Course title

Advanced Technician for mechanical and material design

Course profile

Advanced technicians for mechanical and material design work in the design and industrialization of mechanical processes/products. They will be required to intervene in the selection and processing of the materials used, based on the functional and performance characteristics required of the product/component by adopting intelligent materials, capable of improving performance. Through specific software for the representation and simulation of the product/process, designing the application of required materials following an approach of the product life cycle (up to recycling) and plan the technological processes of treatment, coating or additivation for improved or intelligent performance.

Organization (main teaching, training and verification methodologies)

The main learning activities include:

- General courses in linguistic, communicative, relational, scientific, technological, legal, economic, organizational and managerial fields;
- Teachings of a technical-professional nature both common to the reference area (Made in Italy Technologies - Mechanical System) and specialist/distinctive of the profile.

The course is carried out in 2 full-time annuities, which constitute a student workload total of 1,500 hours.

The workload includes all the training methods:

- In the classroom;
- In didactic laboratories in offices equipped with software, systems and tools for exercises and checks, also installed at member companies/partners;
- Project Work/Research Project;
- Internship;
- Individual study.

Most of the teaching hours are entrusted to member companies or partners, who provide experts and/or in the company setting with related technological equipment, laboratories, plants and technical documentation.

40% of the work takes place in the company through an internship and establishing a strong link in the production fields.

Guided visits are also provided to leading companies and to laboratories and research centres both in and outside the Region. Visits to events or fairs abroad may also be possible.

Methodologies and verification criteria

At the end of the course there will be a final exam for the release of the Advanced Technician diploma.

The assessment of learning outcomes is also carried out at the end of each training unit, with the following criterion:

- Practical exercises to verify and evaluate the learning outcomes of the training units which provide for the prevalence of active and laboratory teaching methodologies and/or learning focused on the technologies in use;
- Written exercises to verify and evaluate the learning outcomes in theoretical training units which involve the use of traditional teaching methods.

Disciplinary area of reference (ISCED - F)

0715 Mechanics and metal trades

Job title (national classification/standard)

Advanced technician for the innovation of processes and mechanical products

Level

QF - EHEA: short cycle qualification

EQF: level 5

Total ECTS credits

120

Learning outcomes of the study course

At the end of the training path the student will be able to:

- Manage communication and relational processes within and outside the organization both in Italian and in English;

- Master the linguistic tools and information and communication technologies to interact in the workplace;
- Arrange, negotiate and develop activities in working groups to tackle problems, propose solutions, help in production, order and evaluate collective results;
- Organize and use information, data and their aggregations;
- Use statistical tools and models in the description and simulation of the different scenarios of the reference area;
- Develop and implement design, prototyping and industrialization techniques;
- Intervene in all segments of the supply chain from production to marketing;
- Manage production flows in programming, control and cost-effectiveness, also in relation to the methods of industrialization and continuous improvement;
- Configure, calibrate, document and maintain automatic systems of different types;
- Know the physical, chemical, mechanical and technological properties of different materials, with particular reference to metallic, polymeric, composite and synthesized materials;
- Choose the most suitable processing and treatments in reference to the characteristics of materials and the requests of the requested technical specifications.

Year I

Area/ Range	Competence objectives from national classification/ standard	Module	Main contents	Learning outcomes of the unit	Methods and criteria for verifying results	Learning methodologies, contexts and related workload (hours)	ECTS credits
General linguistic, communicative and relational field	Use technical English (micro language), related to the technological area of reference, to communicate correctly and effectively in the contexts in which is required. Manage the communication and relational processes inside and outside the organization both in Italian and in English. Prepare technical and regulatory documentation that can be managed through the telematic networks.	Technical English I	Communication in English (written, oral) on technical-specialist subjects relating to the professional domain and workplace.	Be able to communicate in English at both written and oral level using a specific language and terminology specific to the sector.	Method: Written test multiple choice and oral interview in a foreign language. Criteria: The student will have to correctly demonstrate technical terminology and grammatical and syntactic correctness, as well as fluency in language conversation.	Classroom / laboratory: 60 hours Individual study: 90 hours	6
		German	Basic terminology level A1.	Use German as L2 at basic level.	Method: Language assessment tests (written production, listening /comprehension, oral production). Criteria: The student will have to demonstrate knowledge of basic terminology.	Classroom / laboratory: 30 hours Individual study: 45 hours	3
	Master the linguistic tools and information and communication technologies to interact in life and work contexts.	Communication	The concept of communicative process: components, phases, personnel, etc. Interpersonal and group communication. The channels of communication and its forms: oral, written and computerized communication.	Use effective communication techniques.	Method: Evaluation through observation grids. Criteria: The student will have to	Classroom / laboratory: 20 hours Individual	2

			The phenomenon of perception The distortion phenomena of communication. Verbal and non-verbal communication Analysis of the context in which communication is inserted. The concept of active listening The regulation of communication within the working group. The concept of assertiveness The planning of a communicative event: definition of the objective, of the recipient, of the time, of the tools.		demonstrate an ability to communicate effectively within a negotiating situation.	study: 30 hours	
		Digital tools for collaborative work, presentation and communication	Fundamental assets of collaborative work tools: speed, accessibility, usability, sharing and security E-mail as a contact and repository tool (risks and opportunities). Mobile and multi-channel work (access to content from PC, notebook, smartphone or tablet). Collaborative exchange applications (video collaboration platforms, Whatsapp, WeTransfer and Skype). Transparent and traceable management tools for company workflows: technological solutions for the convergence of office automation, document management and management systems (co-editing, self-service analytics, personal archiving). Platforms and web promotion tools (Facebook Ads, Google AdWords) and organic positioning and search engine optimization (SEO).	Know how to use online collaboration tools. Know how to use presentation and communication tools. Know how to intervene in digital communication activities: digital marketing, positioning and optimization on search engines (SEO).	Method: PC practice test. Criteria: The student must demonstrate the use of online collaboration tools and/or presentation and communication.	Classroom / laboratory: 16 hours Individual study: 14 hours	1

	Arrange, negotiate and develop activities in working groups to face problems, propose solutions, help produce, order and evaluate results.	Team work	Teamwork, cooperation (outdoor methodology at IAL Campus in Cervia - Teambuilding in the kitchen and in the classroom, orienteering in the city).	Identify leadership style and interpret the main motivational dynamics that favour the active participation of the members in a working group.	Method: Practice Test. Criteria: Placed in a team working situation, the student will have to demonstrate collaborative skills, listening and proposing solutions.	Classroom / laboratory: 16 hours Individual study: 24 hours	1,5
General Scientific and technological field	Use statistical tools and models in the description and simulation of the different phenomenologies of the reference area, in the application and development of the appropriate technologies. Use tools and methodologies specific to experimental research for the applications of the technologies of the reference area.	Statistics	Fundamentals of descriptive statistics and statistical distributions – Statistical distributions – Representation of data: tables and graphs – Central indices of a distribution (average, mode, median) – Dispersion indices – Range and range of variation – Concept of optimization; (also called what-is-best approach) – Mean Absolute deviation (MAD) – Variance and standard deviation – Probability calculation – Logic of events – Schematic diagrams – Repeated tests – Regression correlation and linear programming – Correlation – The technique of linear regression – Linear programming	Know the basics of statistics.	Method: Written tests of applied statistics. Criteria: The student will have to demonstrate an ability to solve problems through applied statistics.	Classroom / laboratory: 12 hours Individual study: 18 hours	1

General organizational and management area	Organize and manage, with a good level of autonomy and responsibility, the work environment, personnel and the reference technological system in order to achieve the expected production results.	HSE - Security	The company's HSE (Health Safety Environment) structure to safeguard workers' health and safety and environmental protection. Integrated risk management; integrated management of plant safety and protection of the working environment. Technical and managerial governance of business continuity. Risk assessment for the user of machines and ISO/TR 14121-2 Safety of machinery.	Apply company regulations and procedures for the prevention of accidents and the safeguarding of health and safety conditions in the workplace, effectively managing general and specific risks.	Method: Multiple choice test. Criteria: The student must demonstrate knowledge of the HSE model of integrated risk management.	Classroom / laboratory: 16 hours Individual study: 24 hours	1,5
Common professional technical skills - Made in Italy Technologies Area - Mechanical system	Develop and implement design, manufacturing and prototyping techniques. Research and apply the technical and safety regulations of the electrical, electronic and mechanical sector in the design and use of components.	Reading and interpretation technical drawings	From understanding drawings to the working cycle: sequence of classroom exercises and subsequent laboratory checks for external and internal turning, drilling, tapping, boring, milling. From the reading of an overall drawing of a mechanical group to the assembly cycle: sequence of classroom exercises and subsequent laboratory checks for the assembly of subgroups and groups including commercial parts such as: bearings, sealing rings.	From understanding drawings, obtain data for the compilation of the processing cycle and from a drawing of an assembly, the data for the study of couplings, extraction of details, assembly cycle.	Method: Laboratory tests. Criteria: The student will have to demonstrate that he can read and interpret mechanical technical drawings.	Classroom / laboratory: 60 hours Individual study: 36 hours	4
		Applied Mechanics I	Kinematics, dynamics, static, rotary motion transmission, axial, bending, shear, compound, torsional flexure, resistances, gear wheels, crank mechanisms, coil springs, bending beams, hyperstatic beams, joints, couplings.	Use the fundamentals of mechanics applied in work activities.	Method: Simulation tests related to hypothetical company orders. Criteria: The student will have to demonstrate an ability to use the fundamentals of applied mechanics.	Classroom / laboratory: 85 hours Individual study: 48 hours	5,5

		Make drawings and use 2D/3D CAD systems I	Two and three dimensional Computer Aided Design	Use 2D and 3D AutoCAD to carry out projects of increasing complexity.	Method: Simulation tests related to hypothetical company orders. Criteria: The student will have to demonstrate an ability to make drawings using CAD systems.	Classroom / laboratory: 30 hours Individual study: 12 hours	1,5
	Identify materials, relative processes and the treatments suitable for various uses.	Material properties	Physical properties (coefficient of thermal expansion, density, etc.) Chemical (corrosion resistance, etc.) Mechanical (tensile strength, compression strength, resilience, hardness, etc.) Technological (malleability, ductility, fusibility, weldability, etc.) Tensile test, hardness tests, resilience test.	Know how to choose material based on its characteristics.	Method: Simulation tests. Criteria: The student will have to demonstrate an ability to recognize the characteristics and properties of the different materials.	Classroom / laboratory: 30 hours Individual study: 20 hours	2
		Metallic materials	Ferrous alloys, aluminium and light alloys, copper and its alloys, magnesium and ultra-light alloys, titanium.	Know how to choose material based on its characteristics.	Method: Laboratory tests. Criteria: The student will have to demonstrate an ability to recognize the characteristics and properties of the different metal materials.	Classroom / laboratory: 70 hours Individual study: 40 hours	4,5
		Polymeric materials	Thermoplastic and thermosetting polymers, engineering plastics. Polypropylene. Elastomers. Processing technologies and applications. Metal replacement.	Know how to choose material based on its characteristics.	Method: Laboratory tests. Criteria: The student will have to demonstrate an ability to recognize the characteristics of polymeric materials.	Classroom / laboratory: 33 hours Individual study: 18 hours	2

		Composite materials	Polymer, metallic, ceramic matrix. Fibre reinforcement (glass, carbon, Kevlar). Structured composites. Forming and rolling.	Know how to choose material based on its characteristics.	Method: Laboratory tests. Criteria: The student will have to demonstrate an ability to recognize characteristics of composite materials.	Classroom / laboratory: 20 hours Individual study: 12 hours	1
		Sintered materials	Powder metallurgy: reduction, conditioning, thermal and thermomechanical sintering.	Know how to choose the material based on its characteristics.	Method: Laboratory tests. Criteria: The student will have to demonstrate an ability to recognize the characteristics of the sintered materials.	Classroom / laboratory: 25 hours Individual study: 14 hours	1,5
	Choose the processing technologies and the relative machines on the basis of the technical-economic characteristics required.	Processing of materials	Chip removal machining (turning, milling, toothed gears, grinding with manual and numerical control machines). Plastic deformation processing (rolling, drawing, extrusion, moulding, etc.) Fusion processing, Welding processes EDM, Ultrasonic processing. Laser processing, Plasma processing. Powder metallurgy. Checks and tests (dimensional, non-destructive: ultrasound, magnetoscopic, with induced current, penetrating liquids, etc.).	Choose the most suitable processing with reference to characteristics of the material and the requests of the technical specifications received.	Method: Laboratory tests on machinery. Criteria: The student will have to demonstrate an ability to choose the most suitable processing.	Classroom / laboratory: 85 hours Individual study: 48 hours	5,5
		Treatments I	Annealing. Tempera. Tempering. Quenching and tempering. Diffusion thermo/chemical treatments: carbo-cementation, nitriding Jominy test, metallographic test.	Choose the most suitable heat treatment.	Method: Laboratory tests on machinery. Criteria: The student will have to demonstrate an ability to choose the most suitable processing.	Classroom / laboratory: 25 hours Individual study: 12 hours	1,5

Specific technical professional skills for the job		Welding	Main types of welding, adjustment of the welding machine, standards, defectiveness of welded joints.	Correctly manage welding problems in compliance with regulations.	Method: MAG - TIG and electrode welding laboratory tests. criteria: The student will have to demonstrate that he can use welding techniques.	Classroom / laboratory: 32 hours Individual study: 18 hours	2
INTERNSHIP I			The 1st year internship is divided into: part 1 (120 h) application with curricular objectives in areas: a) characterization of metallic materials and alloys; b) mechanical processing of metal materials for removal; part 2 (120 h) application with curricular objectives in areas: a) other processing of materials (deformation, casting, welding, ultrasound, laser, plasma) and heat treatments; b) analysis, design and verification of mechanical kinematic mechanisms.	Develop a greater awareness on personal study path, consolidating the knowledge acquired in the classroom phase.	Method: Observation and verification of the intern's performance by evaluating their effective exercise of knowledge and skills. Self-evaluation and reworking of the experience by the student. Criteria: The chosen evaluation will include an evaluation judgment of the company tutor and subsequent feedback with the student's self-evaluation by the agency's educational. The result of the combination of hetero and self-evaluation constitutes the summary report of the experience, which will be one of the objects of the final exam.	Internship in the company: 240 hours Individual study: 72 hours	13

Total hours in classroom/laboratory in year I: 665
Total internship hours in year I: 240
Total sum of hours in year I: 905

Year II

Area/ Range	Competence objectives for national classification/ standard	Module	Main contents	Learning outcomes of the unit	Methods and criteria for verifying results	Learning methodologies, contexts and related workload (hours)	ECTS credits
General linguistic, communicative and relational field	Use technical English (micro language), related to the technological area of reference, to communicate correctly and effectively in the contexts in which is required. Manage the communication and relational processes inside and outside the organization both in Italian and in English. Prepare technical and regulatory documentation that can be managed through telematic networks.	Technical English II	Communication in English (written, oral) on technical-specialist subjects relating to the professional domain and workplace.	Be able to communicate in English at both written and oral level using a specific language and terminology specific to the sector.	Method: Written test multiple choice and oral interview in a foreign language. Criteria: The student will have to demonstrate mastery of sector technical terminology and grammatical and syntactic correctness, as well as fluency in language conversation.	Classroom / laboratory: 40 hours Individual study: 60 hours	4

	Assess the implications of information flows with respect to the effectiveness and efficiency of the management of production or service processes, also identifying alternative solutions to ensure quality.	Analysis, use and protection of digital data	Introduction to complex predictive models (inferential statistics and nonlinear systems) based on nonlinear data sets, raw data and large amounts of data to reveal relationships and dependencies and make predictions of results and behaviours. Presentation of analysis and data mining tools with emerging technologies based on cloud computing and distributed computing: Hadoop, MapReduce and NoSQL databases Data protection: general regulation for the protection of personal data n. 2016/679 and the data protection organizational structure. Corporate network and data protection plan: device configuration, backup and cybersecurity processes against the dangers of device theft and cryptolocker virus.	Analyse, manage, interpret big data and open data. Know and apply the right level of protection to the data (Reg. EU 679/2016 - GDPR). Know and adopt different copyright and license rules to apply to data, digital information and content. Apply different behavioural rules and know-how in the use of digital technologies and in the interaction with digital environments.	Method: Open-ended questionnaire. Criteria: The student must describe the application potential of complex predictive models based on large amounts of non-linear data and the use function of data protection systems in the company.	Classroom / laboratory: 16 hours Individual study: 4 hours	1
General Scientific and technological field	Use statistical tools and models in the description and simulation of different phenomenologies of the reference area, in the application and development of appropriate technologies.	Office suite	Word, Excel, Internet and Email	Use MS Office packages.	Method: PC practice test. Criteria: The student will have to demonstrate mastery in the use of Microsoft Office applications.	Classroom / laboratory: 16 hours Individual study: 4 hours	1
	Use tools and methodologies specific to experimental research for the applications of the technologies of the reference area.	Environmental management (recycling of materials)	Reuse, recycling, recovery and disposal of technical materials. Environmental focus: solutions for the enhancement of waste, residues that derive from the processes of processing materials (e.g. steel) also in the perspective of industrial symbiosis.	Apply pyramid waste management techniques.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student must demonstrate to apply the circular economy to the recovery, reuse, recycling and disposal of slags and residues from steel processing.	Classroom / laboratory: 22 hours Individual study: 33 hours	2

General Legal and economic field	Use negotiation strategies and techniques with reference to the market in which companies in the sector also operate to strengthen their image and competitiveness.	Marketing and Innovation	Corporate strategy. Customer and the Value for the Customer. The concept of Marketing and consumer behaviour. The market: actors and competitive forces. Segmentation and positioning. The development of new products Portfolio of Innovation projects.	Use the main marketing concepts	Method: Exercise. Criteria: Starting from the analysis of a business case, the student must demonstrate an ability to apply segmentation and market criteria and product positioning.	Classroom / laboratory: 16 hours Individual study: 24 hours	1,5
	Find sources and apply the regulations that regulate the life of the company and its external relations at national, European and international level. Know the relevant rules governing the company and the impact for the company in a territorial context.	The firm: constituent and regulatory factors	The main types of businesses The world, European and national standardization specific to the reference sector. The Machinery Directive. Labour law.	Know the main national, European and international regulations that regulate the life of the company and its internal and external relations.	Method: Written multiple choice test. Criteria: The student will have to correctly demonstrate an ability to interpret the definition of enterprise, company and society relevant to economics, organizational and legal discipline.	Classroom / laboratory: 16 hours Individual study: 24 hours	1,5
	Know the relevant rules governing the company and the impact for the company in a territorial context.	Entrepreneurship	From idea to action, entrepreneur profile. Entrepreneurship concept: starting and managing your own business. Entrepreneurship concept: the completion of entrepreneurial skills in non-owned work environments. The "Five C's"; key entrepreneurial model: knowledge (knowing), ability (knowing how to do), behaviours (knowing how to be), personal characteristics, context of entrepreneurs/entrepreneurial life.	Experimenting with ideas transforming them into action with the entrepreneur/ entrepreneurial activity.	Method: Simulation (Role play). Criteria: The student will have to correctly demonstrate an ability to interpret entrepreneurial action with reference to the skills acted in the simulation.	Classroom / laboratory: 8 hours Individual study: 12 hours	1

		Leadership in corporate organizations	Leadership styles (visionary, democratic, motivator/coach, demanding, harmonizing, authoritarian) in relation to the various organizational contingencies. Exercise of leadership on Change management and Project management situations.	Use adequate leadership techniques within the company context in relation to the role covered.	Method: Simulation (Role play). Criteria: The student will have to correctly demonstrate an ability to interpret the leadership style required for change management and/or project management.	Classroom / laboratory: 14 hours Individual study: 21 hours	1,5
General organizational and management area	Organize and manage, with a good level of autonomy and responsibility, the working environment, personnel and the reference technological system in order to achieve the expected production results.	HSE - Organization	Work environment, human context, technological system: risks, damages, prevention, protection.	To participate consciously in the integrated management of Health, Safety and the Environment.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student must demonstrate to correctly apply the organizational procedures provided by the safety management system.	Classroom / laboratory: 8 hours Individual study: 12 hours	1
	Manage relationships and collaborations within the organizational structure within the work contexts, evaluating their effectiveness.						
	Manage external relationships and collaboration - interpersonal and institutional - evaluating their effectiveness.						

	Know, analyse, apply and monitor, in specific contexts, management models of production processes of goods and services.	Industrial property and patents (in English)	Patents and models, national and supranational patentability requirements. Patent documents as sources of technical information. Patent databases.	Enhance an invention while protecting its Industrial Property; correctly interpret patent documents and carry out prior art searches.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student must correctly demonstrate an ability to interpret the patent documents as sources of technical information.	Classroom / laboratory: 8 hours Individual study: 12 hours	1
	Analyse, monitor and control competently, the production processes in order to formulate proposals/ identify solutions and alternatives to improve the efficiency and performance of the technological and personnel resources used with a view to progressive continuous improvement. Know, analyse, apply and monitor, in specific contexts, management models of production processes of goods and services.	Costs - times and methods	Industrial product costs (direct and full). Analytical accounting dimensions: time, subject of allocation and cost configuration.	Apply industrial accounting management techniques.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student will have to correctly demonstrate an ability to apply product certification techniques.	Classroom / laboratory: 12 hours Individual study: 18 hours	1
	Know and help to manage the quality organizational models that encourage innovation in companies in the sector.	Quality: ISO standards for the product design/ certification	Technical, relational, environmental, organizational quality; reference standards and regulations and requirements of business management systems.	Manage programming procedures, control and continuous improvement of product quality.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student will have to correctly demonstrate an ability to interpret the requirements of the ISO standards relating to product design.	Classroom / laboratory: 16 hours Individual study: 24 hours	1,5

	Know, analyse, apply and monitor, in specific contexts, management models of production processes of goods and services.	Lean manufacturing (in English)	Lean production and guiding principles (value, flow, cadence, pull, Kaizen). Lean techniques: JiT, 5S, visual management, A3 (problem solving).	Apply lean manufacturing methods.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student will have to correctly demonstrate an ability to interpret the principles and techniques of lean manufacturing.	Classroom / laboratory: 12 hours Individual study: 18 hours	1
Common professional technical skills – Made in Italy Technologies Area - Mechanical system	Develop and implement design, manufacturing and prototyping techniques. Programming industrial automation systems (PLC, robots, CNC machines, communication networks, monitoring and diagnostics systems, etc).	Applied mechanics II	Gearing, material resistance, tensile test, rolling bearings, transmission between skewed axes, worm gears, eccentric and cams, connecting rod-crank mechanism, flywheels.	Use the basics of mechanics applied in work activities.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student must be able to carry out the kinematic study of a gear train.	Classroom / laboratory: 75 hours Individual study: 37 hours	4,5
		Make drawings and use 2D / 3D II CAD systems	Transformation from 2D to 3D, 3D Orbit, perspective axonometry, generation of elevations and sections, three-dimensional solid modelling, modification of surfaces, printing in three-dimensional space.	Use 2D and 3D AutoCAD.	Method: CAD tutorial. Criteria: The student must be able to model solids and surfaces.	Classroom / laboratory: 50 hours Individual study: 12 hours	2,5
		Parametric solid modelling	PTC Creo Parametric; LEAN cost educational environment Sketcher; technical features, Top-Down modelling, from the three-dimensional model to the two-dimensional table.	Realization of three-dimensional exploded views and generation in two-dimensional environment of tables with automatic shot peening.	Method: CAD tutorial. Criteria: The student must be able to perform parametric modelling of a solid.	Classroom / laboratory: 50 hours Individual study: 12 hours	2,5

	Intervene in all segments of the supply chain from production to marketing.	Industrialization of the product	BOM structure and manufacturing cycles. The planning of the process: study of the working cycles, definition of cycle, phase, sub-phase, elementary operations. manufacturing and assembly of parts and components. Process selection: product-process matrix, identification of manufacturing technologies/ assembly equipment and scheme of production layout strategies. Eco-design of products and production systems. Environmental focus: Eco-design solutions, to encourage the reduction of the use of raw materials and energy, reuse and recyclability of waste or by-products of the processes during the production phase.	Understand the phases of industrialization and its upstream and downstream relationships with other value creation processes.	Method: Exercise. Criteria: The student must be able to configure a production cycle starting from the bill of materials of the product.	Classroom / laboratory: 20 hours Individual study: 10 hours	1
	Manage post-sales and maintenance needs.						
	Manage production flows in their programming, control and cost-effectiveness, also in relation to the logic of industrialization and continuous improvement.						
	Configure, size, document and maintain automatic systems of different types.						
	Apply fault prevention, analysis and diagnostics methodologies on systems and plants and propose possible solutions.						
	Choose the processing technologies and relative machines on the basis of the technical-economic characteristics required.	Processing of materials II	Laser, plasma energy beam processing. Powder metallurgy and sintering. Checks and tests (dimensional, non-destructive: ultrasound, magnetoscopic, with induced current, penetrating liquids, etc.)	Choose the most suitable processing with reference to the characteristics of the material and the requests of the technical specifications received.	Method: Exercise Criteria: Starting from the analysis of a business case, the student must demonstrate knowledge of the different functions of	Classroom / laboratory: 20 hours Individual study: 10 hours	1

					use of energy beam and sintering processes.		
		Treatments II	Thermo-chemical diffusion treatments: carbo-cementation, nitriding, jominy test, metallographic test.	Choose the most suitable heat treatment with reference to the characteristics of the material and the requests of the technical specifications received.	Method: Exercise. Criteria: Starting from the analysis of a business case, the student will have to demonstrate knowledge of the different functions of use of thermo-chemical treatments.	Classroom / laboratory: 16 hours Individual study: 7 hours	1
		3D printing and additive manufacturing technologies	3D printing. Additive manufacturing technologies and materials characterization; Stereolithography (SLA), modelling for deposition of molten material (FDM), selective laser sintering (SLS), selective laser fusion (SLM) databases of interoperable business 3D models; optimization of the 3D model in production.	Know and use additive manufacturing technologies. Realize innovative parts and products through the use of additive manufacturing technologies and three-dimensional printers.	Method: Exercise. Criteria: The student must be able to generate the STL file from a CAD model of the prototype to be made in 3D printing.	Classroom / laboratory: 40 hours Individual study: 24 hours	2,5
Specific technical professional skills for the job		Design/ development/ implementation of a technical project	Simulation of a complete process with interdisciplinary team work: design, industrialization, processing, treatment and control of a technical product.	Develop technical solutions to design, develop and manufacture a technical product in the reference area.		Classroom / laboratory: 60 hours Individual study: 15 hours	3

INTERNSHIP II	The second year internship is divided into: application part 1 (120 h) with curricular objectives in areas: a) rapid prototyping; b) analysis of assembly cycles; c) analysis, design and fatigue verification of components; d) CAD parts drawing; part 2 (440 h) application with curricular objectives in areas: a) 3D drawing of mechanical parts, finite element simulation and modelling; b) product industrialization (feasibility study, reverse engineering and use of PDM data).	Develop a greater awareness of personal study path, consolidating the knowledge acquired in the classroom phase.	Method: Observation and verification of the intern's performance by evaluating their effective exercise of knowledge and skills. Self-evaluation and reworking of the experience by the student. Criteria: The chosen evaluation will include an evaluation judgment of the company tutor and subsequent feedback with the student's self-evaluation by the agency's educational. The result of the combination of hetero and self-evaluation constitutes the summary report of the experience, which will be one of the objects of the final exam.	Internship in the company: 560 hours Individual study: 12 hours	23

Total classroom/laboratory hours in year II: 535
Total hours of internship in year II: 560
Total sum of hours in year II: 1,095

Progression rules (prerequisites)

Successful completion of the first year is necessary to access the second year of the course and only upon obtaining 60 credits.

At the end of the course in year II, the diploma of Advanced Technician is obtained after passing a final test. The diploma stipulates the technological field and the national classification/standard, which allows access to public competitions and universities with the recognition of university credits. The EUROPASS certificate is also issued in Italian and English.

Internship abroad

Participants are given the opportunity to carry out part or the entire internship period in foreign companies. Credits are recognized without any further activity or learning verification being requested from the student.

Flexibility / customization

Extracurricular REALIGNMENT modules (Applied Mathematics - English - Mechanics – Studying Technical Drawings) are provided for all admitted students. The aim is to provide all participants with a level of knowledge and preparatory skills in order to be able to face the course. Realignment is mandatory for all participants. These hours are to be considered additional to the expected course hours.

Credit calculation criteria

The calculation criterion applied is the following:

1 credit = sum of classroom hours / laboratory / enterprise / internship + individual study hours / 25 hours (except for rounding up).

Course location

ITS MAKER Foundation

Modena office