Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Mechanical Engineering
BGE006-POWER PLANT ENGINEERING
Seventh Semester, 2015-16 (odd Semester)

Course (catalog) description

To understand the various components, operations and applications of different types of power plants .

Compulsory/Elective course : Non-Major elective for Mech Engg Students

Credit & contact hours : 3 & 45

Course Coordinator : S.THIRUMAVALAVAN

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
A.BUCKSHUMIYAN	**4A,4B**	**JR201, JR202**		buckshu@gmail.com	**9.00am-9.50 am**
S.THIRUMAVALAVAN	**4C**	**JR203**		thiru_thriu@hotmail.com	**1.30pm-2.20pm**
G.ANBALAGAN	**4D**	**JR112**		anbupressmach@gmail.com	**11.40pm-12.30pm, 2.20pm-3.10pm**

Relationship to other courses:

Pre –requisites **:** BASIC MECHANICAL ENGINEERING
Co –requisites **:**
Assumed knowledge : To understand the types of power plants

Following courses : **Nil**

Syllabus Contents

UNIT I STEAM POWER PLANT 9

Various components ,types of firing systems-pulverized fuel, tilting and tangential systems, fluidized bed combustion system, coal handling systems-crushers, feeders, ash handling system-Dust collectors ID and FD fans-flue stack, Feed pumps, Economizers, Air preheaters, Super heaters, Reheaters, Condensers- Types.

UNIT II STEAM GENERATORS AND POWER CYCLES 9

Boilers-types-Boiler efficiencies, combustion calculations, equivalent evaporation, Boiler power, cooling towers-tower characteristics. Review of Rankine cycle-reheat, regeneration with open and closed type of feed water heaters and their representation in T-S diagram

UNIT III NUCLEAR, HYDEL AND GAS TURBINE POWER PLANTS 9 Nuclear energy,Fission,Fusion reaction, chain reaction, parts and types, waste disposal and safety in nuclear plants,Hydel plants-classification, selection of turbines, pumped storage system, performance evaluation of turbines. Gas turbine plants-open and closed cycles-combined cycle plants and their representation in T-S diagram

UNIT IV NON CONVENTIONAL ENERGY BASED POWER PLANTS 9

Wind energy, wind mills, wind forming, site selection and limitation, tidal power plants, solar energy-Various solar power energy systems, geothermal energy, Fuel cells, thermionic and thermo electric converters, magneto hydro dynamic plant.

UNIT V ECONOMICS OF POWER GENERATION 9

Load duration curves, power plant economics, fixed and operating costs, Load sharing and plant selection, Economical comparison of various power plants and co-generation. Environmental consideration of various power plants-CO_2, SO_2, NOx and particulate emissions and their control

Total : 45

Computer usage:

Professional component

General	-	0%
Basic Sciences	-	10%
Engineering sciences & Technical arts	-	100%
Professional subject	-	100%

Broad area : Non-conventional sources of energy

Test Schedule

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

Mapping of Instructional Objectives with Program Outcome

To understand the various components, operations and applications of different types of power plants .	Correlates to program outcome		
	H	M	L
Student learns the steam power plant	a		
Student learns the working of generators	c,i		e,k
Student learns the working of turbines	a	f	
Student learns the principle of working in wind energy and wind mills	c	g	e
Student learns the solar energy	i		
Student understands the economics of power generation	a		e,l

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

Draft Lecture Schedule

Session No	Topics to be covered	Problem solving Yes/no	Text/chapter
UNIT-I STEAM NOZZLES			
1	Steam power plants various components	NO	[T1]/CHAPTER-4,5,6
2	Types of firing systems	NO	
3	Titling and tangential , fluidized bed combustion systems	NO	
4	Coal handling systems-crushers, feeders	NO	
5	Ash –handling system-dust collectors ID and FD fans-flue stack	NO	
5	Feed water pumps, economizers, air –pre-heaters	NO	
6	Super heaters and re-heaters, condenser and types	NO	
7	Steam power plants various components	NO	
8	Tutorial -I	YES	

9	Types of cooling towers and draught systems	NO	[T1]/CHAPTER-6
UNIT-II **STEAM GENERATORS AND POWER CYCLES**			
10	Introduction of boilers and different types of boilers	NO	[T1]/CHAPTER-2
11	Types of boilers and production details	NO	
12	Evaporation of vapor details	NO	
13	Boiler power generation calculations	YES	
14	Cooling tower characteristics	YES	
15	Rankine cycle and reheat rankine cycle	NO	
16	Regeneration cycle with open and closed type of fees water heaters and T-S Diagram	NO	
17	Boiler efficiency problem solve	YES	
18	Combustion calculations	YES	
UNIT-III NUCLEAR ,HYDEL AND GAS TURBINE POWER			
19	Introduction of nucleus	NO	[T1]/CHAPTER -9 [R1]/CHAPTER-11,12,13
20	Fission and fusion reaction and new updates chain reaction	NO	
21	`Different parts of nuclear power plant	NO	
22	Waste disposal details and safety measurement	YES	
23	Hydel power plants and recent technology updates	YES	
24	Selection of turbines in power plant	YES	
25	Classification of hydel and nuclear power plants,gas turbine open and closed cycle and their representation T-S diagram	NO	
26	Problems solve to load calculation and dryness	YES	

	fraction		
27	Solve to the gas turbine open and closed cycle problems	YES	
UNIT-IV **NON –CONVENTIONAL ENERGY BASED POWER PLANTS**			
28	Introduction of non conventional energy	NO	[R1]/CHAPTER-15
29	Different types of non conventional power plants	NO	
30	Site Selection and limitation	NO	
31	Tidal power plant and updates	NO	
32	Solar power plant and pv-pannel manufactures d and installation	NO	
33	Various solar power energy systems	NO	
34	Geothermal energy	NO	
35	Fuel cells,thermoionic and thermoelectric converters	NO	
36	Magneto hydro dynamic plant	NO	

UNIT-5 ECONMICS OF POWER GENERATION			
37	Load calculation and dyration curves	NO	[T1]/CHAPTER-14 [R1]/CHAPTER-16,18
38	Power plant economics ,fixed and operating costs	NO	
39	Load sharing and plant selection	NO	
40	**Economical comparison of various power plants co-generation**	NO	
41	Environmental consideration of various power plants	YES	
42	CO2,SO2,NOX and particulate emissions and their control	YES	
43	Solve to the problem	YES	
44	Solve to the problem	YES	

45	Solve to the problem	YES	

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 : S.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
A.BUCKSHUMIYAN	
S.THIRUMAVALAVAN	
G.ANBALAGAN	

Course Coordinator **HOD/MECH**
A.BUCKSHUMIYAN