Academic Course Description

BHARATH UNIVERSITY

Faculty of Engineering and Technology

Department of Mechanical Engineering

BME010 ADVANCED TURBO MACHINES
Seventh Semester, 2015-16, (Odd Semester)

Course (catalog) description

To develop skilled manpower in the field of turbo machines with the knowledge of transport processes through the turbo machine passage, analytical, numerical and experimental tools for design, operation, performance evaluation and innovative research in the area of turbo machines"

Compulsory/Elective course : Core Elective

Credit & contact hours : 3 & 45

Course Coordinator : Mr.Thirumavalavan

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mr.Thirumavalavan	Final Year Mech	JR001		thirumavalavans.mech@ bharathuniv.ac.in	10.50 to 11.40
Mr. R. Karthikeyan	Final Year Mech,	JR002		Karthikeyan.mech@bharathuniv.ac.in	10.50 to 11.40

Relationship to other courses:

Pre –requisites **:** Heat and Mass Transfer

Assumed knowledge : Conduction, Convection, Radiation, Compressor.

Following courses : Nil

Syllabus Contents

UNIT I PRINCIPLES 9
Energy transfer between fluid and rotor, classification of fluid machinery, dimensionless parameters, specific speed, applications, stage velocity triangles, work and efficiency for compressors and turbines.

UNIT II IMPELLER BLADES 9
Types, stage and design parameters, flow analysis in impeller blades, Volute and diffusers, losses, characteristics curves and selection, fan drives and fan noise.

UNIT III CENTRIFUGAL COMPRESSOR 9

Construction details, types, impeller flow losses, slip factor, diffuser analysis, losses and performance curves.

UNIT IV AXIAL FLOW COMPRESSOR 9

Stage velocity triangles, enthalpy-Entropy diagrams, stage losses and efficiency, work down factor, simple stage, design problems and performance characteristics.

UNIT V AXIAL AND RADIAL FLOW TURBINES 9

Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics..

Total : 45 Hours

TEXTBOOKS:

1. S.M.Yahya – Turbines, Compressors and Fans – Tata McGraw Hill Publishing Company, 2005.
2. V.Ganesan – Gas Turbines - Tata McGraw Hill Publishing Company, New Delhi- 2003.

REFERENCES:

1. Earl Logan Jr, Ramendra Roy.,Handbook of Turbo Machinery., CRC Press.
2. https://books.google.co.in/books/about/

Computer usage: **No**

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	100%
Professional subject	-	0%

Broad area : Manufacturing

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To develop skilled manpower in the field of turbo machines with the knowledge of transport processes through the turbo machine passage, analytical, numerical and experimental tools for design, operation, performance evaluation and innovative research in the area of turbo machines"	Correlates to program outcome		
	H	**M**	**L**
Understand the performance evaluation, operation and maintenance of rotodynamic machines.			
Will have knowledge on conceptual design of different components of thermal and hydroturbomachines.	a,b	i	
Design and develop turbomachineries	b,k	f,j	
Design and develop turbomachineries	a,l		
Learn axial and radial flow turbines	b	f	
Learn the principles and application of turbines	l		

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I General Design			
1.	Energy transfer between fluid and rotor	No	[T1] chapter -1,2, [R1]
2.	classification of fluid machinery	No	
3.	dimensionless parameters	No	
4.	dimensionless parameters	No	
5.	specific speed, applications	No	
6.	stage velocity triangles	No	
7.	stage velocity triangles	No	
8.	work and efficiency for compressors and turbines.	No	
9.	work and efficiency for compressors and turbines.	Yes	
UNIT II Fits and Assemblies			
10.	Types, stage and design parameters,	No	[T1] chapter - 3, [R1, R3]
11.	flow analysis in impeller blades,	No	
12.	Deciding the number of groups	No	
13.	Control of axial play	No	
14.	Grouped datum systems	No	
15.	Volute and diffusers, losses,	No	
16.	characteristics curves and selection	No	
17.	characteristics curves and selection	No	
18.	characteristics curves and selection	No	
UNIT III			
19.	Construction details,	No	[T1] chapter - 5, [R2]
20.	Construction details	No	
21.	Construction details	No	
22.	Construction details	No	
23.	Floating fasteners	No	
24.	diffuser analysis, losses and performance curves	No	
25.	diffuser analysis	No	
26.	diffuser analysis	No	
27.	diffuser analysis	Yes	
UNIT IV Redesigning			
28.	Stage velocity triangles	No	[T1] chapter - 6, [R2,R3]
29.	enthalpy-Entropy diagrams,	No	
30.	stage losses and efficiency	No	
31.	stage losses and efficiency	No	
32.	stage losses and efficiency	No	
33.	simple stage,	No	
34.	design problems and performance characteristics.	No	
35.	design problems and performance characteristics.	No	
36.	design problems and performance characteristics.	Yes	
UNIT V Design for Assembly			
37.	Stage velocity diagrams	No	[T1] chapter – 7,8, [R1]
38.	Stage velocity diagrams	No	
39.	Design for machining	No	

40.	reaction stages	No	
41.	reaction stages	No	
42.	reaction stages	No	
43.	reaction stages	No	
44.	testing and performance characteristics	No	
45.	testing and performance characteristics	No	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment / Seminar / Online Test / Quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by Mr.Thirumavalavan

Addendum

ABET Outcomes expected of graduates of B.Tech / MECH / program by the time that they graduate:

a) The ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) The ability to identify, formulate and solve engineering problems.

c) The ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) The ability to design and conduct experiments, as well as to analyze and interpret data

e) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) The ability to apply reasoning informed by the knowledge of contemporary issues.

g) The ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) The ability to understand professional and ethical responsibility and apply them in engineering practices.

i) The ability to function on multidisciplinary teams.

j) The ability to communicate effectively with the engineering community and with society at large.

k) The ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) The ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION:
Mechanical Engineering graduatesare enthusiastic to provide strong foundation in mathematical, scientific and engineering fundamentals necessary to analyze, formulate and solve engineering problems in the field of Mechanical Engineering.

PEO2: CORE COMPETENCE:
Mechanical Engineering graduates have competence to enhance the skills and experience in defining problems in the field of Mechanical Engineering and Technology design and implement, analyzing the experimental evaluations, and finally making appropriate decisions.

PEO3: PROFESSIONALISM:
Mechanical Engineering graduates made competence to enhance their skills and embrace new thrust areas through self-directed professional development and post-graduate training or education.

PEO4: PROFICIENCY:
Mechanical Engineering graduates became skilled to afford training for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS:
Mechanical Engineering graduates are morally merged to apply the ethical and social aspects of modern Engineering and Technology innovations to the design, development, and usage of new products, machines, gadgets, devices, etc.

Course Teacher	Signature
Mr.Thirumavalavan Mr. R. Karthikeyan	

Course Coordinator **HOD/MECH**
Mr.Thirumavalavan