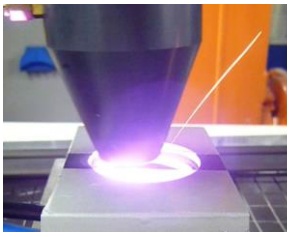
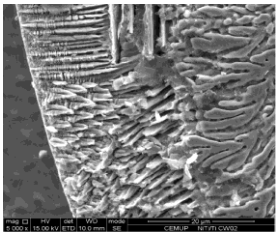
Manufacturing Technologies and Automation

1) Areas of Expertise

1.1 - Welding and joining technologies

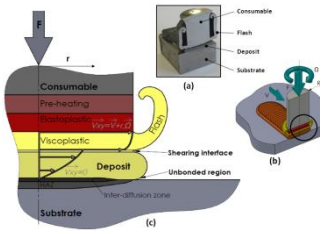


Laser welding



Laser welded Ti6Al4V

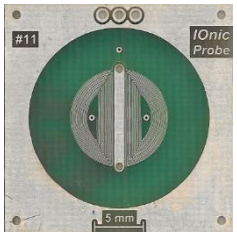
Friction Stir Surfacing



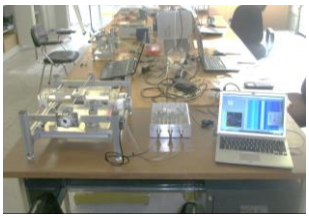
Process modelling

Topics	Strategy
• **Laser welding** • **Laser additive manufacturing** • **Friction Stir Welding (FSW) and Processing** • **Dissimilar joining** • **Magnetic Pulse Welding**	• Process development • Welding metallurgy • Materials science and characterization • Effect of shielding gases in arc welding • Fume and nanoparticles analysis

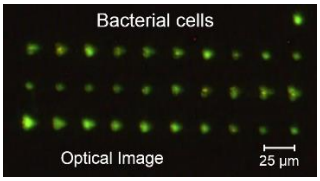
1.2 – Non-Destructive Testing (NDT)



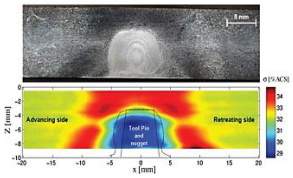
Dedicated Eddy Current Probes



Integrated NDT Systems



Detection of micro-defects with bacterial cells

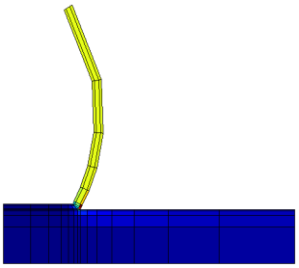


Characterization of processed materials by electrical conductivity

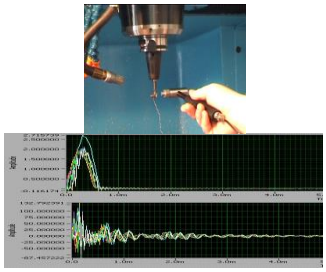
Topics	Strategy
• **Eddy Currents (EC)** • **Ultrasound (US)** • **Dye Penetrant and Magnetic Particles** • **Innovations based on bacterial cells** • **Other dedicated solutions**	• Design and production of dedicated NDT probes • Development of integrated NDT systems (probes, mechanical devices, electronics and s/w) • Dedicated NDT systems for Friction Stir Welding • Micro defects detection in micro-fabrication • Characterization of processed materials by electrical conductivity

1.3 – Machining

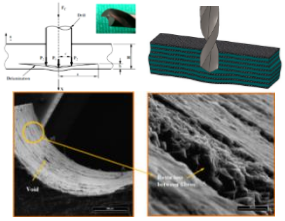
High Speed Milling



Temperature modelling with in-house code



Dynamic Evaluation of a Cutting Tool

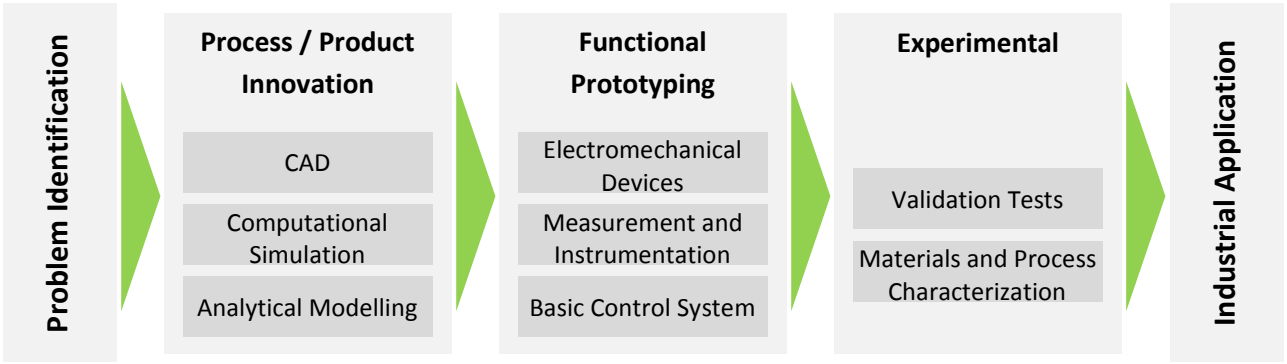


Drilling Composite Materials

Topics	Strategy
• **Conventional Machining of Materials;** • **High Speed Machining (metals and composites)** • **Dynamics of Cutting**	• Modelling cutting forces in machining • Mechanistic Simulation of Cutting Forces; • Experimental evaluation of machining operations; • Experimental evaluation of composite material behaviour under drilling operations; • Development of in-house code for modelling the temperature distribution in orthogonal cutting.

2) Research Approach in the area of Manufacturing Technologies

Research is based on a problem solving approach, which includes:



3) Laboratories and Facilities

- Lab. of Materials Characterization

Optical metallography • Hardness measurement (micro HV, Rockwell and Brinell) • Pin-on-disc tribometer • Roughness measurement • Wafer grinding, lapping & polishing • Abrasive cut-off machine • Coordinate measurement machines…

- Lab. of Non-Destructive Testing

Eddy currents • Ultra-sound • Low intensity X-ray • Dye Penetrant • Magnetic Particles • Dedicated equipment for micro defects detection in micro-fabrication with bacterial cells • Automated mechanical scanning devices • Data acquisition • Dedicated electronic devices…

- Lab. of Processes Simulation;

SolidWorks® 3D CAD • SolidWorks Simulation® • Product Data Management • SOLIDCast® • MATLAB® • LabVIEW® • ANSYS®…

- Lab. of Mechanical Processes (Machining and Metal Forming);

Conventional milling machine • Conventional lathe • CNC vertical milling • CNC lathe • Surface grinding machine • Electrical discharge machining • Ultrasonic cutting machine • Modelling/Milling & 3D Scanning • Metal band saw • Bench Grinders • Drilling machine…

- Lab. of Thermal Processes (Welding and Casting).

Electrode welding machine • MIG/MAG welding machine • TIG welding machine • Oxigas welding bench • Electrex resistance welding machine • FSW adapted machine • Automated MIG/MAG welding machine • Furnace with controlled atmosphere…


Materials Characterization


Non-Destructive Testing


Welding and Casting


Machining and Metal Forming

4) Contact

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