

## Academic Course Description

BHARATH UNIVERSITY  
 Faculty of Engineering and Technology  
 Department of Electrical and Electronics Engineering

**BEE048 & RENEWABLE ENERGY SOURCES**  
**Sixth Semester (EVEN Semester)**

### Course (catalog) description

To create awareness among the students about the different types of non-conventional energy resources and emphasize its importance

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

Credit hours : 3 & 45

Course Coordinator : S.Uma Mageswaran

**Instructors** : S.Uma Mageswaran

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
S.Uma Mageswaran	Third year EEE	KS 302	04422290125	u_magesh125@yahoo.co.in	9.00-9.50 AM

### Relationship to other courses:

Pre –requisites : BEE505 Power Generation Systems

Assumed knowledge : knowledge in various energy sources, optimal power production

Following courses : Nil

### Syllabus Contents

#### UNIT I INTRODUCTION ABOUT ENERGY RESOURCES

9

General primary and commercial energy resources- study of availability-energy consumption pattern and growth rath in India- non –commercial energy sources –availability, economics and efficiency

#### UNIT II SOLAR ENERGY AND APPLICATIONS OF SOLAR ENERGY 9

Solar energy and application; solar radiation-principles of solar energy collections- types of collectors-characteristics and principles of different types of collectors- their efficiencies-solar energy applications water heaters, air heaters, solar cooking, solar drying and power generation-tower concept (solar plant)-solar pump

**UNIT III WIND ENERGY****9**

Wind energy: energy from wind-general theory of wind mills - types of wind mills-performance of wind machines-wind power - efficiency

**UNIT IV TIDAL AND GEOTHERMAL ENERGY****9**

Tidal Energy from tides and waves- working principles of tidal plants-tidal power generations –geothermal energy-principle of working of geothermal power plants

**UNIT V BIOMASS ENERGY****9**

Bio energy: energy from bio mass-biogas plants-various types-industrial wastes-municipal wastes-burning plants-energy from the agricultural wastes- applications

**Total: 45 HOURS****Text Books:**

1. Rai.G.D, “Non-conventional resources of energy”, Khanna publishers, Fourth edition, 2010.
2. Khan.B.H, “Non-Conventional Energy Resources”, The McGraw Hills, Second edition, 2009.

**References:**

1. S.P.Sukhatme, 'Solar Energy,(principles of thermal collection and storage ), Tata McGraw-Hill Publishers, Fourth print-February 1989
2. Ronald Shaw, 'Wave Energy – (A Design Challenge )', Ellis Horwood Limited publishers, first edition- 1982
3. [http://nptel.ac.in/courses/113104058/mme\\_pdf/Lecture1.pdf](http://nptel.ac.in/courses/113104058/mme_pdf/Lecture1.pdf)

**Professional component**

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	0%
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 <sup>nd</sup> week	Session 1 to 14	2 Periods
2	Cycle Test-2	March 2 <sup>nd</sup> week	Session 15 to 28	2 Periods
3	Model Test	April 3 <sup>rd</sup> week	Session 1 to 45	3 Hrs

4	University Examination	TBA	All sessions / Units	3 Hrs.
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### Mapping of Instructional Objectives with Program Outcome

To create awareness among the students about the different types of non-conventional energy resources and emphasize its importance	Correlates to program outcome		
	H	M	L
1. Able to understand the renewable energy sources available at present.	b,g,h,j,k	c,l,j,l	a
2. Able to understand the solar energy operation and its characteristics.	e,f	b,c,g,h,l	k
3. To educate the wind energy operation and its types.	b,c,e,f,,g,h,k	l,j,l	a
4. To educate the tidal and geothermal energy principles and its operation.	c,e,f,g,h,k	b,j,	a,d,i
5. Able to understand the biomass energy generation and its technologies.	a,d	b,c,f,g,h,l,	e,g,k

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

**Draft Lecture Schedule**

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
<b>UNIT I</b>			
1.	General primary and commercial energy resources	No	T1,R2
2.	General primary and commercial energy resources	No	
3.	study of availability	No	
4.	energy consumption pattern and growth rath in India	No	
5.	energy consumption pattern and growth rath in India	No	
6.	non –commercial energy sources	No	
7.	availability of Energy sources	No	
8.	availability of Energy sources	No	
9.	economics and efficiency	No	
<b>UNIT II</b>			
10.	Solar energy and application	No	T1,T2
11.	solar radiation-principles of solar energy collections	No	
12.	types of collectors	No	
13.	characteristics and principles of different types of collectors	No	
14.	their efficiencies	No	
15.	solar energy applications water heaters	No	
16.	air heaters, solar cooking, solar drying and power generation	No	
17.	tower concept (solar plant)	No	
18.	solar pump	No	
<b>UNIT III</b>			
19.	Wind energy	No	T2,R1
20.	energy from wind	No	
21.	general theory of wind mills	No	
22.	types of wind mills	No	
23.	performance of wind machines	No	
24.	performance of wind machines	No	
25.	wind power – detailed analysis	No	
26.	wind power – detailed analysis	No	
27.	Efficiency	No	
<b>UNIT IV</b>			
28.	Tidal Energy from tides and waves	No	T1,R1
29.	Tidal Energy from tides and waves	No	
30.	working principles of tidal plants	No	
31.	tidal power generations - Introduction	No	

32.	tidal power generations	No	
33.	tidal power generations - Analysis	No	
34.	geothermal energy- Introduction	No	
35.	principle of working of geothermal power plants	No	
36.	principle of working of geothermal power plants	No	
<b>UNIT V</b>			
37.	Bio energy	No	T2,R2
38.	energy from bio massapplications	No	
39.	biogas plants-various	No	
40.	types-industrial wastes	No	
41.	municipal wastes	No	
42.	burning plants	No	
43.	burning plants	No	
44.	energy from the agricultural wastes	No	
45.	energy from the agricultural wastes	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%
Seminar&Assignment	-	5%
Final exam	-	70%

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**Prepared by:** S.Uma Mageswaran Assistant Professor, Department of EEE

**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.S.Uma Mageswaran	

**Course Coordinator**

(Mr.S.Uma Mageswaran)

**HOD/EEE**

