Course Code TEE 813	Credit Hours (Th-Pr) 3.0-0	**Turbomachinery (Elective)**	Contact Hrs/Week (Th-Pr) 3.0-0	Total Contact Hrs (Th-Pr) 45-0

Course Outline:

Different aspects of the turbo machines will be discussed. 2D and 3D steady flow phenomena in turbomachine components. Major turbomachinery blade design philosophies. Appropriate materials for turbomachinery applications and cooling techniques. Operational aspects of thermal turbomachines. technically today's and tomorrow's challenges related to thermal turbomachines

Eligibility Criteria:

B.E in Mech., Elect (Power), Chemical, Industrial, Process

B.S (4-years) Or M.Sc. degrees in Physics

Recommended Books:

S. No.	Title	Author(s)	Assigned Code	Remarks
1.	Fluid Mechanics and Thermodynamics of Turbomachinery	S Dixon Cesare Hal	SD	Text
2.	Turbomachinery Flow Physics and Dynamic Performance	Meinhard T. Schobeiri	MS	Reference
3.	Principles of Turbomachinery	Seppo A. Korpela	SK	Reference
4.	Gas Turbine Theory	Cohen, H., Rogers	CR	Reference
5	Power plant Technology	El-Wakil	EW	Reference

Course Objectives:

Thermal turbo-machines are extensively used in the transport and the energy sector.

Most of the world's electricity is generated in processes where thermal turbo-machines play a vital role. Regardless of what fuel may be used as tomorrow's main

energy supply thermal turbo-machines will most likely be used in the energy transformation process .The current course will provides insight into dedicated areas of thermal turbo-machines and aims at giving the background for discussing phenomena of interest on an advanced level.

Learning outcome:

After completing the course the student will be able to

- Explain the 2D and 3D steady flow phenomena in turbo-machine components
- Understand the unsteady flow phenomena in turbo-machines
- Understand the major turbo-machinery blade design philosophies
- Perform simple aerodynamic designs
- Explain the interaction of fluid and structure
- Understand basic aeromechanical design aspects
- Perform preliminary calculations of mechanical integrity
- Understand gas turbine combustor principles and challenges
- Discuss cooling technologies
- Choose appropriate materials for turbo-machinery applications
- Understand operational aspects of thermal turbo-machines
- Discuss the content of a scientific article on an advanced level
- Discuss technically today's and tomorrow's challenges related to thermal turbo-machines

Topics Covered:

No.	Topics	Text Book	Contact Hours
1.	**Basics of Thermal Turbo-machinery** - Thermodynamic fundamentals - fluid properties and changes of state - fundamentals of fluid mechanics, application to component design - laws of similarity - turbine and compressor theory - losses and efficiencies, ways of influencing them - classification of components, load, design, production - strength and vibration problems - labyrinth seal - rotor dynamics - performance - unsteady loads - engine characteristic, control behavior - modern numerical calculation	SD &MS	10

		methods.		
2.	**Thermal Turbo-machinery** - Introduction and fundamentals - types of construction of thermal turbomachinery - thermodynamics and system processes - range of application and selection of machine type - axial compressor - axial turbine - radial compressor and turbine - operating mode, regulation and performance - machine design using numerical methods - measurement instrumentation in turbomachines.	SD, SK,EW &MS	10
3.	**Turbochargers** Introduction to turbochargers - radial compressors - axial and radial turbines - dimensionless performance - component testing - mechanical design - matching of turbine and compressor - matching with the engine - developments.	SD, SK,EW &MS	10
4.	**Steam Turbine Technology** - Thermodynamic work process - methods of operation and types of construction - power control - blading - operating conditions - turbine rotor and turbine housing - system technology and controlling - materials technology.	SD, SK,EW &MS	8
5.	**Use of CFD for Turbo-machinery analysis and design**		7