Model Template for Scheme of Course Work

to be submitted by the Faculty of B.Tech/M.Tech/MCA I semester on or before 11.10.2013 to bhanucvk@gvpce.ac.in and yadavalliraghu@yahoo.com

SCHEME OF COURSE WORK

Course Details:

Course Title	**: Turbomachines**		
Course Code	**:** 13ME2310	**L T P C**	**: 4 0 0 3**
Program:	**: M.Tech.**		
Specialization:	**: Thermal Engineering**		
Semester	**: II**		
Prerequisites	**:** Basic Thermodynamics and Thermal Engineering		
Courses to which it is a prerequisite	**:**		

Course Outcomes (COs):

At the end of the course, the student will be able to

1	apply thermodynamic principles to nozzles, diffusers and various stages of compressors and turbines.
2	discuss the gas, steam turbine plants and explain flow through the cascades of compressors and turbines.
3	apply the methods to estimate the stage work and efficiency of axial and centrifugal compressors.
4	apply the methods to estimate the stage work and efficiency of axial and radial turbines.
5	explain the parameters required for the design of fans

Program Outcomes (POs):

1	exhibit in-depth knowledge in thermal engineering specialization
2	think critically and analyze complex engineering problems to make creative advances in theory and practice
3	solve problem, think originally and arrive at feasible and optimal solutions with due consideration to public health and safety of environment
4	use research methodologies, techniques and tools, and will contribute to the development of technological knowledge
5	apply appropriate techniques, modern engineering tools to perform modeling of complex engineering problems with knowing the limitations

6	understand group dynamics, contribute to collaborative multidisciplinary scientific research
7	demonstrate knowledge and understanding of engineering and management principles and apply the same with due consideration to economical and financial factors
8	communicate complex engineering problems with the engineering community and society, write and present technical reports effectively
9	engage in life-long learning with a high level of enthusiasm and commitment to improve knowledge and competence continuously
10	exhibit professional and intellectual integrity, ethics of research and scholarship and will realize the responsibility towards the community
11	examine critically the outcomes of actions and make corrective measures

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S										
CO-2		S	M								
CO-3		M	S								
CO-4		M	S								
CO-5		M	S								

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Turbo machines, turbines, pumps and compressors, fans and blowers, compressible flow machines, incompressible flow machines, turbine, compressor and fan stages, extended turbo machines,	CO-1	Differentiate the compressible flow machines and incompressible flow machines	▫ Lecture	
2	axial stages, radial stages, mixed flow stages, impulse stages, reaction stages, variable reaction stages, multistage machines, stage velocity triangles, design	CO-1	Explain briefly about impulse and reaction stages	▫ Lecture ▫ Discussion ▫ Problem solving	

	conditions, off-design conditions, applications.				
3	Thermodynamics -basic definitions and laws, energy equation, adiabatic flow through nozzles, adiabatic flow through diffusers, work and efficiencies in turbine stages, work and efficiencies in compressor stages.	CO-1	Explain about adiabatic flow through nozzles and diffusers	▫ Lecture ▫ Discussion	
4	Gas and steam turbine plants - open and closed circuit plants - aircraft gas turbine plants - gas turbines for surface vehicles, electric power station, petro-chemical plants and cryogenics	CO-2	Discuss about the applications of gas and steam turbines	▫ Lecture ▫ Discussion Problem solving	
5	Flow through cascades -two-dimensional flow, cascade of blades, cascade performance, axial turbine cascades	CO-2	Discuss about Cascade variables	▫ Lecture ▫ Discussion Problem solving	Assignment (Week 5 - 7)
6	Axial compressor cascades, annular cascades, radial cascades	CO-2	Explain about annular cascades	▫ Lecture ▫ Discussion	
7	Axial compressor stages -stage velocity triangles, enthalpy-entropy diagram, flow through blade rows, stage losses and efficiency	CO-3	Explain about the axial compressor stage velocity triangles	▫ Lecture ▫ Discussion	
8	Work done factor, low hub-tip ratio stages, supersonic and transonic stages, performance characteristics.	CO-3	Discuss the performance characteristics of an axial flow compressor	▫ Lecture ▫ Discussion Problem solving	Mid-Test 1 (Week 9)
9	**Mid-Test 1**				
10	Centrifugal compressor stages - elements of centrifugal compressor stage, stage velocity triangle,	CO-3	Explain how the stage velocity triangles helpful to design of centrifugal compressor	▫ Lecture ▫ Problem solving	

11	Enthalpy-entropy diagram, nature of impeller flow, slip factor, diffuser, volute casing, stage losses, and performance characteristics.	CO-3	Explain about the volute casing of centrifugal compressor	▫ Lecture ▫ Discussion Problem solving	
12	Axial turbine stages -Stage velocity triangle, single impulse stage, multi stage velocity and pressure compounded impulses, reaction stages	CO-4	Discuss about multistage velocity and pressure compounded impulses	▫ Lecture ▫ Discussion Problem solving	
13	Blade-to-gas speed ratio, losses and efficiencies, performance charts, low hub-tip ratio stages.	CO4	Discuss about losses and efficiencies of axial turbines	▫ Lecture Problem solving	
14	Radial turbine stages -Elements of a radial turbine stage, stage velocity triangles,	CO-4	Explain about the radial turbine stages	▫ Lecture ▫ Discussion Problem solving	
15	Enthalpy-entropy diagram, stage losses, performance characteristics, outward flow radial stages.	CO-4	Discuss about the outward flow radial stages	▫ Lecture Problem solving	Assignment (Week 15 - 17)
16	Axial fans and centrifugal fans -fan applications, axial fans, fan stage parameters	CO-5	Explain about the design parameters of axial fans	▫ Lecture Problem solving	
17	Types of axial fan stages, types of centrifugal fans, centrifugal fan stage parameters, design parameters.	CO-5	Explain about the design parameters of centrifugal fans	▫ Lecture ▫ Discussion Problem solving	Mid-Test 2 (Week 18)
18	**Mid-Test 2**				
19/20	**END EXAM**				