

Academic Regulations and Policies

Master degree

in

Mechanical Engineering

Class LM 33 Mechanical Engineering

New course arrangement: 2015/2016 schedule

Specific educational objectives

The Master degree in Mechanical Engineer (Class LM 33) aims at training young engineers with an advanced education, in order to let them acquire skills in design and planning and learn to manage complex activities of research and development in an industrial environment. This goal is achieved by means of a widespread training proposal founded on advanced mathematics and physics, a professional expertise targeted to the solution of complex engineering problems concerning design of processes, plants, systems, devices, machines, their principles of operation and their technological innovation, and the organization and managing of safety related to all industrial activities.

The employment perspectives for graduated students who achieve the Master Degree in Mechanical Engineering, are in the manufacturer industry and services, mechatronic, transportation (automotive, naval, aeronautical and railroad) conventional and renewable energy production, biomechanics and many other fields. In these ambits mechanical engineers are responsible for design, testing, manage, research and development services.

In particular, graduated engineers can find occupation as engineers in manufacturer and service companies or in manufacturing companies, in research and development and finally in public administrations.

Admission Requirements and credit recognition

In order to get the access to the Master degree in Mechanical Engineering, students need a three years bachelor degree or university diploma or another acknowledged university degree. Before the enrollment a commission will verify admission and knowledge requirements in accordance with the procedures specified below.

Curricular Requirements

Students can apply for enrollment if they have:

- i. a bachelor degree,
- ii. or a university diploma,
- iii. or another degree acknowledged by this university
- iv. or students if they have achieved during certified university activities, at least 120 ECTS within the following groups of scientific areas (SSD), reported in the following list (with specified bounds)

a) At least 54 ECTS in at least 5 SSD:

CHIM/07 Chemical fundamentals of technologies
FIS/01 Experimental physics
MAT/03 Geometry
MAT/05 Mathematics
MAT/06 Probability and Statistics
MAT/07 Applied Mathematics and physics
MAT/08 Numerical Analysis
MAT/09 Operational Research
ING-INF/05 Systems for information processing

b) At least 48 ECTS in at least 6 SSD:

ING-IND/08 Fluid Machinery
ING-IND/09 Systems for Energy and Environment
ING-IND/10 Thermal and heat transfer
ING-IND/11 Environmental Engineering Physics
ING-IND/12 Mechanical and Thermal Measurements
ING-IND/13 Applied Mechanics
ING-IND/14 Machine design
ING-IND/15 Design methods for industrial engineering
ING-IND/16 Mechanical Engineering Technology
ING-IND/17 Industrial Plants

c) At least 18 ECTS in at least 3 SSD:

ICAR/08 Continuum Mechanics
ING-IND/06 Fluid Dynamics
ING-IND/21 Metallurgy
ING-IND/22 Material Science
ING-IND/31 Electrics
ING-IND/32 Electric Machines

in case the minimum requirement of 120 ECTS is fulfilled, the Scientific Committee (CdA) can also admit students which requirements do not completely fulfill bounds related to the credits distribution explained in points from a) to c) after a validation of the effective knowledge required by students. For these students the academic regulators of the course will establish additional indications to complete the curriculum with additional courses.

It is also required a CEF (Common European Framework) Language Certification, at least at B2 level. This certification could also be replaced with at least 3 ECTS credits in one of the following SSD:

L-LIN/03 French Literature
L-LIN/04 Translation and language - French
L-LIN/05 Spanish Literature
L-LIN/06 Translation and language – Hispanic/American
L-LIN/07 Translation and language - Spanish
L-LIN/10 English Literature
L-LIN/11 Anglo-American Language and Literature
L-LIN/12 Translation and language - English
L-LIN/13 German Literature
L-LIN/14 Translation and language – German

With reference to the US Curricula dual degrees, students must have graduated with a grade greater than or equal to 101/110 and they have to demonstrate a good knowledge of the English language, certified by TOEFL or GRE

Adequacy and Personal Preparation Screening

Adequacy and personal preparation is considered suitable if at least one of the following scenarios occurs:

- student's average rating for the exams sustained to achieve the degree for admission requirements (see items i-iv) must be $\geq 22/30$.
- The final rate of the degree to fulfill admission requirements (see items i-iv) is at least 90/110.

Admission Test

In case a student does not fulfill the mentioned criteria, he can ask to take an admission test consisting in a written or oral test on the subjects relevant to mechanical engineering.

Programs, calendars and modality of tests will be published on the Area Council web site. If the student fail test, he won't be accepted for enrollment.

In the event that a student does not comply with the eligibility criteria defined above, may apply to the Area Council to support an admission test will be based on a written and / or oral arguments concerning the relevant subjects of the specific and related engineering mechanics.

Description of the Educational Path

The educational path is created in order to have balanced activities between peculiar mechanical activities and subjects from related cultural areas. Proposed subjects in the educational path are those relevant to the mechanical engineering, like: thermal machinery, material study, thermal and mechanical measurements, machine design, components and systems, technology and industrial plants. All those activities are joined in a perfect blend with other disciplines like applied mathematics economy and industrial automation.

Curricula: Educational Path consists of 10 or 11 modules, some of them mandatory, while others are optional, inside different areas historically linked to Mechanical Engineering: machine design, energy conversion, management and production administration, automotive and automation.

Students can choose between 10 curricula. Six of them are valid for the achievement of the double degree with Universidad Central de Venezuela: Machine Design, Energy Conversion, Industrial Production and General Mechanics (selectable only as individual educational path). Two curricula are valid for the achievement of the double degree with New York University Polytechnic School of Engineering (U.S.A.): Automation, management of industrial production (<http://engineering.nyu.edu/academics/departments/mechanical/>). A curriculum, Industrial Automation, is valid for Georgia Tech University double degree (<http://www/lorraine.gatech.edu>).

The last curriculum, Mechanical Engineering Design, is delivered entirely in English.

Final Exam: Educational path can be considered complete after a final exam that consists in the open discussion in front of a Commission of an innovative master thesis project, reporting results achieved during an important theoretical, experimental or design activity on subjects related to the area of Mechanical Engineering. This work must be followed by a supervisor enrolled in the Scientific Committee. The essay must demonstrate mastery of the topics covered, the skills to operate autonomously and a good level of communicative skills. To the final exam are attributed 18 ECTS. Master theses can be developed either in research labs or cooperation with industrial companies within a comparable time with assigned credits.

Activation: for academic year 2014/2015 I and II years will be activated.

Rules for Individual Educational path: Students must present their own educational plan during enrollment following instructions established from the Scientific Committee in Mechanical Engineering. Here students must indicate the chosen curricula and optional courses they decided to attend. Individual educational plans can be modified or re-presented at the discretion of CdA the following year.

Career Opportunities

Professional career opportunities for graduated Mechanical Engineers are in the manufacturer or services industry, research institutes, depending on the chosen curricula. Main career opportunities are- Design of components, and mechanical systems both for plants mechanical systems and biomedical applications.

- Design of components for energy plants and HVACR systems
- Design of components, and management of vehicles, regarding in particular dynamics, propulsion, passive and active safety, maneuverability, aerodynamics, structural, vibrations noise aspects and environmental impact.
- Management of industrial production, focusing on design of processes and technologies, production systems, logistics and industrial production plans.

Employment opportunities in the industrial sector are: mechanical and electromechanical industries; aeronautical and automotive industries; companies and organizations for energy conversion; plant engineering companies; industrial automation and robotics; manufacturing firms in general for the production, installation and commissioning, maintenance and management of machines, production lines and departments, complex systems. Courses provide a wide competence that allows graduated to be employed in government agencies, for research activities or business development.

Courses gives a good preparation in prevision of the final exam to achieve Italian engineering qualification.

General Information

Programs and teaching materials: The course program and learning materials and information are available on the website <http://www.ingmecc.uniroma1.it/>.

Tutorial services: The following teachers are engaged in tutoring and guidance in the manner and at the times indicated on the website of the course:

Council of Area Mechanical Engineering A.A. 2015-2016

- A. Gisario
- M. A. Boniforti
- G. B. Broggiato
- E. Cirillo
- A. Savo

Structure

Educational program in Mechanical Engineering consists in 8+1 curricula, where the Student must take both mandatory and elective courses.

Courses in each curricula are reported below where are reported mandatory and elective courses. Students must present an individual educational path that must be self-consistent with their educational program.

Mechanical Engineering curricula, also valid for double degree with *New York University*

Table I. Mandatory courses

<i>Automation Curriculum</i>							
6 Mandatory classes (48 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Fluid Machinery in energy conversion systems</i>	ING-IND/08	9	CR	E	1	1	B
<i>Mechanical and Thermal Measurements (in italian)</i>	ING-IND/12	9	CR	E	1	1	B
<i>Industrial Measurements</i>	ING-IND/12	6	CR	E	2	1	B
<i>Mechanical vibrations</i>	ING-IND/13	9	CR	E	2	1	B
<i>Mechanics of Robot Manipulators</i>	ING-IND/13	6	CR	E	2	1	B
<i>Machine design & Finite Element Analysis (Transferred from NYU)</i>	ING-IND/14	9	CR	E	3	2	B
2 Integrative (Mandatory) classes (18 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Economics of Technology and Management</i>	ING-IND/35	9	CR	E	2	1	C
<i>Control Systems</i>	ING-INF/04	9	CR	E	1	1	C
3 Integrative (Mandatory) classes (18 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Applied Thermo-Fluid-Dynamics (NYU Transport phenomena)</i>	ING-IND/06	6	CR	E	3	2	C
<i>Mathematical methods for Engineering (NYU Applied mathematics in mechanical engineering)</i>	MAT/05	6	CR	E	3	2	C
<i>Mathematical Physics (NYU Linear Control Theory and Design I)</i>	MAT/07	6	CR	E	3	2	C

<i>Management of industrial Production Curriculum</i>							
6 Mandatory classes (48 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Fluid Machinery in energy conversion systems</i>	ING-IND/08	9	CR	E	1	1	B
<i>Mechanical and Thermal Measurements (in italian)</i>	ING-IND/12	9	CR	E	1	1	B

<i>Industrial Measurements</i>	ING-IND/12	6	CR	E	2	1	B
<i>Special Technologies</i>	ING-IND/16	9	CR	E	2	1	B
<i>Safety and maintenance for industrial systems</i>	ING-IND/17	6	CR	E	2	1	B
<i>Costruzione di macchine e progettazione agli elementi finiti (Transferred from NYU)</i>	ING-IND/14	9	CR	E	3	2	B
4 Integrative (Mandatory) classes (30 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Economics and Business Management</i>	ING-IND/35	9	CR	E	2	1	C
<i>Control systems</i>	ING-INF/04	9	CR	E	1	1	C
<i>Mathematical methods for engineering (transferred from NYU)</i>	MAT/05	6	CR	E	3	2	C
<i>Thermo-fluid-dynamics (transferred from NYU)</i>	ING-IND/06	6	CR	E	3	2	C
1 Mandatory classes (6 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Additive Manufacturing and Production Systems (Trasferito da NYU)</i>	ING-IND/16	6	CR	E	3	2	B
<i>Management of industrial plants (transferred from NYU)</i>	ING-IND/17	6	CR	E	3	2	B
<i>Quality management (transferred from NYU)</i>	ING-IND/17	6	CR	E	3	2	B

Table II Optional Courses (NYU)

2 Optional (Mandatory) classes (12 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Offered Classes from Sapienza (Transferred from NYU)</i>	Various	12-15	CR	E	3-4	2	D

Mechanical Engineering Curriculum also valid for double degree with *Georgia Tech*

Table III. Mandatory Classes

<i>Material Science Curriculum</i>							
6 Mandatory classes (54ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Fluid Machinery in energy conversion systems</i>	ING/IND-08	9	CR	E	1	1	B
<i>Mechanical and Thermal Measurements (in italian)</i>	ING-IND/12	9	CR	E	1	1	B
<i>Industrial Measurements</i>	ING-IND/16	9	CR	E	2	1	B
<i>Additive Manufacturing and Production Systems</i>	ING-IND/16	6	CR	E	1	1	B
<i>Safety and maintenance for industrial systems (Transferred from GT)</i>	ING-IND/17	6	CR	E	2	1	B
<i>Mechanical design and laboratory characterization of micro-nano devices (Transferred from GT)</i>	ING-IND/13	12	CR	E	3	2	B
<i>Mechanical vibrations (Transferred from GT)</i>	ING-IND/13	9	CR	E	4	2	B
4 Integrative (Mandatory) classes (30 ECTS)	Area	credits	type	exam	semester	Year	Activity
<i>Non-metallic materials for engineering (Transferred from GT)</i>	ING-IND/22	6	CR	E	3	2	C
<i>Economics of Technology and Management</i>	ING-IND/35	9	CR	E	2	1	C
<i>Control systems</i>	ING-INF/04	9	CR	E	1	1	C
<i>Mathematical methods for (Transferred from GT)</i>	MAT/05	6	CR	E	3	2	C

Table 6 Optional Courses

Optional (Mandatory) classes (12)	Area	credits	type	exam	semester	Year	Activity
<i>Offered Classes from Sapienza (Transferred from GT)</i>	Various	12-15	CR	E	3-4	2	D

Tabella IV Mechanical Engineering Design Course

Mechanical Engineering Design							
5 Mandatory classes (39 ETCS)	Area	credits	type	exam	semester	Year	Activity
<i>Fluid Machinery in Energy Conversion Systems</i>	ING-IND/08	9	CR	E	1	1	B
<i>Measurements for Mechanical Systems and Production</i>	ING-IND/12	9	CR	E	2	1	B
<i>Advanced Methods in Mechanical Design</i>	ING-IND/15	6	CR	E	4	2	B
<i>Additive Manufacturing and Production Systems</i>	ING-IND/16	9	CR	E	3	2	B
<i>Operations Management</i>	ING-IND/17	6	CR	E	4	2	B
1 Optional Mandatory classes (9 ETCS) among:							
<i>Safety and Maintenance for Industrial Systems</i>	ING-IND/17	9	CR	E	2	1	B
<i>Mechanical Vibrations</i>	ING-IND/13	9	CR	E	2	1	B
<i>Mechanical Design and Laboratory Characterization of Micro-Nano Devices</i>	ING-IND/13	9	CR	E	3	2	B
1 Optional Mandatory classes (6 ETCS) among:							
<i>Thermo-Economics and sustainability</i>	ING-IND/08	6	CR	E	2	1	B
<i>Computational Thermo-Fluids Analysis in Fluid Machinery</i>	ING-IND/09	6	CR	E	3	2	B
<i>Vehicles Dynamics</i>	ING-IND/13	6	CR	E	4	2	B
<i>Mechanics of Robot Manipulators</i>	ING-IND/13	6	CR	E	2	1	B
2 Integrative (Mandatory) classes (15 ECTS)							
<i>Control Systems</i>	ING-INF/04	9	CR	E	1	1	C
<i>Physical Metallurgy</i>	ING-IND/21	6	CR	E	1	1	C
1 Optional Mandatory classes (9 ETCS) among:							
<i>Turbulence and Combustion</i>	ING-IND/06	9	CR	E	4	2	C
<i>Economics of Technology and Management</i>	ING-IND/35	9	CR	E	2	1	C
1 Optional Mandatory classes (6 ETCS) among:							
<i>Operation Research</i>	MAT/09	6	CR	E	3	2	C
<i>Dynamics of Electrical Machines and Drives</i>	ING-IND/32	6	CR	E	4	2	C

Table 8 Optional Classes

<i>Optional (Mandatory) classes (12 or 15 ECTS)</i>	Area	credits	type	exam	semester	Year	Activity
Offered Classes from Sapienza	Various	12-15	CR	E	1-2-3-4	1-2	D

How to complete a curriculum to get the minimum ECTS necessary to get your Degree

Curricula must be completed with the following activities:

Table 9 (Other Activities)

Activity	Area	credits	type	exam	semester	Year	Activity
Final Test		18			3-4	2	E
External activities or courses related to your course*		6			1-2-3-4	1-2	F
External activities or courses related to your course*		3			1-2-3-4	1-2	F

*external stages, external courses such as CAD, safety, etc...

Latest activities must be approved in advance by the Scientific Committee and certified by the teachers of reference set by the Board. Possible example of activities are the Labs:

Assisted Labs:

SSD	Titole	ECTS	Sem.
AAF	<i>Traction system Laboratory</i>	3	2
AAF	<i>Laboratory for structures calculation</i>	3	3
AAF	<i>Laboratory for combustion and turbulence</i>	3	3
AAF	<i>Laboratory for Vehicle aerodynamics</i>	3	4
AAF	<i>Laboratory for Fluid Machinery</i>	3	2
AAF	<i>Laboratory for propulsion Systems and Vehicle Dynamics</i>	6	3
AAF	<i>Introduction to modelling and simulation of turbulent transport processes</i>	6	3
AAF	<i>Laboratory of energy systems modeling for conventional or renewable sources</i>	3	2
AAF	<i>Lab for Measurements for Biomechanics</i>	3	4
AAF	<i>Laboratory for Vehicle Dynamics</i>	3	4
AAF	<i>Laboratory for Vibrations Mechanics</i>	3	2
AAF	<i>Laboratory for Noise and Vibrations Control</i>	3	3
AAF	<i>Lab for Design and Building autovehicles</i>	6	3
AAF	<i>Laboratory of Rapid Prototyping</i>	3	2
AAF	<i>Laboratory for technology Innovation</i>	3	2
AAF	<i>Laboratory for Safety in industrial Plants</i>	3	3
AAF	<i>Laboratory for Operative Research</i>	3	1
AAF	<i>Laboratorio di analisi strutturale dei materiali metallici</i>	3	2
AAF	<i>Laboratorio di progettazione di sistemi energetici da fonte rinnovabile</i>	3	2

And:

- Internship inside companies;
- Seminars and lectures (at universities, research institutions, public or private, government, and corporations) with the signature of the presence;
- Erasmus Programme;
- Other Certified Activities (training, work experience and further exams);
- Lectures attended in NYU e GT.

Legenda

Type of lecture: CR ordinary lecture, CL Lab lecture, CM Monographic lecture, CP Design lecture

Exam: E rated exam, V pass/rejected exam.

Type of formative activity: peculiar B, affine and integrative C, Optional D, Final Test E, Others F.