

Stages for the students of the School of Aerospace Engineering

The curriculum for students enrolled since academic year 2018/19 includes 6 credits for stages, to be collected during the second year. These 6 credits are approximately equal to 150 hours of activities. Students are responsible to fulfil such a mandatory activity, and the easiest way is to choose among the wide offer proposed by the School and listed in this catalogue.

Students are suggested to consider stages whether they are close to end their regular courses or – always during the second year – they do have spare time available from mandatory or elective courses. Students are requested to inform by mail the instructor responsible for stage activities (currently prof. G.Palmerini, giovanni.palmerini@uniroma1.it) about their preferences (no more than 4) and their current advances in curriculum (passed and missing exams, with a scan or pdf of their INFOSTUD page). Students who already agreed a stage activity (either included or not in the following list) with a professor of the School should follow the same process, clearly indicating in the e-mail that they already got their activity assigned (please detail the activity and relevant tutor, no preferences in this case).

The board of the School will officially assign the different tasks taking into account preferences, time availability and, in case of stage opportunities in high demand, average of the marks and marks of the exams significant for the specific activity.

Additional opportunities can arise in the different labs, and students can always ask about to the faculty responsible for the labs. Students could also prepare and arrange their own proposal of stages (either as industrial or research activities) and submit it to the School: the proposal will be evaluated by the School board and the decision reported to the student together with the indication of an instructor responsible on the academic side. Notice that every stage activity could start only after approval by the School board.

This catalogue includes the stages offered up to the current date, partitioned in two sections according to their characteristics: activities to be performed at the School's labs, activities outside the School in industries or research centers in Rome or vicinity. For every stage there will be a tutor (the professor responsible of the lab for the in-house possibilities, a professional profile from the industry or research center for the external activities).

The stage is a self-standing activity, mandatory part of the curriculum, and it will end at the completion of a number of working hours in the order of the due amount (150) with the approval of the relevant tutor. The tutor will fill and sign a form, and the School will grant the 6 credits including them in the student's profile on Infostud. It is possible that – upon appreciation of both parties (student and tutor) - the activity can be pursued as a thesis: however, there will be a formal assignment of this dissertation work, different and separated from the award of the stage's credits.

Section I. Stages offered at the School Labs, via Salaria 831, Rome

Stages are listed according to each Lab's offer

The number of positions is provided as a general indication only. More positions could be available on the specific topic, depending on the choices of the professor responsible for the lab.

Additional options could be offered by some Labs, to be proposed according to students' skills and preferences (contact the relevant professor)

AEROSPOWER Lab (prof. L. Schirone)

- AP1. Modeling of a power distribution unit**
1 position: Matlab or Simulink coding
- AP2. Modeling locomotion solution for planetary rovers**
1 position: Matlab or Simulink coding
- AP3. Modeling Solar Panels : flexible 1-D, flexible 2-D, retractable, lightweight**
1 position: Matlab or Simulink coding
- AP4. Modeling Primary Generation System for satellites, n-wheels rover, spheric rover**
1 position: Matlab or Simulink coding
- AP5. Modeling Energy storage system**
1 position: Matlab or Simulink coding

Automation, Robotics and Control for Aerospace – ARCA (prof. F. Curti)

- ARC1. Design & implementation of a slip control algorithm for a rover in a simulated lunar surface.**
1 position: Matlab coding, interest to work on experimental set up
- ARC2. Design & implementation of proximity maneuvers using the robot simulator MONSTER**
1 position: Matlab coding, interest to work on experimental set up
- ARC3. Experimental set-up for an attitude control subsystem**
2 positions: Matlab coding, interest to work on experimental set up
- ARC4. Preliminary design of attitude determination and control architecture for SiaSat**
1 positions: Matlab coding
- ARC5. Development of the attitude determination and control software simulator for SiaSat**
2 positions: Matlab/Simulink coding

Earth Observation Lab – EOSIAL (prof. G. Laneve)

- EO1. Cloud mask on Sentinel-2 images**
1 position: Matlab coding capability
- EO2. Shadow mask taking into account topography and clouds on Sentinel-2 or Landsat 8 images**
2 positions: Matlab coding capability
- EO3. Identify stable reflectors for the Sardinia region**
1 position: Matlab coding capability
- EO4. Developing and test a Vegetation Water Index based on Sentinel 2 images**
1 position: Matlab coding capability, SNAP software package knowledge
- EO5. Test burned area indices (NBR = Normalized Burn Ratio, BAI = Burned Area Index) on an area of interest**
1 position: Matlab coding capability
- EO6. Estimate Land Surface Temperatures by using MSG/SEVIRI images**
1 position: Matlab coding capability
- EO7. Compare crop growth using vegetation Index based on Sentinel 2 imagery**
2 positions: Matlab coding capability
- EO8. Compute vegetation fuel map by using Sentinel2 imagery, phytoclimatic data for Sardinia or Calabria region**
2 positions: Matlab coding capability
- EO9. Implement a soil erosion susceptibility method exploiting Earth Observation satellite images**
1 position: Matlab coding capability

Nanosatellite Electronics Lab (prof. A. Nascetti)

- EL1. On-Board Computer (OBC): firmware design**
1 position. Prerequisites: microcontrollers (basic knowledge), C-language programming
- EL2. OBC: development of self-test and calibration routines**
2 positions. Prerequisites: microcontrollers (basic knowledge), C-language programming
- EL3. OBC: development of main operation routines (TT&C, Logging, ...)**
2 positions. Prerequisites: microcontrollers (basic knowledge), C-language programming
- EL4. Development of Graphical User Interface for OBC test**
1 position. Prerequisites: Matlab or Java programming
- EL5. Setup of Flatbed Satellite**
1 position. Prerequisites: electronics (basic), Word or Latex (for documentation)
- EL6. Hardware In the Loop (HIL) Setup for Flatbed Satellite**
1 position. Prerequisites: FPGA (basic knowledge), Simulink
- EL7. HIL sensitivity analysis**
1 position. Prerequisites: FPGA (basic knowledge), Simulink

Flight Mechanics Laboratory (prof. P. Teofilatto)

FM1. Mission analysis of the SiaSat

2 positions: Matlab coding capability

FM2. Analysis of interplanetary cubesat mission to Mars with ballistic capture

1 position: Matlab coding capability

FM3. Test bed development for the centre of mass and inertial moments experimental determination of 3U cubesat

1 position: capability to work on experimental set up

FM4. Review about the use of the cubesat standard for missions involving microsattellites of mass in the range 10 to 30 kg

1 position: capability in collecting and analysing the data

FM5. Use of CnC machine and 3D printer for the production of structural components of use of the Flight Mechanic Lab

1 position: capability in using CnC and 3D printer

FM6. Project of a small scaled gyroplane having deployable blades and trajectory guidance in view of a possible prototype

1 position: aeronautical knowledge

Guidance and Navigation Lab (prof. G.B. Palmerini)

GN1. Experiments with Arduino boards exploiting INS/GPS

1 position: interest to work with Arduino microcontroller

GN2. Understanding Pulsar-based Navigation

1 position: In-depth study of PulsarNav technique, Matlab coding capability

GN3. Real Time Control Capabilities

1 position: Matlab coding capability / Unix-Linux knowledge / microcontroller experience

GN4. Formation Flying Simulations

1 position: Matlab coding capability

GN5. Setup/rehearsal of a small rover mockup

1 position: Matlab coding capability, interest to work on experimental set up

GN6. Setup/rehearsal of a testbed to reproduce S/C proximity navigation

1 position: Matlab coding capability, interest to work on experimental set up

GN7. Analysis and experiments of the *Optical Flow* technique for image-based navigation

1 position: Matlab coding capability, interest to work on experimental set up

GN8. Experiments with GPS receivers

2 positions: Matlab coding capability, interest to work on experimental set up

Propulsion Laboratory (prof. A. Ingenito)

PL1. Experiments for hybrid rocket engines

1 position: to work on experimental set up

PL2. Project of a GIE for LEO

1 position: Matlab coding capability, SolidWork

PL3. Numerical Simulations of Hybrid Rocket Engines

1 position: knowledge of Ansys

Telecommunications and Ground Station (prof. A. Nascetti)

TLC1. Forward Error Correction with HIL

1 position. Prerequisites: Telecommunications (basic knowledge), Simulink

TLC2. Setup of Ground Station based on Software Defined Radio (SDR)

2 positions (also in team). Prerequisites: Telecommunications (basic knowledge), Matlab/Simulink/Java

TLC3. Setup of Synthetic Aperture Radar (SAR) simulation environment (Simulink)

1 position. Prerequisites: Telecommunications (basic knowledge), RF, Simulink

TLC4. Setup of Wireless connection system for flatbed satellite

1 position. Prerequisites: Telecommunications and microcontrollers (basic knowledge), C-programming

Section II. Stages offered in external Labs / Industrial firms in Rome area

AVIO-ELV (Colleferro, outside Rome)

AV1. Technical Activities in Launcher's Engineering

2 positions: selection on the basis of an interview

Thales Alenia Space Italia (via Saccomuro and via Tiburtina, outside GRA, Rome)

TAS1. Activities in the Observation, Exploration and Navigation Areas

1 position: selection on the basis of an interview

IONVAC PROCESS srl (Viale Anchise 24, 00071, Pomezia, Roma)

ION1. Sizing and design of a hybrid rocket

1 position: knowledge of SolidWorks/Autocad/Catia, Matlab coding and ANSYS/FLUENT