



TECHNOLOGICAL EDUCATION INSTITUTE OF  
CENTRAL MACEDONIA  
SCHOOL OF TECHNOLOGICAL APPLICATIONS  
DEPARTMENT OF MECHANICAL ENGINEERING

**Graduate Studies Program:**  
**Academic Year 2014 - 15**

**"Renewable Energy Systems: Design,  
Development and Optimization"**

**Supervisor's Name : Dr Dimitrios Missirlis**

**Subject:**

*Investigation of flow field and energy conversion in turbo machinery applications*

**Introduction & Motivation:**

Turbo machines are used in a wide range of energy-related applications. The optimization of their performance requires the combined use of a wide range of sciences such as thermodynamics, fluid mechanics and computational fluid dynamics. In this thesis the operation of a turbo machine (compressor or turbine) will be investigated theoretically and computationally with the use of dedicated computational software. A parametric analysis will be performed which will provide useful data for this technology.

**Implementation & Means:**

- Detailed literature survey and theoretical analysis of flow field/energy conversion inside turbo machine applications (compressor and turbines)
- Analysis of design methods for energy conversion in turbo machine applications
- Creation of a CFD model of a turbo machine (either compressor or turbine)
- CFD computations with dedicated CFD software (Ansys CFD software)
- Parametric analysis of flow/thermodynamics conditions in relation to energy conversion optimization

**References:**

[1] J. Seume , F. Herbst, D. Missirlis, K. Yakinthos, A.Goulas, 2006, Numerical modelling of the unsteady interaction between probe and flow in axial turbomachinery, The XVIII Symposium on Measuring Techniques in Turbomachinery - Transonic and Supersonic Flow in Cascades and Turbomachines,

Thessaloniki, GREECE, 21- 22 September, 2006.

[2] Akinola A. Adeniyi, Abubakar Mohammed and Sunny Okara Emmanuel, CFD Modelling of Wakes on Cascade Compressor Blades, International Journal of Advances in Science and Technology, Vol. 4, No.2, 2012

**Requirements:** Very good knowledge of Computational Fluid Dynamics/ Applied Thermodynamics/ Energy Conversion