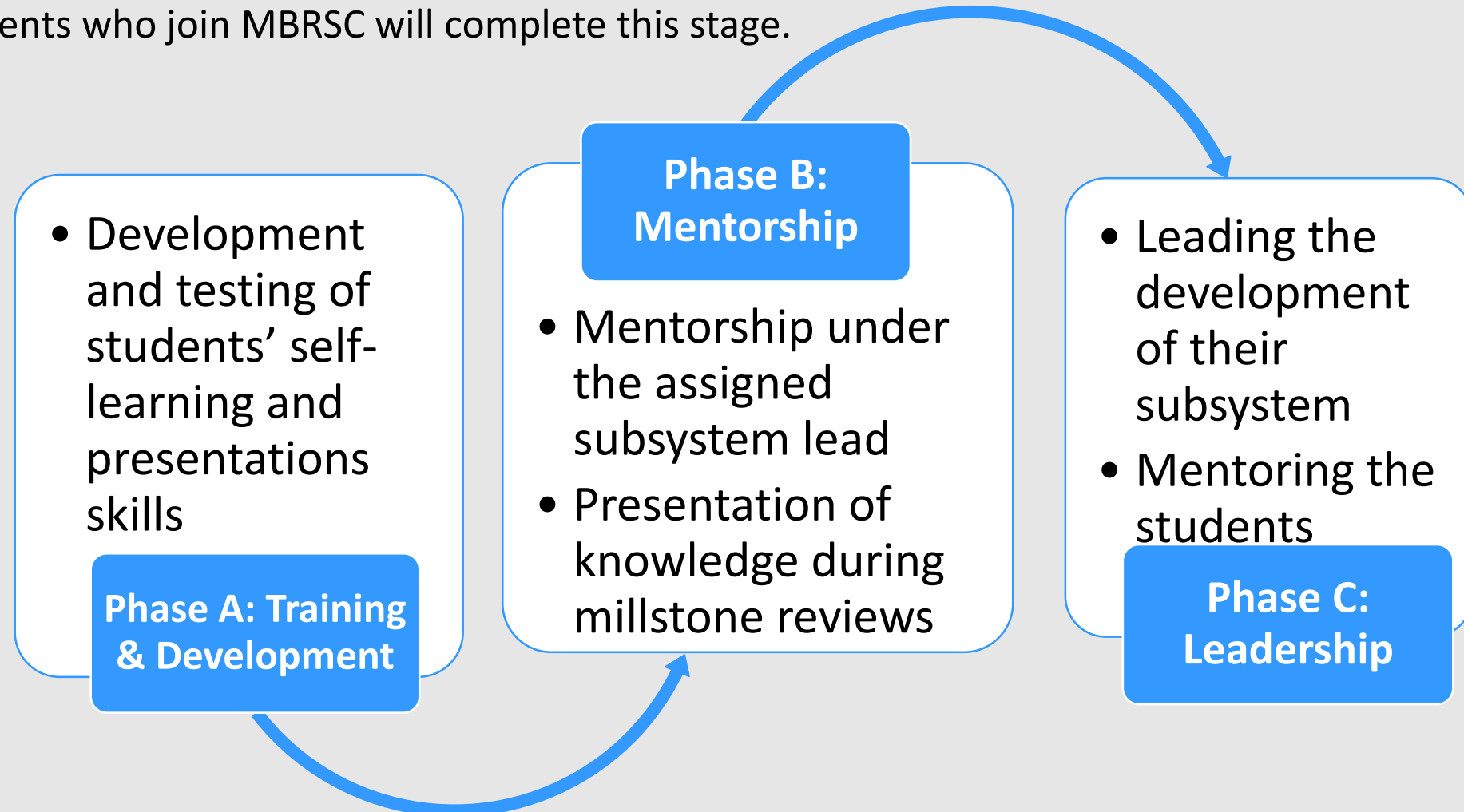
MBRSC Role

University Role

Student Role

- Students are able to join the project once reaching Junior 2 level or higher
- Students must have completed most of the necessary background courses
- Responsibilities:
  1. The student must deliver all tasks on time to both the university and MBRSC leads
  2. The student must be able to defend his/her work during the mission milestones reviews

Training Plan

- Each iteration will go through phases one and two for all students.
- For phase three, only students who join MBRSC will complete this stage.

Phase A: Training & Development

- Development and testing of students' self-learning and presentations skills

Phase B: Mentorship

- Mentorship under the assigned subsystem lead
- Presentation of knowledge during millstone reviews

Phase C: Leadership

- Leading the development of their subsystem
- Mentoring the students

Training Plan – Phase A (Training & Development)

Readings & Presentations

Prior to acceptance, students must read, analyze, and present four sets of readings:
1. Satellite Types and Applications
2. Space Environment
3. Satellite Subsystems
4. Launch and Ground Segment

Upon completion, MBRSC team evaluates the students and finalizes their acceptance to the program

Trainings

Training Plan – Phase A (Training & Development)

Readings & Presentations

Trainings

After acceptance, students must attend four trainings

1. System Engineering
2. Orbit Mechanics
3. Cleanrooms and ESD
4. Design for Safety

- All readings and trainings must be completed before SDR, except for trainings three and four which must be completed at least one month prior to PDR
- In addition, trainings #3 & 4 are dependent on the subsystem the students are assigned to

Training Plan – Phase B (Mentorship)

Students

- Students are assigned to a subsystem based on their backgrounds.
- Most subsystems will have more than one student on the team.

MBRSC Lead

- The lead will assign his students specific readings and tasks to complete during each phase.
- The lead will guide and teach his students through one-to-one training, coaching, and mentorship
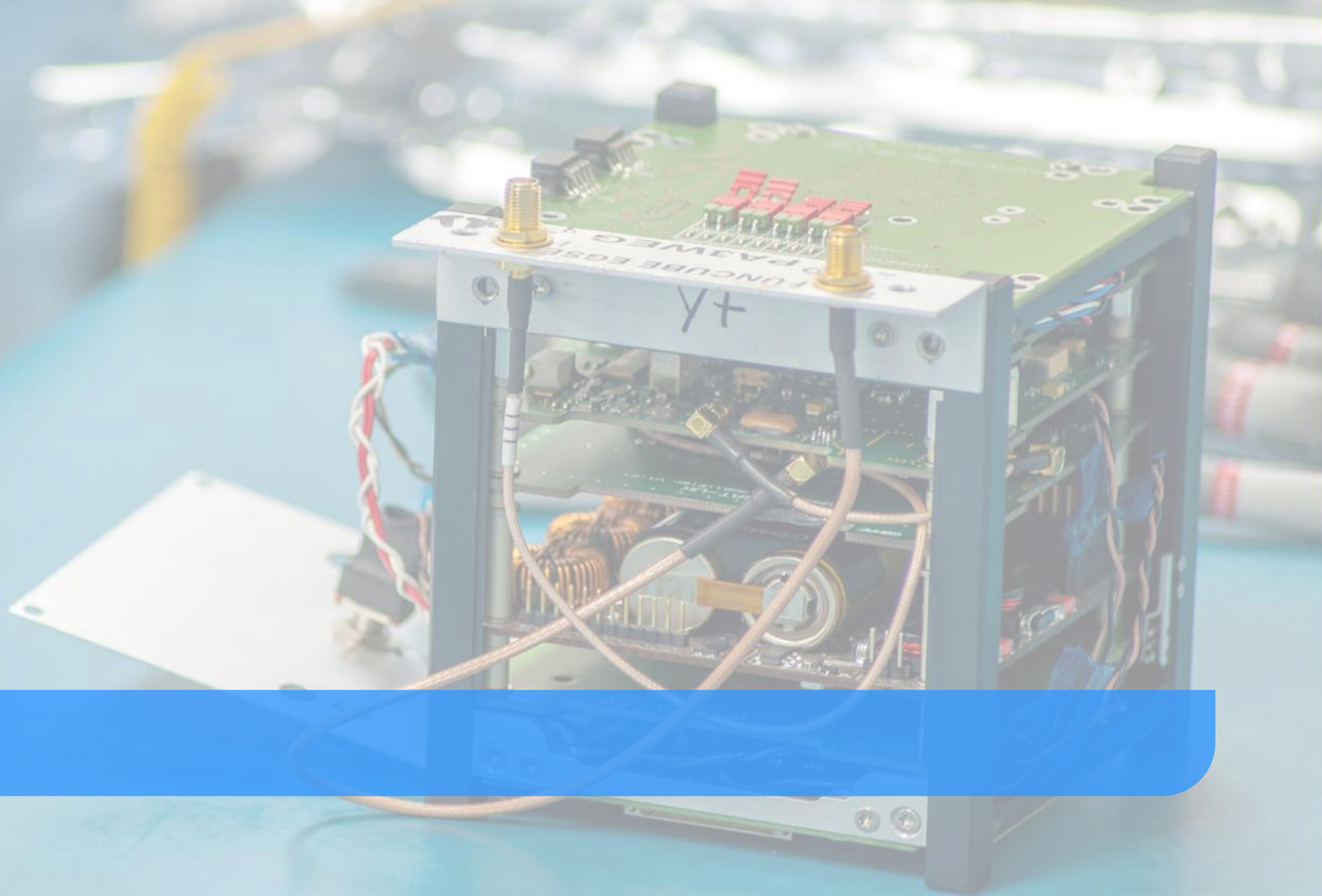
Training Plan – Phase C (Leadership)

Goal: is to guarantee the sustainability of the program and the continuation of knowledge gain and transfer cycle
Students who join MBRSC are eligible to become a subsystem lead

Example

From Nayif-1, all seven students have graduated
Four have joined MBRSC workforce and are currently leading their own teams in NSOP-1

Nayif-1

Nayif-1 Mission Details

The mission objective is:

- Implementation of a communication relay payload developed with ISIS in the Netherlands

Team

The team consisted of seven Emirati students from the American University of Sharjah
The students were involved in:
1. System Design & Definition
2. Assembly, Integration, and Testing
3. Ground Station Operations

Current Status

Launched in February 2017

NSOP-1: The First Mission

NSOP-1 Mission Details

The mission objective is:

- Complete development of the CubeSat payload and mechanical structure
- Procurement of the other bus subsystem

Payload

Bluetooth communication protocol simulation to potentially replace the internal harness of a satellite

Current Status

PDR phase

Team Structure:

MBRSC Team

Consists of 16 Engineers, dedicating 20% of their time

Student Team

Consists of 15 undergraduate students from 5 universities in the UAE

Team Structure:

Ground Station

Consists of one team, with an MBRSC lead and 2 students

CubeSat

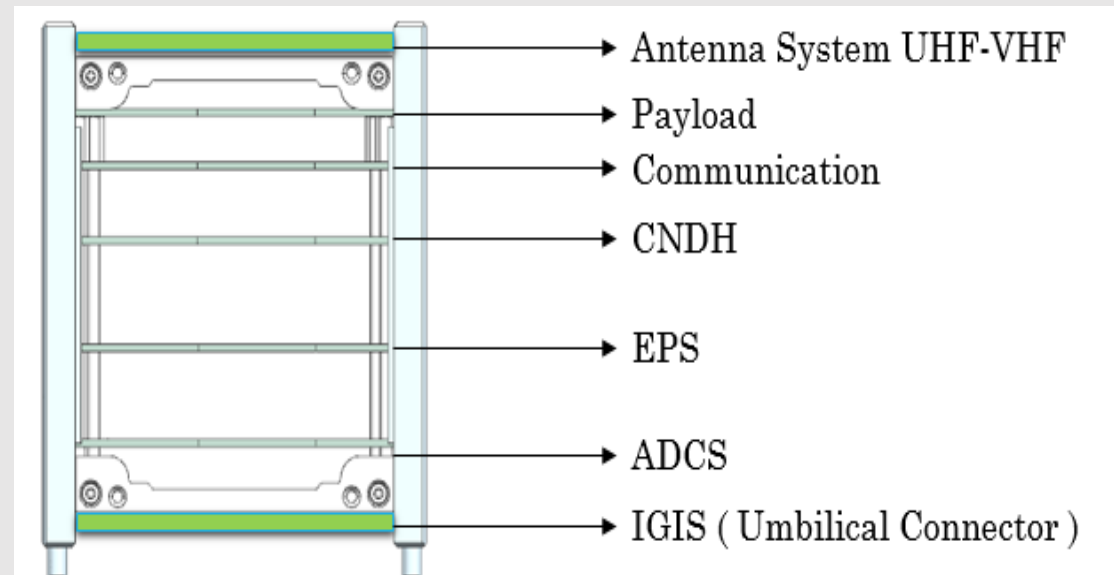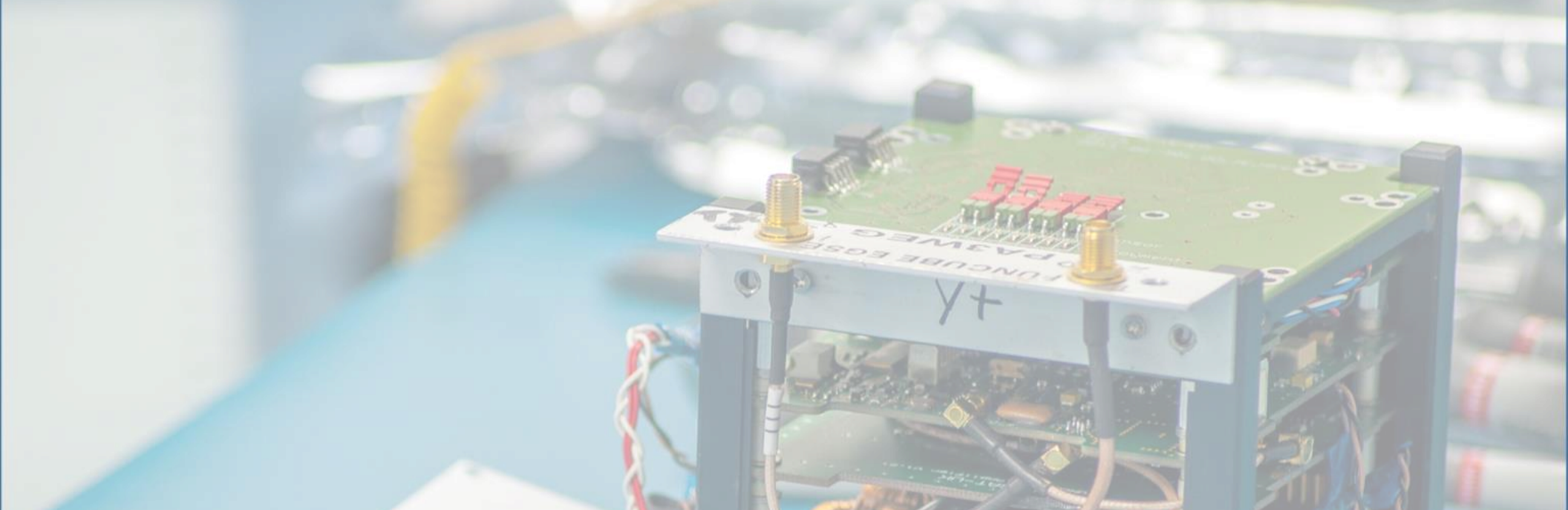Divided into 8 teams, each with an MBRSC lead:

Subsystem	Number of Students
Communication	Two
Payload	One
ADCS	One
Power	Two
Mechanical	Three
C&DH	Two
Thermal	Two
Flight Software	Two

The CubeSat is made of seven boards:

- Six boards are procured
- The payload board is developed in-house at MBRSC
- The students completed all the designs and analyses prior to procuring the boards

Thank You
& Any Questions?