

Academic Course Description

BHARATH UNIVERSITY
 Faculty of Engineering and Technology
 Department of Electrical and Electronics Engineering
 BEE045 INSTRUMENTATION AND CONTROL IN POWER PLANT INDUSTRIES
Sixth Semester, (Even Semester)

Course (catalog) description

We can know about the various methods of power generation and its control methods.

Compulsory/Elective course : Elective for EEE students

Credit & Contact hours : 3 and 45 hours

Course Coordinator : Mr.S.P.Vijayaragavan

Instructors : Mr.Kathiravan

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Mr.Kathiravan	Final year EEE	KS 304	-	Hod.eee@bharathuniv.ac.in	9.00 - 9.50 AM

Relationship to other courses:

Pre –requisites : Control System

Assumed knowledge : The students will have a physics and mathematics background obtained at a high school level.

Following courses : Nil

Syllabus Contents

UNIT I OVERVIEW OF POWER GENERATION 9

Brief survey of methods of power generation-Wind, Solar, Tidal, Geothermal, MHD, Fuel cells, Biomass- Conventional energy resources-Hydro, Nuclear, Gas, Thermal-Comparison of various conventional power plants-Importance of Instrumentation and control in power generation-P&I diagrams-P&I diagram of boiler-co-generation

UNIT II TURBINE MONITORING AND CONTROL 9

Electrical parameters-Current, Voltage, Power, Energy, Frequency, Power factor etc-Non-electrical parameters-Flow of feed water, fuel, air and steam with correction factor for temperature and pressure-Speed, vibration, shell temperature monitoring and control-Steam pressure control-Lubricant oil temperature control- cooling system.

UNIT III ANALYTICAL MEASUREMENT**9**

Oxygen measurement in flue gas-CO₂ in flue gas-Combustibles analyzers-Infrared flue gas analyzers-Smoke detector-Dust monitor-Closed Circuit Television-Fuel analyzers-Pollution monitoring instruments

UNIT IV CONTROL LOOPS IN BOILERS**9**

Combustion control-air-fuel ratio control-furnace draft control-drum level control- main steam and reheat steam temperature control-super heater control- attemperator- deaerator control-Distributed Control System in power plant interlocks in boiler operation. 188 IC-2013 SRM(E&T)

UNIT V NUCLEAR POWER PLANT INSTRUMENTATION**9**

Introduction-Nuclear physics-Classification of nuclear reactors-Basic reactor systems-P&I diagram of Nuclear power plant-Radiation detection instruments- nuclear reactor control systems and allied instrumentation

Text book(s) and/or required materials

- T1. P. K. Nag, "Power Plant Engineering" 2nd Edition, Tata McGraw-Hill Education, 2002
 T2. Sam G. Dukelow, "The control of boilers" 2nd Edition, Research Triangle Park, 1991

Reference Books:

- R1. R.K.Jain, "Mechanical and Industrial Measurements", 10th Edition, Khanna Publishers, New Delhi, 1995
 R2. Bela G Liptak, "Instrumentation in the processing industries" 1st edition, Chilton Book Co, Chilton Book Co; 1973

Professional component

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

Broad area : Electrical Machines/Electronics/Power system/**Control & Instrumentation.**

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2 nd week	Session 1 to 18	2 Periods
2	Cycle Test-2	March 2 nd week	Session 19 to 38	2 Periods
3	Model Test	April 3 rd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

We can know about the various methods of power generation and its control methods.	Correlates to program outcome		
	H	M	L
1 .Measurement, Control System	a,b,c,d,e,g,h,i,j	k,l	
2. To be familiar about the important parameters that has to be monitored and controlled	l	a,d,e,f	g,h
3. To be familiar about the various parameters that has to be analyzed and measured analytically	c,l		a,b
4. To understand about the boilers.	b,c,d,l		
5. To get an detailed knowledge about Nuclear Power Plant Instrumentation	a,c,h,j,l	b	

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

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I OVERVIEW OF POWER GENERATION			
1.	Brief survey of methods of power generation	No	[T1]
2.	Wind, Solar, Tidal, Geothermal, MHD, Fuel cells	Yes	
3.	Biomass	No	
4.	Conventional energy resources	No	
5.	Hydro, Nuclear, Gas, Thermal	No	
6.	Comparison of various conventional power plants	No	
7.	Importance of Instrumentation and control in power generation	No	
8.	P&I diagrams	No	
9.	P&I diagram of boiler-co-generation	No	
UNIT II TURBINE MONITORING AND CONTROL			
10.	Electrical parameters- Current, Voltage, Power, Energy	Yes	[T1][T2][R1]
11.	Frequency, Power factor	Yes	
12.	Non-electrical parameters	No	
13.	Flow of feed water, fuel, air and steam	Yes	

14.	correction factor for temperature and pressure	Yes	
15.	Speed, vibration monitoring and control	No	
16.	shell temperature monitoring and control	No	
17.	Steam pressure control-Lubricant oil temperature control	No	
18.	Cooling system	No	
UNIT III ANALYTICAL MEASUREMENT			
19.	Oxygen measurement in flue gas	No	[T1][R1][R2]
20.	CO2 in flue gas-Combustibles analyzers	No	
21.	Infrared flue gas analyzers	No	
22.	Smoke detector	No	
23.	Dust monitor	No	
24.	Closed Circuit Television	No	
25.	Fuel analyzers	No	
26.	Pollution monitoring instruments	No	
27.	Pollution monitoring instruments		
28.	Pollution monitoring instruments		
UNIT IV CONTROL LOOPS IN BOILERS			
29.	Combustion control	No	[T1][T2]
30.	air-fuel ratio control-furnace draft control	Yes	
31.	drum level control	No	
32.	main steam and reheat steam temperature control	No	
33.	super heater control	No	
34.	attemperator	No	
35.	deaerator control	No	
36.	Distributed Control System in power plant interlocks in boiler operation. 188 IC-2013 SRM(E&T)	Yes	
37.	Distributed Control System in power plant interlocks in boiler operation. 188 IC-2013 SRM(E&T)		
38.	Distributed Control System in power plant interlocks in boiler operation. 188 IC-2013 SRM(E&T)		
UNIT V NUCLEAR POWER PLANT INSTRUMENTATION			
39.	Introduction	No	[T1]
40.	Nuclear physics	No	
41.	Classification of nuclear reactors	No	
42.	Basic reactor systems	No	

43.	P&I diagram of Nuclear power plant	No	
44.	Radiation detection instruments	No	
45.	nuclear reactor control systems and allied instrumentation	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%
Attendance	-	5%
Assignment		5%
Final exam	-	70%

Prepared by:
Mr.S.P.Vijayaragavan

Dated :

Addendum

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

- a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.
- b) An ability to identify, formulate, and solve engineering problems.
- c) An 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) An ability to design and conduct experiments, as well as to analyze and interpret data.
- e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- f) An ability to apply reasoning informed by the knowledge of contemporary issues.
- g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- h) An ability to understand professional and ethical responsibility and apply them in engineering practices.
- i) An ability to function on multidisciplinary teams.
- j) An ability to communicate effectively with the engineering community and with society at large.
- k) An 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) An ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION

Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE

Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM

Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS

Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Mr.Kathiravan	

Course Coordinator
(Mr.S.P.Vijayaragavan)

HOD/EEE
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