Course Number: 28601

Course Name: Parallel Computing with Applications in CFD

Course Type:	Type & Max Unit: 3
Prerequisite:	Corequisite:
Level: Graduate	First Presentation:
Group: Energy Conversion	Last Edition:

Objectives:

Topics:

- **Introduction**: importance of parallel computing in large scale and time consuming engineering problems
- **Principles of Parallel Computing:** Basic definitions and approaches
- **Architecture of Clusters and Super-computers:** Hardware and software
- **Description of Sharif's Cluster:** Hardwares and softwares used
- **Introduction to Linux:** Installation, setting and basic commands and utilities
- **Introducing MPI and PVM protocols and libraries:** installation, settings and usage
- **How to develop a parallel program:** Partitioning, Communication, Agglomeration & Mapping, choices of programming language, network communications and increasing speed
- **Criteria for evaluation of a parallel code:** Speed-up, scale-up, efficiency, Amdahl's and Gustafson's law, time-complexity
- **Domain Decomposition Methods:** load-balancing, Shur and Schwartz methods
- **Parallel Solution Techniques for Fluid Flow:** compressible and incompressible flows, structured and unstructured grids, finite volume and finite element methods

References:

1- Linux Programmer's Reference, R. Peterson, 2nd Ed., Osborne McGraw-Hill, 2000.
2- Principles of Computational Fluid Dynamics, P. Wesseling, Springer, 2000.
3- Parallel Computing; Principles and Practice, T.J. Fountain, Cambridge University Press, 1988.
4- Designing and Building Parallel Programs, I. Foster, Addison-Wesley, 1995.
5- Parallel Programming: Techniques and Applications Using Networked Workstations, Prentice-Hall, 1998.
6- Iterative Methods for Sparse Linear Systems, Y. Saad, SIAM, 2003. (**ISBN:** 0898715342)