

DEGREE PROFILE OF
Laurea Magistrale in INGEGNERIA MECCANICA
Second Cycle Degree in MECHANICAL ENGINEERING

TYPE OF DEGREE & LENGTH	Single Degree (120 ECTS-credits), 2 years
INSTITUTION(S)	Università degli Studi dell'Aquila - <i>University of L'Aquila</i> , ITALY
ACCREDITATION ORGANISATION(S)	Italian Ministry of Education and Research Register of Engineers (Albo degli Ingegneri)
PERIOD OF REFERENCE	Programme validated for 3 years starting in October 2013
CYCLE /LEVEL	QF for EHEA: Second Cycle; EQF level: 7; NQF for Italy: Laurea Magistrale

A	PURPOSE
	<p>Graduates of this second cycle course, in accordance with the Italian Ministry Degree n.270/2009, are licensed professionals and high-profile specialists in the field of Mechanical Engineering, able to plan and manage complex engineering problems.</p> <p>Mechanical engineering is a branch of engineering that applies principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) for modeling, analysis, design, and realization of physical systems, components, or processes. Mechanical engineering curriculum also prepares students to work professionally in both thermal and mechanical systems areas. Mechanical engineering is one of the oldest and broadest engineering disciplines.</p> <p>The programme meets the requirements of European and National laws and Directives. Degree holders, after a national exam, can be enrolled in the Italian Register of the Engineers (Albo degli Ingegneri), established with <i>D.P.R. 328/2001</i>.</p>

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2	FURTHER STUDIES	The Master Degree in Mechanical Engineering normally gives ability to direct access to a wide range of PhD degrees, in the fields encompassed on engineering areas. It also gives access to some specialist professional courses.
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D EDUCATION STYLE		
1	LEARNING & TEACHING APPROACHES	Lectures, group-work, individual study and autonomous learning, interprofessional training, self directed learning program and work placement.
2	ASSESSMENT METHODS	Formative assessment is a strategic component of the teaching and learning method used in the master degree in Mechanical Engineering. With the purpose to guarantee the formative objective formative assessment is performed continuously during the lectures in different ways according to the specific characteristics of each module. Summative assessment is performed in several ways, according to the characteristics of each Module; it is normally performed by means of an oral and/or written examination, and/or by means the evaluation of a project reports. The final exam consists in the discussion of an original work, carried out under the supervision of a professor, and described through a written text. It is aimed at demonstrating that the candidate has acquired the essential professional skills and competencies related to the professional profile.

E PROGRAMME COMPETENCES		
1	GENERIC	<p>During the two-year master, students in Mechanical Engineering acquire a very broad general and specific education. Upon the successful completion of the degree they become mechanical engineers. The degree programme meets the competences and quality assurance procedures required by Italian Register of Engineers and by the National Higher Education Quality Assurance Agency (AVA) for degree courses at second level. This provides the generic competencies expected for the graduates in the second cycle, listed as follows:</p> <ul style="list-style-type: none"> — Analysis and synthesis: Knowledge and understanding of complex issues regarding their profession, identifying relationships between the various domains of science; ability to critically and systematically integrate knowledge and analysis, assess and deal with complex phenomena, issues and situations even with limited information; — Creativity: ability to design, conduct experiments, analyze and report results in accordance with the applicable standards in more than one technical area, autonomously and with an original contribution, using appropriate methods; — Leadership, Management and Team-working: ability to assume employment status of high responsibility in public or private organizations, or in self-employed profession, demonstrating awareness of ethical aspects of their role, and contribution within this; ability to work, both independently and in team, with technical and scientific problems of high complexity and to frame the work into a broader context which involves the industry and the society; — Communication skills: Ability to communicate both orally and in writing, in first language and in another European language, using appropriate scientific terminology; — Learning ability: ability to self-identify the need for further knowledge and to take responsibility for his/her ongoing learning; ability to consult specialized literature, to permanently update knowledge and skills and to be familiar with recent scientific findings and developments in Mechanical Engineering, and ability to formulate a critical opinion; — Problem solving: Ability to identify engineering problems, understand existing requirements and/ or constraints, articulate the problem by means of technical communication and formulate alternative creative solutions.
2	SUBJECT SPECIFIC	The Programme meets all the Specific Competences as established and agreed in collaboration with the field stakeholders taking into consideration the standards for the second cycle recommended by EUR-ACE for

accreditation of engineering programmes, clustered within the key overarching competences summarized below. The graduates must demonstrate:

Knowledge of

- the principal branches of mathematics relevant to Mechanical Engineering (arithmetic, geometry, algebra, trigonometry, analysis, calculus, differential equations, numerical methods, linear algebra, probability and statistics, and optimization);
- The basic sciences, including science of materials, physics, and the transformations and interactions of matter, energy and signals, which affects the functionality of mechanical systems;
- The Physics for understanding the structure and principles that govern the natural and artificial world for obtaining solutions to problems, by means of the design of complex systems;

Comprehension of

- the Mechanical engineering principles finalized to design products and mechanical systems, or energy production plants;
- the relationship between the theoretical models of a mechanical product and its useful properties;

Application

- ability to apply logical reasoning and quantitative calculation, and to use mathematical language;
- ability to solve Mechanical engineering problems using differential equations, numerical methods, calculus-based physics, chemistry, and statistics;

Analysis

- ability to safely conduct mechanical engineering experiments according to established procedures, and analyze, interpret, and report the results;
- ability to analyse and solve mechanical engineering problems in a creative and effective manner, using basic principles, modern techniques and systematic approach;

Synthesis

- ability to design mechanical engineering experiments to investigate a phenomenon, conduct the experiment safely, and analyze and interpret the results;
- capacity to contribute to innovation and practical implementation of ideas for a new mechanical system, industrial product, manufacturing process and in advanced industrial research;
- ability to perform a feasibility study, for industrial product development or to design a new mechanical system, from the customer need, by using the best engineering practices and by performing investment analyses or other economic considerations;

Evaluation

- ability to assess the need to implement changes in industrial processes to perform product quality improvement, environmental impact reduction and the improvement of the production efficiency;
- ability to assess the impact of engineering solutions in societal context and to apply engineering principles to develop products and manufacturing processes that are sustainable.

F	COMPLETE LIST OF PROGRAMME LEARNING OUTCOMES
	<p>Upon successful completion of the 2nd Cycle degree in Mechanical Engineering, the typical outcomes of the graduates are listed as follows:</p> <ul style="list-style-type: none"> - an ability to apply knowledge of mathematics, science, and engineering - an ability to design and conduct experiments, as well as to analyze and interpret data - an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability - an ability to function on multidisciplinary teams - an ability to identify, formulate, and solve engineering problems - an understanding of professional and ethical responsibility - an ability to communicate effectively - the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context - a recognition of the need for, and an ability to engage in, lifelong learning - a knowledge of contemporary issues - an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

