



# Regulations for the Master Course in in SPACE ENGINEERING

## Class LM 20 – Aerospace and space engineering

Academic Year 2011/ 2012

### Specific educational goals

The Master Degree in Space Engineering aims to provide students with advanced professional scientific education with specific engineering skills that will enable them to cope with complex problems associated with the analysis, development, simulation and optimisation of different components of launch vehicles and space missions.

This course is mainly aimed at the development of the most advanced survey and design instruments and innovation in the space industry, focusing on improving efficiency and reducing weight.

These skills and capabilities are achieved by enhancing the solid body of knowledge already acquired during the degree course, which is extended in terms of methodology and application throughout the two years of the Master course.

### Admission requisites and recognised credits

#### Curricula requisites

In order to be admitted to the Master Degree course, all candidates must have

- At least 39 UC in the MAT/03/05/06/07/08, FIS/01, CHIM/07 sectors
- At least 27 UC in the ING-IND/03/04/05/06/07 sectors
- At least 24 UC in the ING-IND/10/11/13/15/22/31, ICAR/08, ING-INF/01/02/03/ 04/05 sectors

#### Proficiency tests

The proficiency level of all candidates for the Master Degree course will be assessed by an admission test.

Exemption from the admission test is granted to students who, with "n" as the number of years taken to complete the 3-year Bachelor's degree and "M" as the weighted average based on credits for all the exams taken in the Bachelor degree, meet the following requirement

$$M \geq 21 + (n-4) \quad \text{with } n \geq 4$$

Students who do not meet this condition must sit and pass the written admission test, which will focus on general knowledge in the basic and characteristic subjects. The admission test will be held each academic year at a time which will be displayed on the [www.ingaero.uniroma1.it](http://www.ingaero.uniroma1.it) website; students who have not yet completed their 3-year Degree Course can also sit the admission test.

### Studying abroad: certification of study periods abroad

Courses taken at foreign or European Universities with which the School of Aerospace Engineering has signed agreements, projects and/or contracts are recognised as prescribed by such agreements.

Upon receiving approval from the Degree Course Academic Council, students can spend a period of abroad as part of the LLP Erasmus Project.

In accordance with University Academic Regulations relating to studies, examinations and academic degrees earned abroad, the Degree Course Academic Council will examine the programme and assign the credits which correspond to the relative scientific disciplines.

If a student comes from another University, from another Sapienza Degree Course or other Academic Course, the Academic Council may recognise the credits acquired which do not exceed the Scientific Disciplinary Sectors - SDS indicated on the course programmes and up to a maximum of 12 University Credits - UC in the SDS not foreseen in the course programme.

If the subject is no longer a student, the Academic Council may approve reinstatement according to the current regulations in force, recognising all or only part of the credits earned.

### **Attendance**

**Attendance is not compulsory.**

### **Course details**

The Master Course in Space Engineering is part of a French-Italian Network for the acquisition of the double-title at selected universities and Grandes Ecoles in Paris, Grenoble, Toulouse, Nantes and Nice. The agreement between La Sapienza and aforementioned French Institutes, updated to meet MD 270 Regulation requirements, defines the operational details and the list of titles that can be acquired at each Institute participating in the agreement.

The academic course foresees a first year with study plan that is the same for all students, which focuses on consolidating their knowledge in the various sectors characterising space engineering (gas dynamics, space structures, space flight mechanics, space engines, space systems) further to basic information in areas not included in the 3-year degree course, i.e. telecommunications and electronics. In Year II, there are 2 different study plans, one that focuses on launch vehicles and space mission and the other that focuses on satellites, satellite communication and earth observation.

The percentage of the total hourly commitment that students may dedicate to personal studies or other individual academic activities is at least 68%.

### **Part-time**

Freshmen and students who are also involved in other activities, can apply for Part-time attendance and plan to earn less UC each year than a full-time student.

The rules and procedures applicable to part-time attendance are provided in the University Regulations. Please consult the general regulations for further details on the rights and duties of part-time students (<http://www.uniroma1.it/studenti/procedure/shortcut.php?cloud=Part-time>).

### **Educational methods and proficiency tests**

Lectures, tutorials, workshops, group work, and any other activities lecturers deem appropriate, will be provided for each individual subject.

Proficiency tests for each subject normally consist of a written and/or oral exam (E), with procedures defined by the Lecturer and communicated with the programme.

### **Final exam**

The final exam consists in preparing a theoretical, experimental, project or design thesis on subjects relating to the teachings of the Master Course, to be developed under the guidance of an

Academic Council Mentor, in collaboration with public and private entities, manufacturing and service companies or research centres operating in the area of interest.

During the preparation of the thesis, students must first analyse the technical literature available on the relative topic.

On completing this first phase, and according to the thesis topic, students shall autonomously :  
identify and develop system models for the analysis of the effects of design parameters;  
in the case of experimental work, conduct measurements and analysis in order to obtain the data and verifications required

- in the case of design work, determine the characteristics of a space mission or a launch vehicle or a satellite (or part of the same), by means of calculation, discussing the results obtained.

### **Career and employment opportunities for graduates**

Career opportunities for those holding Master Degrees in space engineering are related to the in-depth skills and expertise acquired in an extremely wide range of design and management activities.

Some examples of career opportunities are:

- in public and private research centers as research and development operators and/or coordinators
- in space companies as designers or project managers;
- in national and international agencies planning and realising space missions

## STUDY PLAN

There are two different branches:

- **Launch vehicles and Space Missions**
- **Satellites, Communication and Earth Observation**

### YEAR ONE

#### *STUDY PLAN IDENTICAL FOR BOTH BRANCHES*

Subject	Sector	UC	Activity type	Semester
Gasdynamics	ING-IND/06	9	B	I
Space Flight Mechanics	ING-IND/03	9	B	I
Free choice subjects (9 UC)				
Automatic Control Principles	ING-INF/04	9	C	I
Telecommunications, Remote Sensing and Satellite Telecommunication Systems		9	C	I
Mod. 1: Telecommunication Basics	ING-INF/03	(3)		
Mod. 2: Remote Sensing Basics	ING-INF/03	(3)		
Mod. 3: Satellite Telecommunication Systems	ING-INF/03	(3)		
Space Structures	ING-IND/04	9	B	II.
Free choice subjects (6 UC)				
Electronics	ING-INF/01	6	C	II.
Satellite Electronics	ING-INF/01	6	C	II.
Space Missions and Systems	ING-IND/05	9	B	II.
Rocket Propulsion	ING-IND/07	9	B	II.

### YEAR TWO

#### Branch I

#### LAUNCH VEHICLES AND SPACE MISSIONS

**18 UC at choice from the following type B subjects**

Subject	Sector	UC	Semester	Type	Recommended Plan
Hypersonics	ING-IND/06	6	I	B	Aero+Propul
Liquid Propellant Engines	ING-IND/07	6	I	B	Aero+Propul
Solid Propulsion Modeling		6	II	B	Aero+Propul
Mod. 1	ING-IND/07	(3)			
Mod. 2	ING-IND/06	(3)			
Turbopump System for Liquid Rocket Engines	ING-IND/07	6	II	B	Aero+Propul
Space Propulsion	ING-IND/07	6	I	B	Aero+Propul
Structural Dynamics	ING-IND/04	6	I	B	Structures
Thermal and Smart Structures	ING-IND/04	6	II	B	Structures
Articulated Space Structures	ING-IND/04	6	I	B	Structures

**6 UC at choice from the following type C subjects**

Aerospace Materials	ING-IND/22	6	II	C	Struct +Aero+Propul Missions
Artificial Intelligence	ING-INF/05	6	II	C	

**Branch I**

**SATELLITES, COMMUNICATION AND EARTH OBSERVATION**

Subject	Sector	UC	Semester	Type	Recommended Plan
Space Environ & Instrum.	ING-IND/05	6	II	B	Obs.

**18 UC at choice from the following type C subjects**

Radar Image Processing	ING-INF/03	6	I	C	Obs.
Satellite Nav & Radioloc.	ING-INF/03	6	II	C	Obs.
Telecommunication Networks	ING-INF/03	6	I	C	Obs.
Environmental Remote Sensing	ING-INF/02	6	II	C	Obs.
Satellite Electronics	ING-INF/01	6	II	C	Satellites
Space Electrical Systems	ING-IND/33	6	I	C	Satellites
Telecommun. & Remote Sensing		6	I	C	Obs.
Mod. 1: Telecomm. Basics	ING-INF/03	(3)			
Mod. 2: Remote Sensing Basics	ING-INF/03	(3)			
Electromagnetic Fields	ING-INF/02	6	II	C	Satellites

**OTHER COMMON ACTIVITIES**

	Sector	UC	Activity type
<b>Exams chosen by the student</b>		<b>12</b>	<b>D</b>
<b>Other</b>		<b>1</b>	<b>AAF</b>
<b>Final test</b>		<b>23</b>	<b>E</b>

**Key**

Academic activity types: basic A, characteristic B, analogous and additional C, free choice by students D, final test E, other academic activities (art 10, paragraph 1, sub-paragraph d) AAF, placements E.

The following courses are offered in English (entirely when attended by students of other nationalities or in part when attended by Italian students only): Space environment and instruments, Aerospace materials, liquid propelled propulsion systems, Structure thermal problems, Articulated space structures.

**Free-choice subjects**

As for the 12 credits earned on free-choice subjects, students can choose from the subjects foreseen for the Master Course which are not included in their study plan, from the Master Course in Aeronautical Engineering or subjects or similar sectors inherent to other Master Courses.

The Academic Council will check that the selected courses are inherent to the study plan before endorsing such requests.

**Study plan**

Students are required to submit their study plan including no less than 96 UC, at the beginning of Year Two [roughly during the period from September 1 to September 30 and, more specifically, in the **periods which will be constantly updated on the Aerospace Engineering Academic Council website (News area)**]. Aerospaziale (sezione News)].

Students must fill in the online study plan form found on the [www.didatticaingegneria.it](http://www.didatticaingegneria.it) website indicating their specific orientation and choice of subjects, following the instructions provided on the Aerospace Engineering Academic Council website([www.ingaero.uniroma1.it](http://www.ingaero.uniroma1.it)).

### **Regulations regarding change of year and relative prerequisites**

Students must have gained at least 30 credits in Year I in order to move on to Year II.

### **Prerequisites**

#### **It is not possible to sit exams on**

Radar image processing  
Satellite electronics  
Hypersonics  
Solid propulsion modeling  
Liquid propellant engines  
Satellite nav & radiolocalisation  
Telecommunication networks  
Turbopump System for Liquid Rocket Engines  
Articulated space structures

#### **if students have not passed the exams on**

Telecommunications, remote sensing and satellite telecommunication systems  
Electronics  
Gasdynamics  
Gasdynamics, Rocket Propulsion  
Gasdynamics, Rocket Propulsion  
Telecommunications, remote sensing and satellite telecommunication systems  
Telecommunications, remote sensing and satellite telecommunication systems  
Gasdynamics, Rocket Propulsion  
Space Structures

### **Programmes and exam papers**

The academic programmes and exam papers can be viewed on the Aerospace Engineering Academic Council website ([www.ingaero.uniroma1.it](http://www.ingaero.uniroma1.it)).

### **Tutoring services**

The Degree Course also foresees tutoring provided by the School of Aerospace Engineering. The Degree Course lecturers Paolo Gaudenzi, Marcello Onofri, Luciano Iles provide tutoring to students.

### **Placements**

**Students can complete placements for which they will earn 23 credits, instead of taking the final exam (23 UF).** On approving the placement, an academic tutor, chosen from among the Academic Council lecturers, and a company tutor will be appointed to follow up the placement activities. The academic tutor will monitor and verify all results.

### **Quality assessments**

The Degree Course Academic Council, in collaboration with the Sapienza School of Aerospace Engineering will conduct surveys on the opinions of students attending the relative academic courses. The survey system is part of a quality programme which the self-assessment group, lecturers, students and academic course operators all work towards. The survey results and analysis conducted by the self-assessment group are used to improve all teaching and academic activities.