

heat

The Polytech network is a French group of 13 Universities Polytechnic Schools of Engineering offering more than 80 specialties among 5 major domains, including : Biotechnology, Bioengineering, Food Science ; Civil Engineering, Environmental Science ; Electrical Engineering, Industrial

Engineering ; Computer Science, Applied Mathematics ; Mechanical Engineering, Materials Science. More than 13 000 enrolled students are in the Polytech network that represents 3 300 graduates per year. 1 200 PhD students are also studying in the Polytech network. Finally more than 58 000 alumni are representing the Polytech Group in companies, in France and all around the world.

As every school of engineering, member of the Polytech group, Polytech Tours is a public school of engineering, component of the University of Tours (France). Polytech Tours has several accreditations, including the French « Commission du Titre d'Ingénieur », and the European accreditation EURACE. Polytech Tours is also a member of the French conference of business and engineering college (« Conférence des Grandes Ecoles »).

Polytech Tours includes 5 research and training areas : Urban & Regional Planning Engineering, Computer Science, Mechanical Engineering, Electronics and Energy, and Embedded Computing. In 2011, more than 1070 engineering students have been enrolled, representing 210 graduates, per year. Notice that these five-year curricula confer the official qualification of Engineer (Master's degree).

Polytech Tours is hosting 4 research laboratories of the University of Tours, and 90 PhD students. 90 Faculty members (Professors and Assistant professors), 36 Administrative and Technical staff are permanent employees of Polytech Tours. More than 150 teaching and research staff from industry are involved in Polytech Tours.

From a pedagogical point of view, Polytech Tours aims at offering an education in compliance with short term industrial needs (technical skills ; internships ; economics and business courses). Our goal is to provide an education to assist engineers for future changeover by guarantying a high level of scientific knowledge. Polytech Tours has also strong links with innovation and research policies (R&D), for instance by proposing research projects in which students are involved in relationship with a research team and/ or 6 « Centres for Research and Studies », jointly with industrial partner companies.

Finally Polytech Tours is an international school of engineering. Students are strongly encouraged to spend either one of their three mandatory internships, or one study semester in a foreign country. To do this, several partnerships with more than 32 foreign universities, in 17 different countries, are currently active.

transfer



Contact Details

Ecole d'ingénieurs Polytechnique de l'Université de Tours (Polytech Tours)

Département Mécanique et Systèmes
Département Electronique et Energie
7 avenue Marcel Dassault - 37200 Tours - France
Phone +33 (0) 2 47 36 13 01
Fax +33 (0) 2 47 36 13 11
m2relec-meca@univ-tours.fr

Laboratory of Mechanics and Rheology

Narayanaswami Ranganathan, Professor
narayanaswami.ranganathan@univ-tours.fr

GREMAN

Nathalie Batut, Assistant Professor
nathalie.batut@univ-tours.fr

electronics



Polytech Tours

Research Master "Electronic and Mechanical Engineering" (EME)

mechanical

Description of the Programme

course content

Duration 1 year (2 semesters) **Total ECTS Credits** 60 **Starting Date** September

→ Objectives

This Masters, taught entirely in English, aims to specialize students in the science and engineering of ceramics, metals, polymers/ elastomers, and composites, with emphasis on a variety of subjects like materials for electronics, biomaterials, nanotechnologies, mechanics, design, numerical modeling, reliability, life cycle analysis, processing and instrumentation, etc. This is an interdisciplinary Masters in Electronic and Mechanical Engineering presented by Polytech Tours, integrating course units delivered by academic staff from the 2 laboratories and leading guest researchers. This program will cater to the needs of both engineering and science majors. Close contacts with the Industry will be provided through off-campus work assignments in industry (internships) or in academic lab. Our goal is to produce well qualified materials scientists and engineers who can function effectively in the technical arena as well as possess the skills to assume leadership roles in industry, academia, and government.

The program's objectives are to produce graduates who are :

- able to apply the principles of materials science for undertaking advanced engineering and / or research projects ;
- knowledgeable about a variety of engineering materials (including metals, semiconductors, ceramics, polymers, and composites), and the relationships among processing, structure, properties, and performance ;
- able to define and solve problems, especially those involving materials selection and design, and are able to develop, implement and evaluate solutions via integration of their basic scientific skills and knowledge ;
- able to communicate effectively and who demonstrate the ability to function in multi-disciplinary teams ;
- skilled at using modern engineering tools for characterization, analysis and design of materials ;
- able to understand their responsibility to their profession and society in a global context.

→ Admission Requirements

Resume with 240 European credits (ECTS), specialization in Electronic engineering and / or Mechanical Engineering.

→ English Proficiency

Level B2 of the Common European Framework of Reference for Languages or equivalent, i.e. minimum level required (for non-native English speakers) : Paper based TOEFL score = 577, Internet-based TOEFL score = 87, TOEIC score = 750, IELTS = 5, Cambridge = FCE.

→ French Proficiency

Only required for everyday life ; minimum recommended level : A2 of the Common European Framework of Reference for Languages, i.e. : TCF 200 points or DELF A2.

→ Application Process and Deadlines

Application process and deadlines are available on the website : <http://www.polytech-tours.fr/>

Tuition Fees

The tuition fees of the EME master program are about 6,000€ for the whole year and include an internship gratification of about 2,000€. Candidates who provide, at the moment of their final registration, an official certificate of a research lab attesting that their internship will be financed may pay only 4,000€ of tuition fees.

The courses are designed with two distinct programs for electronics and mechanical engineering with a few common courses. Common courses are marked with the superscript C. Courses for electronics specialization with the superscript E and the Mechanical Engineering specifications with the superscript M.

→ U.E. 1 : Mechanical Properties of Advanced Materials ^C

Courses : 7 h - Tutorials : 9 h - Laboratories : 9 h / 5 ECTS
Mechanical properties of materials. Functional steels, titanium alloys, shape memory alloys, intelligent materials. Software for materials selection.

→ U.E. 2 : Acoustics and Vibrations ^C

Courses : 10 h - Tutorials : 9 h - Laboratories : 6 h / 5 ECTS
Propagation phenomena (Fundamental laws of propagation, reflection, transmission, attenuation)
Acoustic radiation (acoustic impedance, vibrating sphere, scalar diffraction theory).
Introduction to non-linear acoustics and its applications.
Experimental vibrations.
Fluid-structure interactions: numerical approaches (finite elements), modal synthesis.
Acoustic radiation of vibrating structures.

→ U.E. 3 : Heat Transfer ^C

Courses : 10 h - Tutorials : 6 h - Laboratories : 9 h / 5 ECTS
Fundamentals of heat transfer according to conduction, convection and radiation.

→ U.E. 4 : Piezoelectric Materials and their Applications ^C

Courses : 10 h - Tutorials : 9 h - Laboratories : 6 h / 5 ECTS
Description : Ferroelectric and piezoelectric materials, fabrication process, properties and functional characterization.
Elastic waves in isotropic solids, Energy considerations, guided waves
Ultrasonic imaging techniques; non-destructive testing and evaluation (NDT, NDE) ; ultrasonic flowmeters, design and modeling of ultrasonic transducers
Piezoelectric sensors and actuators.

→ U.E. 5 : French Language and French Culture, Job Training ^C

Courses : 10 h - Tutorials : 10 h - Laboratories : 10 h / 6 ECTS
French language and culture (common with other courses at Polytech Tours)
Students attending the EME master program will have to succeed to an English Level Test and to French Level Test.

Each student has to choice between courses U.E. 6a, U.E. 6b, U.E. 6c :

→ U.E. 6a : Power Devices and Systems ^E

Courses : 7 h - Tutorials : 9 h - Laboratories : 9 h / 4 ECTS
Power electronic systems, Power devices and application requirements, Power device technologies in Si (>99 % of market) : Power diodes, Thyristors, Bipolar Junction Transistors, Power MOSFETs, Insulated Gate Bipolar Transistors (IGBTs).

→ U.E. 6b : Behaviour of Polymers and Elastomers ^M

Courses : 7 h - Tutorials : 9 h - Laboratories : 9 h / 4 ECTS
Mechanical behavior of Polymers and Elastomers. Viscoelastic and thermo-elastic behaviors. Mooney-Rivlin constitutive laws.

→ U.E.6c : Material Fatigue ^M

Courses : 7 h - Tutorials : 9 h - Laboratories : 9 h / 4 ECTS
Fatigue of materials, Endurance limit, mean stress effects, low cycle fatigue, stress concentration effects. Miners law
Introduction to Fracture mechanics, Plastic zone and fracture toughness. Fatigue crack propagation.

Each student has to choice between courses U.E.7a, U.E.7b, U.E.7C :

→ U.E. 7a : Materials and Technologies for Microelectronics ^E

Courses : 10 h - Tutorials : 6 h - Laboratories : 9 h / 5 ECTS
This course deals with processes of semiconductor devices fabrication:
→ Functionalities (Doped well, bipolar junctions, ohmic and rectifying contacts, insulating layers ...)
→ Fabrication processes (doping diffusion, implantation, oxidation, deposition, surface cleaning, wet and plasma etching, lithography...)
→ Electrical and optical characterization for the determination of semiconductor properties and device performances.
Impacts of processes are discussed in terms of overdoping, defect generation and cross contamination on the performance of electronic device.
Practical works will be done in the microelectronic center of the University of Tours (CERTeM) in connection with the STMicroelectronics Company.
Knowledge of technologies for electronic components and microcircuits fabrication.

→ U.E. 7b : Numerical Modeling of Materials and Components ^{E or M}

Courses : 10 h - Tutorials : 6 h - Laboratories : 9 h / 5 ECTS
Electronics course: Design of analogical and bipolar circuits. Power electronic components and MEMS. Specific projects with cadence design systems.
Mechanical engineering course: Finite element modeling for metals and polymeric applications. CAO using CATIA software and FEM using ANSYS software.

→ U.E. 7c : DS (SP): Surface Engineering ^M

Courses : 10 h - Tutorials : 6 h - Laboratories : 9 h / 5 ECTS
Mechanical and physical properties of thin films/coatings for advanced applications. Relation between structure and properties. Surface treatment and analysis techniques.

→ U.E. 8 : Research Internship ^{E or M}

5 months / 25 ECTS
Internship in a research laboratory or in an industrial environment. Literature survey, presentation of the project and realization of the project under a project tutor. A final project report will be presented before a jury. The project can be carried out in one of the European partners to this program.

