

## Efficient Heat Engines and Heat Pumps (10 credits)

The aim of the module is to introduce the various ideal thermodynamic cycles that form the basis for power generation, heat pumping and refrigeration. It will also emphasise the difference between the actual and ideal cycles and methods of enhancing the performance of actual cycles.

The module will also introduce the basic chemistry of combustion and IC Engines performance.

### **Syllabus**

#### **Heat Engines and Heat Pumps**

- Second Law of Thermodynamics, Concept of heat engines and Heat Pumps
- Ideal single phase heat engine cycles, Otto, Diesel, Gas Turbines Cycle (Brayton)
- Two Phase fluid properties, Ideal Two phase heat engine cycle, Simple Rankine Cycle
- Complex steam Power plant cycles
- Vapour Compression refrigeration and heat pump cycles

#### **Combustion, Engines and Emissions**

- Mixtures,
- Combustion - stoichiometry, thermal effects, flame temperature
- ICE Engines - basic performance calculations