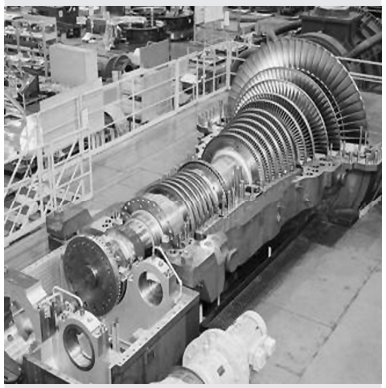
22ME303 APPLIED THERMODYNAMICS



Source: https://www.maritimeprofessional.com/news/steam-turbines-with-chinese-company-230665.

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Thermodynamics.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers fundamental concepts and application of thermodynamic laws for compressors, IC engines and turbines. The objective of this course is to impart basic knowledge on work producing and consuming devices, understanding of performance parameters and methods to improve its efficiencies.

MODULE-1

UNIT-1 **6L+6T+6P=18 Hours**

PERFORMANCE OF RECIPROCATING COMPRESSORS, IC ENGINES AND STEAM POWER CYCLES:

Introduction: Compressors, IC engines, steam power cycles, steam nozzles – construction and working. Performance parameters, methods of improvement.

UNIT-2 **10L+10T+10P=30 Hours**

Analysis of Thermodynamic Systems: Analysis of compressors, IC engines, steam power cycles and nozzles, case studies, measurements/modelling and simulation.

PRACTICES:

- Performance test on Multi stage compressor with intercooler.
- Evaluate the performance and emissions characteristics of a single cylinder 2 stroke petrol engine.
- Evaluate the performance and emission characteristics of a single cylinder 4 stroke diesel engine.
- Evaluate the performance and emission characteristics of a single cylinder 4 stroke VCR diesel engine
- Perform thermodynamic cycle simulation of Rankine cycle at different qualities of steam.

MODULE-2

UNIT-1 **6L+6T+6P=18 Hours**

CONSTRUCTION, WORKING AND PERFORMANCE OF TURBINES:

Steam Turbines: Impulse & Reaction Turbines-construction, working and performance, compounding of turbines.

Gas turbines: Methods to improve the thermal efficiency.

UNIT-2 **10L+10T+10P=30 Hours**

Analysis of Turbines: Analysis of steam and gas turbines, numerical, case studies, modelling and simulations.

SKILLS:

- ✓ *Analyze the performance of air compressors.*
- ✓ *Compare the performance of IC engines with different fuels.*
- ✓ *Interpret the efficiency of steam turbines for different inlet conditions.*
- ✓ *Estimate the performance of gas turbines using different methods.*

PRACTICES:

- Perform thermodynamic cycle simulation of impulse turbine at different steam inlet pressure.
- Perform thermodynamic cycle simulation of reaction turbine at different steam inlet pressures.
- Evaluate performance characteristics of gas turbine with regeneration using thermodynamic cycle simulation.
- Perform cycle simulation of gas turbine with reheating unit.
- Evaluate performance characteristics of gas turbine with inter-cooling using thermodynamic cycle simulation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Characterize various performance parameters of energy conversion devices using laws of thermodynamics.	Analyze	1, 2	1, 2,12
2	Evaluate the performance parameters of engines and turbines at different conditions.	Evaluate	1, 2	1, 2, 3, 4
3	Draw velocity triangles to determine efficiencies of steam turbines.	Analyze	1, 2	1, 2, 3
4	Apply different methods to improve thermal efficiency of a given thermodynamic system.	Apply	1, 2	1, 2
5	Investigate the working of various work producing devices.	Evaluate	1, 2	1, 2, 3, 4

TEXTBOOKS:

1. Cengel, Yunus A., Michael A. Boles, and Mehmet Kanoğlu., "Thermodynamics: An Engineering Approach". McGraw-Hill Publications, 9th Edition, 2019.
2. Moran, Michael J., Howard N. Shapiro, Daisie D. Boettner, and Margaret B. Bailey. "Fundamentals of engineering thermodynamics", John Wiley & Sons, 1st Edition 2010.

REFERENCE BOOKS:

1. V.Ganesan, "Gas Turbines", 3rd Edition, Tata McGraw-Hill, New Delhi, 2010.
2. B. K Sarkar, "Thermal Engineering", 1st Edition, Tata McGraw-Hill, 2005.
3. P K Nag, "Power Plant Engineering", 3rd Edition, Tata McGraw-Hill, 2008.