

# IMPERIAL

Mechanical Engineering

*Mechanical Engineering is key to addressing modern technological and societal challenges, driving innovation across a broad range of applications:*

## Safety

fires, ventilation,  
emissions,  
forensic,  
aerosols, noise,  
pollution, satellites,  
imaging, inspection,  
defence

## Transportation

aircraft, space,  
automotive,  
emissions, batteries,  
hybrid thermal/electric,  
decarbonization,  
vehicles  
turbomachinery

## Energy

hydrogen, nuclear,  
storage/batteries,  
fuel cells,  
wind turbines,  
alternative fuels,  
harvesting,  
emissions,  
biomimetics

## Healthcare

surgery, implants,  
imaging,  
robotics,  
wearables,  
biomechanics  
biomimetics  
sports

## Manufacturing

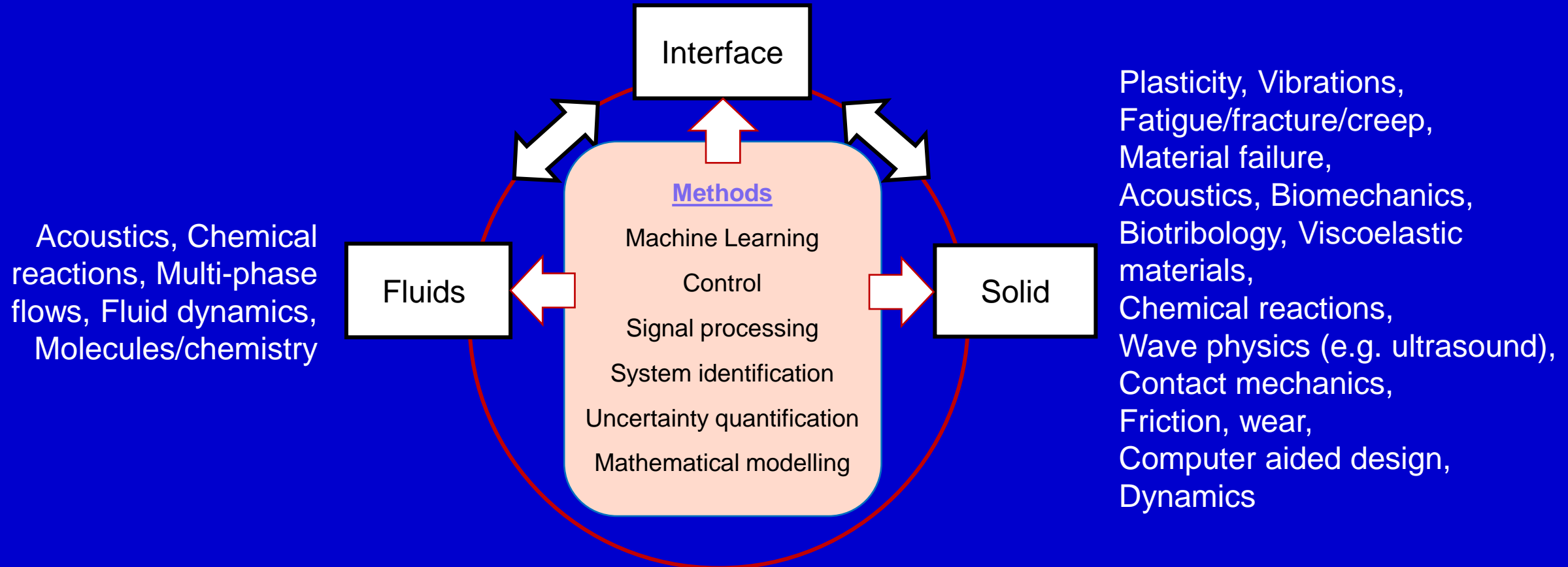
food,  
3D printing,  
forming,  
robotics,  
satellite,  
lightweight  
defence

# IMPERIAL

Mechanical Engineering

*Innovations are underpinned by core scientific and engineering principles...*

Aeroelasticity, Aero-dynamics, Heat transfer, Thermodynamics, Lubricants,  
Electrochemistry, Boundary layers, Solid-liquid interfaces, Tribology



# IMPERIAL

Mechanical Engineering

*The department integrates advanced technologies and methodologies across a range of strategic research areas, such as:*

- *Smart Mobility*
- *Sustainable energy*
- *Healthcare*

# IMPERIAL

Mechanical Engineering

*Smart Mobility applications:*



**Net Zero Transportation**

Electrical power unit  
Batteries  
Energy infrastructure  
Energy storage  
Sustainable fuels  
Hydrogen



**Hybrid Thermo-Electric propulsion**

Propellers  
Turbomachinery  
Thermal power unit  
Aeroelasticity  
Lubrication  
Lightweight vehicles  
Additive manufacturing  
Composites & adhesives



**Safety**

Fire safety  
Noise and vibration  
Pollutants  
EM control of flames



**Intelligent Networks**

Smart Sensors  
Autonomous Systems  
Robotics  
Digital Twin

Techno-economics, Circular economy, Policy, Enterprise

# IMPERIAL

Mechanical Engineering

*Sustainable Energy applications:*



**Carbon Capture Utilisation & Storage**

Net-zero  
Nuclear energy  
Fluid regeneration  
Waste management



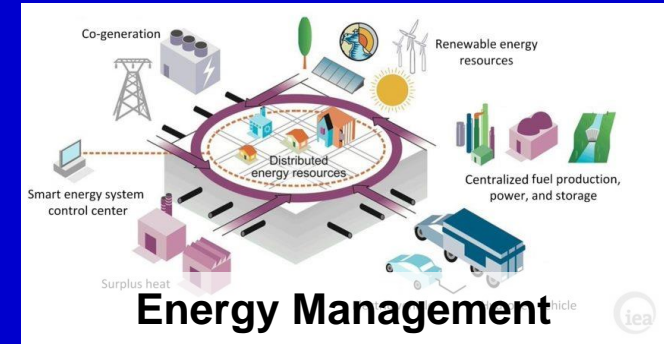
**Energy Storage**

Thermal power unit  
Sustainable fuels  
Hydrogen  
Batteries  
Electrical power units



**Energy Conversion & Recovery**

Turbomachinery  
Heat Recovery  
Fuel cell  
Smart Systems  
Supercritical System



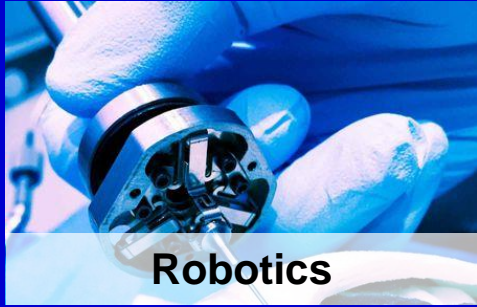
**Energy Management**

Thermoeconomics  
Energy infrastructure  
Pollutants  
Circular economy  
Policy

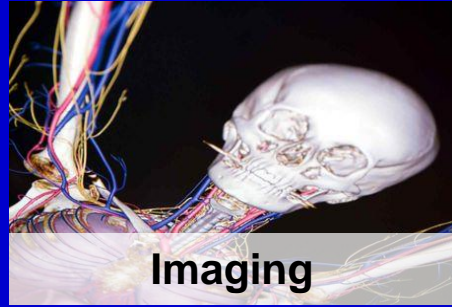
# IMPERIAL

Mechanical Engineering

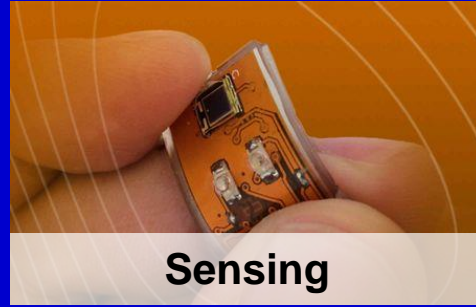
*Healthcare applications:*



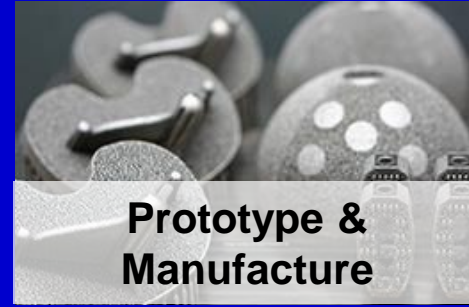
Soft-robotics  
Neurosurgery  
Orthopaedics  
Steerable needles



Ultrasound  
CT  
MRI  
Intraoperative



Wearables  
Implants  
Surgery



Surgical robots  
Surgical tools  
Additive  
manufacture  
Medical devices  
Implants  
Orthopaedics  
Neurosurgery



Surgical robots  
Implants  
Simulated surgery  
ISO tests  
Orthopaedics  
Neurosurgery