Department of Innovative Technologies
The Department of Innovative Technologies (DTI) is active in Information Technology, Artificial Intelligence, Electronics, Mechanics, Industrial Production and Medical Technologies.

The Department engages in engineering education as well as applied research and technology transfer projects with companies.
University courses

The Department of Innovative Technologies offers various Bachelor Programmes:
• Bachelor in Electrical Engineering
• Bachelor in Engineering & Management
• Bachelor in Computer Science
• Bachelor in Mechanical Engineering
• Bachelor in Data Science and Artificial Intelligence

The Department also offers two Master programmes:
• Master of Science in Engineering
• Master of Arts in the Teaching of Mathematics at Lower Secondary level

All the educational programmes are recognised at the Federal and European levels. Students must obtain a total of 180 ECTS (European Credit Transfer System) for the Bachelor programmes, 90 ECTS for the Master in Engineering and 124 ECTS for the Master in Teaching.

The educational programmes offer a sound foundation for the students to build upon to develop into professional engineers. Practical activities account for a large share of the programme, ranging from over 20% of the programme in the first year to roughly 40% in the third year. Our close relationships with the job market enables nearly all DTI graduates to find employment readily.

Bachelor in Electrical Engineering

The Electrical Engineer is a professional at the cutting edge of modern technology who uses electricity to process and transmit information, as well as to transport energy. In particular, he designs systems integrating sensors, actuators, power circuits and microprocessors, combined with algorithms and signal processing techniques in the fields of telecommunication, automation, etc.

The applications of his developments range from solving the most diverse problems of everyday life up to the most technologically advanced fields, such as the renewable energies of the future and space exploration.

The degree course offers a common first part of 4 semesters focusing on the basic subjects: mathematics, physics, electrical engineering, analogue and digital electronics, programming, metrology and microelectronics.

In the last two semesters, students choose between two in-depth studies:
• Signal and control electronics: focusing on numerical signal processing algorithms in the embedded environment, techniques for the realisation of integrated circuits and the automatic control of mechatronic systems.
• Energy: focusing on aspects relating to power generation, both centralised (nuclear, coal, etc.) and distributed (solar, wind, etc.), as well as power transport and storage, integrating topics such as optimised grid management through intelligent algorithms.

In addition to these in-depth studies, the curriculum offers elective modules in semesters 4, 5 and 6, for example: optoelectronics, embedded systems, regulation and control systems, medical technologies, Internet of Things (IoT), and more.

The SUPSI graduate in Electrical Engineering is therefore a versatile figure who can cover a wide range of roles. Some possible careers include: researcher and developer of circuits and systems in the field of automation, telecommunications, energy, etc., quality manager, marketing and sales manager, up to company management.
Bachelor in Engineering and Management

The Bachelor in Engineering and Management trains professionals who can design and deploy optimal solutions both in economic financial terms and technological ones, across several market sectors. In the first two semesters, the Bachelor in Engineering and Management embraces fundamental subjects such as analysis, linear algebra, physics and mechanics, programming, materials science and chemistry. Starting from the third semester, students deal with a range of professionalising subjects, such as production and logistics, industrial plant management and industrial production.

In their fourth semester, students can choose between five specialisation options:
- **Additive manufacturing**
- **Industrial sustainability**
- **Industry 4.0 and the factory of the future**
- **Logistics**
- **Pharmaceuticals**

The Bachelor promotes projects in collaboration with companies, seen as an excellent way for students to specialise and experience hands-on education: indeed, starting from a solid theoretical framework, the thesis and specialisation projects are practical and well-contextualised activities always carried out with local companies. The high flexibility of the profile allows the management engineer to adapt to multiple business needs and to play an irreplaceable role within manufacturing companies in various areas, including: procurement and management of materials; organisation and automation of production systems; planning, management and control of production processes; planning and management of logistics systems; evaluation of investments, risk management in financial and industrial areas.

Bachelor in Computer Science

The Bachelor in Computer Science trains professionals with in-depth knowledge in methodologies of software design and development, as well as in the management of systems in the Information Technology (IT) field. The degree course is strongly practice-oriented and connected to the professional world, with the aim of facilitating the student’s entry into the labour market. In addition to the basic scientific subjects common to the other courses, the Bachelor in Computer Science includes subjects such as database, digital technology languages and programming, modelling and simulation, computer architectures, computer graphics, operating systems, data management systems, algorithmic and software engineering.

During the third year, students can specialise by choosing between specific options, which include the following modules:
- **Data Science**
- **Game development**
- **Internet of Things**
- **Linguistic data processing**
- **Machine learning**
- **Security and privacy by design**

The specialisation options are updated annually in order to adapt them to technological developments and market requirements, so that students can successfully deal with real-life professional situations. At the end of the final year, students must work on their Bachelor projects, in collaboration with a company or research institute. Computer scientists are typically employed as designers or developers, or in the management of IT infrastructures and systems in different business environments. This professional figure is often expected to work in teams, sometimes multidisciplinary, and in contact with colleagues and customers. For this reason, the degree course develops both the technical and methodological aspects as well as the social and communication skills required to be able to collaborate and take on responsibilities within a working group. Group projects are also a central element of the entire course, as well as aspects of economics and entrepreneurship.

From the fourth semester onwards, the student can extend his or her knowledge by choosing modules on the following topics:
- **Business organisation**
- **Design and production**
- **Energy**
- **Railway technology**

The mechanical engineer is not only involved in product development, but also in the design and control of production processes. For this reason, these professionals are the most commonly employed in Swiss companies in comparison to other types of engineers. Their main career opportunities are found in the mechanical and electromechanical sector, companies and organisations for energy conversion, plant construction companies, automation and robotics industries. New graduates can find employment in a wide range of departments, such as product design, research and development, production planning, quality control, sales, technical and customer service.
Bachelor in Data Science and Artificial Intelligence

Graduates in Data Science and Artificial Intelligence know the fundamental methods of artificial intelligence and data science. They can implement them in organisations with large amounts of data that want to make their decision-making processes linked to the information contained in this data (e.g. financial and marketing institutions, manufacturing and process industries; transport systems; health sector, etc.).

Therefore, graduates in Data Science and Artificial Intelligence can:

- Operate in the different phases of data analysis: collection, choice of analysis methods, implementation, evaluation of results, and implications on ethics and privacy;
- Extract information and knowledge from data through Machine Learning in order to create value for the organisation;
- Develop artificial intelligence models and software libraries for autonomous systems; evaluate and optimise their accuracy, security, performance and scalability;
- Communicate the results to a non-specialist audience;
- Build automatic and efficient systems for Big Data analytics.

In each course, preference is given to active learning, practical exercises and laboratories, as well as project works. Interactions between courses carried out both in series and in parallel are also promoted, by means of transversal case-studies. Several multidisciplinary and team activities such as data challenges, hackathons and seminars are included in the study programme. Furthermore, an initial training is provided on the so-called soft-skills, mainly addressing teamwork, effective communication and project management. Finally, several courses include in depth analysis of specific domains and practical applications provided by lecturers coming from industry. Courses are taught in English.

Master of Science in Engineering

The Master of Science in Engineering (MSE) is offered in collaboration with the other Swiss Universities of Applied Science. The programme is structured over three semesters for a total of 90 ECTS. Theoretical lectures constitute 1/3 of the programme, while the remaining 2/3 are dedicated to professional development (projects, research, seminars). Classes are held in Lugano in English, in Lausanne in English or French and in Zurich in English or German. The MSE Master’s programme is practice-oriented and is characterised by a wide range of choices. The MSE guarantees students autonomy in shaping their studies according to their personal interests and professional goals. The Master offers 15 specialisation profiles covering different engineering disciplines, 11 of which are in the Engineering and IT field and 4 in the Construction and Planning field.

The Department of Innovative Technologies of SUPSI offers 10 specialisation profiles in the field of Engineering and IT, while one profile (Civil Engineering) is offered by the Department of Environment, Construction and Design.

The following profiles in the field of Engineering and IT are offered by SUPSI DTI:
- Aviation
- Business Engineering
- Computer Science
- Data Science
- Electrical Engineering
- Energy & Environment
- Mechanical Engineering
- Mechatronics & Automation
- Medical Engineering
- Photonics

Students acquire the skills to become the technical/management staff of the future for industry and the public sector. Their careers typically develop in the following areas: research and development, production, logistics and consultancy. In addition, their contextual and communication skills enable them, when necessary, to lead projects and teams also at an international level.

EIT Manufacturing Double Degree Master Program

SUPSI is a partner of EIT Manufacturing, the Innovation Community within the European Institute of Innovation & Technology (EIT) that connects partners from business, education and research active in the manufacturing sector in Europe.

In 2020, the EITM network launched the EIT Manufacturing Master School, a programme jointly developed by SUPSI, Mondragon Unibertsitatea (Spain), Technische Universität Wien (Austria), Aalto University (Finland), University College Dublin (Ireland), Politecnico di Milano (Italy) and Ecole Centrale de Nantes (France). The EITM master combines technical competence with skills on Innovation and entrepreneurship adopting a learning-by-doing approach.

Students follow one of four programmes (with international mobility):
1. People and Robots for Sustainable Work
2. Additive Manufacturing for Full Flexibility
3. Zero Defect Manufacture for a Circular Economy
4. Platforms for Digitalized value Networks

For each programme, different study paths are offered including one entry and one exit university among those belonging to the master school. At the end of the course, students receive two Master’s degrees (one per each of the two universities in the study path) and an EIT label certificate. Students enrolled in SUPSI get the Master of Science in Engineering degree (90 ECTS) from SUPSI and another degree of 120 ECTS from the other university involved in the selected study path.

Master of Arts in Mathematics Teaching

The Master of Arts in the Teaching of Mathematics at Lower Secondary level is conducted in collaboration with the SUPSI Department of Education and Learning. The programme lasts for three years and awards 124 ECTS. The first year takes place mainly at the Department of Innovative Technologies in Lugano and focuses on the fundamentals of the discipline. The second and third years focus on disciplinary didactics and take place mainly at the Department of Education and Learning in Locarno and at one or more public secondary schools in the Canton of Ticino. The programme trains participants to teach mathematics at middle school level, a profession serving the cultural development of citizens.
Continuing Education

The Department of Innovative Technologies conducts a wide range of engineering continuing education courses. The programmes consider both the ongoing technological developments and the market demands in terms of industry and services. There is a common approach to all the courses, which combines the transmission of theoretical knowledge with practical activities. On average, this latter component amounts to 50% of the teaching hours specified for a course and ensures that participants know how to apply their acquired technical expertise to real-world situations. In addition to the extensive catalogue of courses focused on electronics, information technology, industrial engineering, engineering and management, and project management, DTI Continuing education programmes may also include customised courses designed in line with the requirements and needs expressed by the counterparty.

The educational programmes are designed in such a way that attendance is possible in parallel with professional activity, so that students can obtain the relative diplomas or certificates without compromising their company positions.

The programmes include:

- **Master of Advanced Studies**
  Leading to a diploma recognised at the federal level, these courses constitute a solid basis for subsequent professional development (60 ECTS).

- **Diploma of Advanced Studies**
  Educational courses, usually offered every two years, and with a minimum of 360 teaching hours, leading to a qualification recognised by the University of Applied Sciences and Arts of Southern Switzerland (from 30 to 59 ECTS).

- **Certificate of Advanced Studies**
  These are 120 – 250 teaching hour study programmes, leading to a certificate recognised by the University of Applied Sciences and Arts of Southern Switzerland.

- **Short-term courses**
  These courses differ from the other educational programmes since they vary from a minimum of 12 to a maximum of 48 teaching hours. Participants receive an attendance certificate.

- **Events and Webinar**
  The Departmental Continuing education office also organises one-day educational events open to all, as well as free, online lessons at lunchtime on topics of broad interest, such as leadership, effective communication and project management.

In addition to the expertise of the instructors who are also active in research and development projects, the DTI continuing education programme enjoys a close collaboration with external organisations, including public institutions and private companies both in Switzerland and abroad. This close connection to employers ensures that the educational offer is always aligned with the needs of the job market.

The Department plans and implements its course catalogue by creating synergies with local professionals, and exploits the experience of instructors from industry and academia.

The Departmental Continuing education office operates in the following areas:

- **Computer Science**
- **Electrical Engineering**
- **Engineering and Management**
- **Fashion Innovation**
- **Industrial Engineering**
- **Project management**
The Department of Innovative Technologies can leverage an extensive network of collaborations at the regional, federal and international level to foster its R&D and educational activities. The Department promotes exchange programmes with prestigious universities and institutions, as well as joint research projects, particularly in the context of Horizon Europe, Eurostars and Eureka programmes. DTI further aims at playing a major role as a leading university at the global level in its fields of expertise.

At the federal level, the Department collaborates actively with the Swiss university network, and particularly with the other Universities of Applied Sciences operating in the engineering field, in terms of educational and joint research projects supported by the State Secretariat for Education, Research, and Innovation (SERI). The Master of Science in Engineering (MSE) was developed in collaboration with the other Swiss Universities of Applied Sciences.

The MSE includes the SUPSI Department of Innovative Technologies as a provider of federally-recognised specialist courses. Equally important in the applied research field are the thematic networks and projects supported by the Confederation through the Swiss National Science Foundation and Innosuisse, in which the Department is a recognised scientific partner. Thanks to its participation in national and international networks, the Department has global connections to top talent that maximize its effectiveness in education and research.

The Department trains the next generation of engineers to be employed locally or internationally, offers continuing education for local professionals and runs applied research projects with companies in the local region as well as nationally and internationally. The collaboration with local companies ensures the development of joint projects and initiatives with institutions (Canton Ticino, USI, the AGIRE Foundation, the Centre for Start Up Promotion), and also with economic associations such as AITI, Chamber of Commerce, Farmaindustria Ticino, Ticinomoda, as well as with many local companies.

Departmental collaboration networks

The Department of Innovative Technologies can leverage an extensive network of collaborations at the regional, federal and international level to foster its R&D and educational activities.

Computational analysis in the biomedical and pharmaceutical sector
Database analysis and model calculation for predictions, classifications and forecasting
Analysis and calculation of sustainability impacts
Non-invasive analysis of materials
Microstructural characterisation
Rheological characterisation and plastic injection process simulation
Fabless ASIC (Application Specific Integrated Circuit) design
Field Programmable Gate Array (FPGA) design
Computer forensics
Metrology in the RF (Radio Frequency) and EMC (Electromagnetic Compatibility) measurements
Design and integration of machines and robots in production contexts
Virtual prototyping with finished elements
WLAN networks (Wireless Local Area Network) simulation and planning
Development of discrete event simulation models of production processes
Development of advanced control systems for operating machinery
Development of artificial vision systems for industrial processes
Development of optimization tools based on Artificial Intelligence and Machine Learning methods
Research and technology transfer

The quality of the Department’s research is appreciated locally, nationally and internationally. Locally, the Department represents a reference point in the economic fabric. The Department engages in applied research and technology transfer activities through its active involvement in networks, initiatives and projects supported by a wide array of extra-mural funding sources.

The topics tackled involve the different engineering disciplines covered by the Department, ranging from computer science to electronics, from mechanics to materials, from production to artificial intelligence and medical technologies.

The following six research Institutes operate within the Department: Dalle Molle Institute for Artificial Intelligence (IDSIA USI–SUPSI), Institute of Systems and Applied Electronics (ISEA), Institute of Information Systems and Networking (ISIN), Institute of Systems and Technologies for Sustainable Production (ISTePS), Institute of Medical Technologies for Personalized Healthcare (MeDiTech) and Institute of Mechanical Engineering and Materials Technology (MEMTi).
IDSIA has been researching on artificial intelligence (AI) since 1988 and presently conducts basic AI research in combination with applications to industrial and economic contexts.

The main research topics of the Institute focus on automatic learning (machine learning, artificial neural networks, imprecise probabilities, data science, natural language processing), optimisation (heuristic, simulation, computational sciences, decision support systems), and cognitive and swarm robotics.

IDSIA’s staff is composed of about 80 people, including many data scientists able to solve complex problems thanks to their solid foundations in mathematics/statistics. IDSIA has achieved international recognition as a pioneering AI Institute, thanks to the algorithms developed by its researchers, such as LSTM neural networks, which are nowadays used in numerous AI systems and devices. IDSIA researchers combine their essential methodological know-how with strong skills in the development of real-world applications. The Institute annual turnaround amounts to approximately 4 million Swiss Francs. This amount is split between different research funding sources: Innosuisse applied research projects, usually performed in collaboration with companies; European Commission funded projects are awarded also thanks to influential competence networks to which IDSIA belongs; and also basic research projects financed by the Swiss National Fund for Scientific Research (FNS) and by the European Research Council (ERC). One of the outcomes of the involvement of IDSIA in these projects is a considerable scientific output which amounts to more than 100 scientific papers being presented every year at conferences or published on peer-reviewed journals.

Machine Learning and Data Science

Learning from experience (machine learning, ML) is often the best method for solving difficult, real-life problems. IDSIA implements ML to tackle problems such as the probability of a patient suffering from a specific illness, image interpretation, support in decision processes and system auto-calibration. The aim of the ML research work conducted by the Institute is to develop methods that prove reliable when data are the only possible source of information. The neural networks developed, together with the algorithms, provide convincing solutions, even with incomplete data series and on large data sets (big data).

Optimisation and Decision Support Systems

The effective solution to a problem related to planning, management or operational control can be obtained by means of appropriate AI algorithms, which, in turn, are based on simulation models and on decision support systems. IDSIA is working to find solutions to the problems of goods transportation and car-sharing, for production optimisation and electrical energy use, and for robot scheduling systems. Applications reach the computational biophysical sphere, in order to optimise drug delivery systems.

Cognitive Robotics and Swarm Robots

IDSIA studies human-robot interaction and swarm robot management (including drones), even without a centralised control. The methods implemented range from insect behaviour inspired architectures, to control devices derived from machine learning, and to other techniques based on evolutionary robotics.
Institute of Systems and Applied Electronics

ISEA works on systems and technologies related to electronics and technical computer science, applied to product development. ISEA's staff is composed of about 60 people, including 5 professors, more than 40 researchers and teachers, numerous assistants and interns. The Institute gathers specialist know-how and highly-qualified people, therefore offering a state-of-the-art and appealing degree course in Electrical Engineering. It also conducts significant applied research activity, in close contact with industry, public bodies and other academic institutes. As suggested by its name, the terms “systems” and “applied” emphasise the applicative nature of the activities conducted, aimed at supporting innovation in businesses by jointly developing new products and methodologies, improving production processes and transferring know-how. With an annual budget of approximately 3.8 million Swiss Francs, research work consists of regularity, more than forty projects financed by the Swiss Innovation agency Innosuisse, European research programmes or bodies, foundations or direct mandates. Its specialised know-how and highly-qualified researchers make ISEA the ideal partner for industrial high technology projects in various sectors: industrial, telecommunications, biomedical, environmental, aerospace and automotive.

Electronic systems

ISEA has scientific expertise in the fields of analogue and digital electronics, discrete and integrated, embedded intelligent systems equipped with microprocessors, microcontrollers and specific communication interfaces. Activities range from the design of electronic platforms to the development of technical software and firmware, programmable integrated components (CPLD, FPGA) and on silicon (mixed signal ASIC), to applications based on integrated DSP algorithms. The Institute works on the treatment of analogue signals and has experience in high and low power electronics and in wired (fieldbus) and wireless communication.

RF electronics, antennas and telecom

The Institute has a remarkable expertise in radiofrequency (RF) and microwaves technologies: ranging from electromagnetic field modelling and simulation, to system design, to testing with RF instruments. Activities span from the development of telecommunication systems to the integration of communication protocols, antenna design and applications for identification (RFID) and localisation (GPS). Specific focus is placed on the use of low-power microwaves in applications ranging from industrial (non-invasive analysis of materials), to medical (tomography) and environmental (radar for terrestrial monitoring). ISEA holds a METAS (Swiss Federal Institute for Metrology) accreditation for non-ionising radiation metrology.

Mechatronic and microtechnical precision systems

ISEA is engaged in the design and control of electrical machines and in the design of miniaturised electromechanical systems, actuators, sensors and positioning systems. This expertise is applied to the development of medical and rehabilitation systems, for cell culture, and also in the machine industry by means of high-precision, dynamic systems and work process controls. The Institute also has expertise in rapid-prototyping and in real-time software development.

Electronic systems for energy and power electronics

In terms of the design of electronic systems for energy, ISEA focuses on the management, reduction and optimisation of energy consumption. The application fields cover smart metering, energy scavenging, smarthome, smart-grid and smart-cities.

Optoelectronics and applied photonics

In the field of electronics for light, research activity is conducted in photonics, optoelectronics, colorimetry, spectrophotometry, laser systems and triangulation, imaging and lighting techniques.

Electronic systems in the medical and assistive sector

ISEA conducts research projects in the medical sectors of diagnostics, tomography and electromyography. It is also working on applications aimed at Active and Assisted Living (AAL) for elderly and people with disabilities. The Institute has expertise in terms of requesting authorisation from Swissmedic and from the Cantonal Ethical Committee, essential for performing experimental tests in hospitals.
The Institute of Information Systems and Networking (ISIN) is an ICT research Institute with a strong expertise in applied computer science as well as data and network science. Established in 2009, today ISIN employs about 60 professionals who engage in teaching and research. ISIN runs SUPSI's educational programmes in Computer Science at the Bachelor and Master level, in addition to several continuing education programmes. Applied research projects and academic activities are carried out in cooperation with Swiss and international partners and are funded through competitive external sources, such as Innosuisse, the European Commission, the Swiss National Science Foundation, as well as other private foundations. Technology transfer activities are typically supported directly by business partners. Research at ISIN primarily follows three scientific directions: human-computer interaction and communication systems; data analysis, processing, and cybersecurity; multimedia and educational technologies. ISIN professionals leverage a substantial core strength in a wide array of topics, including programming languages, development frameworks and tools, software architectures, development paradigms and methodologies, operating systems, databases and storage systems, data mining, computer graphics, networking architectures and protocols.

Human-Computer Interaction and Communication Systems

Today, the Internet is accessed by advanced human-machine and machine-machine interfaces provided on computers and smart devices. Users and things perform pervasive forms of communication, where everything can talk to everything else. Humans are part of complex systems integrating sensors, actuators and infrastructure in a wide range of application fields ranging from smart living to smart industry. ISIN’s expertise includes: human-computer and computer-computer interfaces, distributed and polymorphic user interfaces, natural language processing, smart sensing frameworks (wearables), IoT and mobile application development, wireless technologies, wireless sensor networks, pervasive computing, cyber physical systems for smart homes/cities/regions, social media/networks, cognitive and semantic systems, behavioural analysis.

Data Analysis, Processing and Cybersecurity

The value of data is continuously growing in our information society. Structured and unstructured data from heterogeneous sources must be safely collected, stored and processed for value extraction. Exposure to hacking attacks and sabotage resulting in data loss and data breaches must be avoided at all costs. ISIN’s expertise includes: cloud native applications and cloud APIs, micro-service architectures, web technologies, big data analytics, data visualization techniques, distributed and parallel computing, distributed ledger technologies (blockchain), cybersecurity, privacy and data protection technologies.

Multimedia and Educational Technologies

Today’s advanced multi-media technologies can leverage high-definition audio-visual content, while solutions for virtual and mixed reality allow users to experience new artificial dimensions that coexist with our real world. Audio, video and immersive multimedia applications enhance our experience in many sectors from entertainment to manufacturing to education. ISIN’s expertise includes: development of applications for digital signal processors and systems on chip, digital signal processing techniques, GPU computing, audio/video streaming and processing, computer vision, software infrastructures for scientific simulation, virtual/augmented/mixed reality, 3D-audio systems, serious and educational digital gaming, educational and training technologies, and open data.
Institute of Systems and Technologies for Sustainable Production

The Institute of Systems and Technologies for Sustainable Production (ISTePS) leads top-level university programmes and continuing education courses, national and international applied research and provides services related to the innovation of manufacturing systems, production processes, products and business models. ISTePS counts 60 researchers with academic qualifications and industrial backgrounds in the various engineering disciplines required for production system design and management. Research topics focus on: 1) smart automation; 2) sustainable and circular manufacturing; 3) human-centered smart production; 4) industrial systems and technologies for additive manufacturing and laser processing; 5) modular robotic based production systems.

The research activities are strongly focused on international projects, particularly those financed by the European Union. The knowhow here developed is then applied to national Innosuisse projects and in numerous industrial consultancies established with leading Swiss companies, amounting to an annual volume of 3.6 million Swiss Francs. The activities of the institute are supported by equipment dedicated to education (the Mini-Factory 4.0, robotic training workcells), research (own developed prototypes of additive and hybrid manufacturing machines, modular manipulators and mobile robots) and services (microscopes and 3D scanners).

The excellence of the research activities managed by ISTePS has been acknowledged several times by the European Commission, for example by the Best Research Practice Award (2014, 2015, 2016), the Innovation Radar Prize (2019) and the Woman Led Innovation Prize (2019).

Smart Automation

To address production resilience and flexibility requirements, modern industries need to properly handle smart automation, empowered by simulation and analytics. ISTePS supports industries both in the deployment of those technologies and in the development of appropriate competences. Technology transfer and training activities leverage on the SUPSI Mini-Factory, which is a small-scale manufacturing environment embedding innovative concepts of modularity and smart automation.

Sustainable and Circular Manufacturing

Sustainability has become a key element for manufacturing competitiveness. ISTePS supports manufacturing companies and supply chains in their sustainability-driven transformation process, from performance assessment against validated maturity models, through advisory services also exploiting circular economy principles, up to project deployment and monitoring of the results.

Human-Centred Smart Production

Digitisation and artificial intelligence are emerging technologies that hold the potential to disrupt the manufacturing domain. An often-neglected nuance is their interaction with the human being. ISTePS helps companies in introducing smart sensing and devices orchestration at shop-floor level so to create environments where humans and factory automation collaborate synergistically.

Industrial systems and technologies for additive manufacturing & laser processing

Innovative Additive Manufacturing (AM) systems adopt several process technologies enabling the manufacture of complex-shaped parts for a wide range of applications. This research area focuses on the design and engineering of machines and mechatronic equipment for metal-based AM, complemented by a number of subtractive technologies, performed with real-time control of laser-based processes, and on the design, inspection and functional characterization of produced parts.

Modular robotic-based production systems

This research area focuses on the design, configuration, engineering and integration of flexible and personalized industrial robots, considering complex and extremely precise manufacturing processes as also the way the robot cooperates with other machines and human operators. Especially modular and collaborative robots, mobile robotics for maintenance in harsh environments, and laser and artificial vision equipped systems are developed.
Institute of Mechanical Engineering and Materials Technology

The Institute of Mechanical Engineering and Materials Technology (MEMTi), formerly known as ICIMSI, focuses on manufacturing and energy and develops novel technical solutions to meet new market needs and make products more competitive. MEMTi employs about 45 professionals who conduct research and teaching activities. MEMTi engages mainly in applied research projects, with an annual research expenditure of approximately 3 million Swiss Francs funded by competitive external sources, such as Innosuisse, and by industry contracts. Basic research activities are also significant and often result in high impact publications. As for teaching, MEMTi plays a major role in the Bachelor programme in Mechanical Engineering.

**Manufacturing process design and optimization**

Simulation is becoming the most widely used tool for the design and optimisation of manufacturing processes such as injection moulding, metal forming, welding, and additive manufacturing. MEMTi specialises in simulation techniques for the evaluation of the effect of the manufacturing parameters on the mechanical behaviour of the product being manufactured.

**Structural mechanics**

MEMTi develops innovative products and machines through a blend of design creativity and engineering excellence. We have experience using Finite Element Analysis computational techniques to optimise and verify static and dynamic structures, as well as to assess their resistance, stability, and long-term fatigue and creep reliability. Our approach takes into account material processing parameters at design time in order to bridge the gap between manufacturing and product performance.

**Termo Fluid Dynamics**

MEMTi specialises in the analysis and optimisation of the thermo-fluid dynamics of components, processes and systems. Application fields include thermal and electrical energy storage systems, innovative solar receivers, multiphase flows, and medium/low temperature district heating networks. MEMTi also tackles engineering problems involving heat transfer and external aerodynamics.

**Polymer engineering**

MEMTi has an extensive know-how in polymer science and technology, surface engineering and formulation engineering. MEMTi specialises in sustainable flame retarded polymers, (nano) composites, tailor-made polymer compounds, functional nano-coatings and bioregradable polymers for biomedical applications, for which modelling approaches are routinely employed.

**Hybrid materials**

MEMTi specialises in hybrid materials, with a specific focus on polymeric and ceramic matrix composites, as well as porous ceramic materials. In recent years, MEMTi has also developed an extensive know-how in additive manufacturing techniques for the production of complex ceramic components.

**Computational materials science**

MEMTi has strong expertise in physical-chemical and multiscale molecular modelling, which are established tools for the study and design of new types of materials for a wide range of applications, from biomedical to chemical and advanced technological materials. Our technical skills span from atomistic to multiscale molecular modelling approaches, and from classical to advanced computer simulation and data analysis approaches. Along with a solid background in theoretical materials science and computational chemistry, such skills serve as fundamental tools to assist the design of technological materials and to explore new concepts to make new types of materials with innovative properties and functions.
Institute of Digital Technologies for Personalized Healthcare

The Institute of Digital Technologies for Personalized Healthcare (MeDiTech) was established in 2021 with the aim of ensuring cross-sectoral coordination of all interdisciplinary competences and activities associated with research and teaching related to healthcare. The Institute is active in the development of new approaches to healthcare and medicine through the integration of digital technologies capable of collecting, analysing and processing large quantities of heterogeneous data. The use of technology in medicine and public health is increasingly widespread and represents a unique opportunity to develop care closer to the individual, enabling the development of personalised therapies and devices. The research activities of the Institute focus on three interdependent research areas, from integrated medical devices development, digital health solutions, to advanced data analysis tools to support medical decision-making processes. These activities are applied in the development of medical devices, digital healthcare platforms, design of diagnostic systems, management information systems and in the resolution of complex decision-making sequences with applications ranging from diagnostics to treatment methods and drug delivery. The Institute aims to become a regionally and federally recognised centre for the design and development of digital solutions and medical, diagnostic and therapeutic devices based on innovative technologies, through a network of national and international partnerships with public and private entities.

Cooperation and the transfer of technology and knowledge, with and to such partners, are fundamental aspects for the development of innovative and useful products in the medical and health sector. The Institute’s activities are structured around three strongly interdependent scientific areas:

- Biomedical Signal Processing
- Digital Health
- Medical Devices

Thanks to the synergy between the three research areas, it is possible to develop comprehensive systems to support personalised health diagnostics, therapy and rehabilitation. In addition, the impact of digital technology on diagnosis and treatment has pioneered the development of highly integrated management models based on the extensive use of technology and a more active and inclusive involvement of patients.

Biomedical Signal Processing

This area focuses on the ability to extract clinically meaningful information from biomedical, subjective and contextual data. With the adaptation and optimisation of artificial intelligence, advanced statistics, data mining, machine learning and deep learning, it aims to develop systems to support personalised diagnosis and therapy, also through bi-behavioural feedback.

Digital Health

The healthcare sector has been in the digital age for many years, but has only recently started to apply digitisation of processes and services on a large scale, thanks to the development of new data acquisition and analysis technologies. These technologies generate a huge amount of heterogeneous medical data on a daily basis. When properly aggregated and analysed, they increase knowledge of different diseases and at the same time make medicine more personalised and precise.

Medical Devices

The interdisciplinary approach in integrating scientific and technological advances in areas such as biology, chemistry, physics, engineering, informatics and medicine enhances the ability to manipulate matter at the molecular level, which is crucial for the development of diagnostics, analysis, therapeutics and medical instrumentation. The Medical Devices research area is focused on the development of devices and systems with different integrative steps. They range from nanotechnologies (nanomaterials, biointerfaces) to microtechnologies (microfluidics, photonics, and sensor technology) and microdevices, leading to the realisation of highly integrated systems for the understanding of cellular and molecular biology as well as for diagnosis and support to the therapy.
Student services

Semester rooms
Final year students can use a classroom equipped for individual and group study. This room can be accessed 24 hours a day, 7 days a week.

mySUPSI
The mySUPSI card for students, alumni and staff entitles holders to benefit from numerous special offers and discounts in Southern Switzerland.
www.supsi.ch/go/mysupsi

SUPSI Sport
The Sports service promotes opportunities for students, teachers and employees to practice a wide range of physical and sporting activities.
www.supsi.ch/sport

Competence Centre for Languages and Studies on Plurilingualism
The Centre organises German and English language courses for SUPSI students, and Italian language courses for foreign students, with the aim of promoting student exchanges and facilitating graduates in their search for appropriate employment. The centre also manages two international examination centres: the Goethe-Institut Examination Centre of Southern Switzerland and the Cambridge Examination Centre of Southern Switzerland.
www.supsi.ch/centrolingue

International Office
The Service manages everything associated with the theme of internationalisation. It provides support for students, teachers and employees/associates who wish to spend time abroad. It also supports international students who come to SUPSI by welcoming and providing them with accommodation options.
www.supsi.ch/international

Gender e Diversity
This service raises awareness about gender, generational, cultural, and equal opportunities issues.
www.supsi.ch/gender

Counselling Service
Counselling and psychological support services for those experiencing personal, interpersonal, emotional or social difficulties.
www.supsi.ch/ascolto

Student Life Service
The Career, Experience, and Orientation service (CEO) revolves around the students and their needs. It organises and coordinates strategic and management activities designed for career planning and development before, during and after university studies.
www.supsi.ch/ceo

SUPSI Alumni
The SUPSI Alumni Association brings together former SUPSI students. Members can use the website to access an information and networking platform. The SUPSI Alumni Office also proposes a series of career services: counselling and guidance, job offers, career development courses. Association members have access to a number of advantages, and can profit from numerous networking opportunities in their fields of interest.
www.supsialumni.ch

Day Nursery
SUPSInido allows employees, associates and students to achieve a better work-life balance. The nursery can accommodate a maximum of 23 children, aged between 4 months and 3-4 years.
www.supsi.ch/nido