

**Academic Course Description**

<p style="text-align: center;">BHARATH UNIVERSITY Faculty of Engineering and Technology Department of Electrical and Electronics Engineering <b>BEE505 &amp; POWER GENERATION SYSTEMS</b> <b>Fifth Semester ( odd semester)</b></p>
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**Course (catalog) description:**

To understand the working of different types of power generation systems and to realize the necessity for interconnected operation of different power stations.

**Compulsory/Elective course** : Compulsory for EEE students

Credit hours&contact hours : 3 &45 hours

Course Coordinator : Mr.K.S.S.Prasad

**Instructors** : Mr.K.S.S.Prasad

<b>Name of the instructor</b>	<b>Class handling</b>	<b>Office location</b>	<b>Office phone</b>	<b>Email (domain:@bharathuniv.ac.in)</b>	<b>Consultation</b>
Mr.K.S.S.Prasad	Third year EEE	KS 302	04422290125	Prasad.eee@ bharathuniv.ac.in	12.30 PM – 1.30 PM

**Relationship to other courses:**

Pre –requisites :BME203 – BASIC MECHANICAL ENGINEERING

Assumed knowledge :To obtain knowledge of different power plants and its operation

Following courses : BEE019- SMART GRID

**Syllabus Contents:**

**UNIT I ECONOMICS OF GENERATION 9**

Load and load duration curve – Load, demand and diversity factors – Plant capacity and plant use factors – choice of type of generation – choice of size and number of unit – cost of energy generated – Tariffs.

**UNIT II THERMAL, NUCLEAR AND HYDRO POWER PLANTS 9**

Location, Layout and working of steam ,diesel and gas power plants - Principles of nuclear power generation, Types of nuclear power plants and their comparison, Layout and working of nuclear power plants, Advantages and disadvantages of nuclear energy-Layout and working, Types of hydroelectric power plants, Advantages of hydro generation, Environmental issues.

**UNIT III POWER PLANT INSTRUMENTATION 9**

Importance of instrumentation in power plants, P & I diagram of boiler- Measurements of non-electrical parameters, flow of feed water, air, steam, radiation detector, smoke density measurement-analyzers, flue gas oxygen analyzer, chromatography, PH meter, pollution monitoring instruments.

**UNIT IV BOILER, TURBINE-MONITORING AND CONTROL 9**

Combustion control - furnace draft control-drum level control- deaerator control- boiler interlocks-speed, vibration, temperature monitoring control of turbine- lubrication and cooling system of turbine.

**UNIT V NON CONVENTIONAL PLANTS 9**

Introduction to the concept of distributed generation –basics on distributed generation Technologies- Effect on system operation. Basic concepts, Principle of working and layout of MHD, Solar, Wind, Tidal, Biomass and Geothermal Power Generation Systems.

**Text book(s) and/or required materials:**

**T1:**Nagpal.G.R, “Power plant engineering”,Khanna Publishers,New Delhi,2001.

**T2:**Uppal.S.L, “Electrical Power”, Khanna Publishers, New Delhi, 1997.

**Reference Books:**

**R1:**Soni, Gupta, Bhatnagar, “A Course in Electrical Power”, Dhanpat Rai & Sons, Delhi.1992.

**R2:**Sam.G,Dukelow, “The control of boilers”, Instrument Society ofAmerica,1991

**R3:**Nagrath.I.J, and Kothari.D.P, “Modern Power System Analysis”, Tata McGraw Hill, 3rd Edition,2003.

**R4:**Wadhwa, C.L., “Generation, Distribution and Utilization of Electric Energy”, New Age International Ltd.,3rd Edition,2011

**R5:**Gupta.B.R, “Generation of Electrical energy” , Eurasia Publishing House(p)Ltd,New Delhi,2003

**R6:**Deshpande.M.V, “Elements of Electrical Power Station design”, Pitman, NewDelhi.1991.

**R7:**Anne-Marie Borbely, Jan F.Kreider, “Distributed Generation”, CRC PressLLc, 2001.

**R8:**Jain.R.K,“Mechanical and industrial Measurements”, Khanna Publishers, New Del hi,1995.

**R9:** <http://nptel.ac.in/courses/108102047/>

**Professional component**

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

Broad area : Circuit Theory | Electrical Machines| Electronics | **Power System**| Control &Instrumentation

## Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1 <sup>st</sup> week	Session 1 to 18	2 Periods
2	Cycle Test-2	September 2 <sup>nd</sup> week	Session 19 to 36	2 Periods
3	Model Test	October 2 <sup>nd</sup> week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

## Mapping of Instructional Objectives with Program Outcome

To introduce control system lab experiments using hardware and software tools which provide path towards the engineering applications.	Correlates to program outcome		
	<b>H</b>	<b>M</b>	<b>L</b>
CO1: To learn the economics connected with power generation	b,c,e,j ,k,l	a,f ,h	g,i
CO2: To learn generation of electrical power from different types of power plants like thermal ,nuclear and hydro power stations.	a,b,e,j, l	c,f ,g, h,I ,k	
CO3: To understand the measurement of various parameter in power plant and power plant instrumentation.	a,b,c,e ,h,j,l	f,g ,I, k	
CO4: To understand the monitoring and control concepts of the of the boiler and	a,b,e,f	c,g	i

turbine.	,j,k,l	,h	
CO5: To understand the concepts of generation of electrical power using non-conventional energy resources .	i,j,k,l, a,b,c,e	f,g ,h	

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

**Draft Lecture Schedule:**

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
<b>UNIT I ECONOMICS OF GENERATION</b>			
1.	Load and load duration curve.	Yes	T2,R1,R5
2.	Load, demand and diversity factors.	No	
3.	Load, demand and diversity factors.	No	
4.	Plant capacity and plant use factors.	Yes	
5.	Choice of type of generation.	No	
6.	Choice of size and number of unit.	Yes	
7.	Cost of energy generated.	Yes	
8.	Tariffs.	Yes	
<b>UNIT II THERMAL, NUCLEAR AND HYDRO POWER PLANTS</b>			
9.	Location, Layout and working of steam, power plants.	No	T,T2,R1,R4
10.	Location, Layout and working of diesel power plants.	No	
11.	Location, Layout and working of diesel and gas power plants.	No	

12.	Principles of nuclear power generation	No	
13.	Types of nuclear power plants and their comparison	No	
14.	Layout and working of nuclear power plants,	No	
15.	Layout and working of nuclear power plants, Advantages and disadvantages of nuclear energy.	No	
16.	Layout and working hydroelectric power plants.	No	
17.	Types of hydroelectric power plants, Advantages of hydro generation, Environmental issues.	No	
<b>UNIT III POWER PLANT INSTRUMENTATION</b>			
18.	Importance of instrumentation in power plants, P & I diagram of boiler	No	T1,T2,R2,R6
19.	Importance of instrumentation in power plants, P & I diagram of boiler	No	
20.	Measurements of non-electrical parameters,	No	
21.	Flow of feed water,	No	
22.	Air Steam, radiation detector.	No	
23.	Smoke density measurement-analyzers.	No	
24.	Chromatography	No	
25.	PH meter.	No	
26.	Pollution monitoring instruments.	No	
<b>UNIT IV BOILER, TURBINE-MONITORING AND CONTROL</b>			
27.	Combustion control.	No	

28.	Furnace draft control-drum level control.	No	T1,T2,R2
29.	Furnace draft control-drum level control.	No	
30.	Deaerator control.	No	
31.	Deaerator control.	No	
32.	Boiler interlocks-speed, vibration,	No	
33.	Temperature monitoring control of turbine.	No	
34.	Lubrication and cooling system of turbine.	No	
35.	Lubrication and cooling system of turbine.	No	
<b>UNIT V NON CONVENTIONAL PLANTS</b>			
36.	Introduction to the concept of distributed generation.	No	T1,T2,R1,R3
37.	Basics on distributed generation Technologies, Effect on system operation.	No	
38.	Basic concepts, Principle of working and layout of MHD	No	
39.	Solar Power Generation System.	No	
40.	Solar, Power Generation System.	No	
41.	Wind Power Generation System.	No	
43.	Tidal Power Generation System.	No	
44.	Biomass Power Generation System.	No	
45.	Geothermal Power Generation System.	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.
- Video Lecture presentation.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

## Evaluation Strategies

Cycle Test – I	-	05%
Cycle Test – II	-	05%
Model Test	-	10%
Attendance	-	05%
SEMINAR&ASSIGNMENT	-	05%
Final exam	-	70%

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**Prepared by:**

**Dated :**

**Mr.K.S.S.PRASAD**

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## **BEE505 & POWER GENERATION SYSTEMS**

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### **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.

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<b>Course Teacher</b>	<b>Signature</b>
Mr.K.S.S.PRASAD	

**Course Coordinator**  
(Mr.K.S.S.PRASAD)

**HOD/EEE**  
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