Academic Course Description

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

BCE097 RENEWABLE SOURCES OF ENERGY
Eighth Semester, 2016-18 (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 Civil students

Credit / contact hours : 3 credits / 45 hours

Course Coordinator : Dr.S. Buvaneshwari

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Dr.S. Buvaneshwari	final year Civil	Civil Block			9.00-9.50 AM

Relationship to other courses:

Pre –requisites : Engineering Earth Science

Assumed knowledge : Basic knowledge in engineering and earth science to provide solutions to engineering problems within the context of the natural world.

Following courses : NIL

Syllabus Contents

UNIT I GENERAL 9
Primary energy sources -direct energy - conversion -comparison with conventional energy-conversion devices. SOLAR ENERGY – Principles of solar energy collection – solar radiation – measurement instruments - data and estimation - types of collectors - characteristics and design principles of different types of collectors - testing of collectors.

UNIT II SOLAR ENERGY APPLICATIONS 9
Solar thermal applications – water heaters and air heaters performance and applications - simple calculations on solar cooling, solar drying, solar ponds, solar tower concepts and solar furnace.

UNIT III WIND AND TIDAL ENERGY 9
Energy from the wind – general theory of windmills – design aspects of horizontal axis and vertical axis windmills – applications. Energy from tides and waves – working principles of tidal plants and ocean

thermal energy conversion plants – power from geothermal energy – principles of working of geothermal power plants.

UNIT IV BIO – ENERGY **9**

Energy from bio – mass bio – gas plants – various types -design principles of bio – gas plants applicationsEnergy from waste burning- power plants, utilization of industrial and municipal wastes – energy from the agricultural wastes.

UNIT V DIRECT ENERGY CONVERSION **9**

(Description, principle of working and basic design aspects only) Magneto hydrodynamic systems, thermo electric generators, thermionic generators fuel cells solar cells types, e.m.f. generated, power output, tosses and efficiency and applications.

Text Books:

1. Rai.G.D, "Non-conventional resources of energy", Khanna publishers, Fourthedition, 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. John A. Duffie, William A. Beckman,"Solar Energy Thermal processes", John Wiley & Sons; 4th Edition edition (17 May 2013)

Computer usage:

Professional component

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

Broad area :

Test Schedule

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

Mapping of Instructional Objectives with Program Outcome

To impart knowledge on sources and characteristics of various renewable source of energy and strategies for its implementation	Correlates to program outcome		
	H	**M**	**L**
1. Have knowledge about the various renewable sources of energy	b,c		
2. Have a well-founded knowledge about the Primary energy sources	b,c		
3. Acquire skills in assessing the suitability of direct energy conversion	b,c		
4. Have knowledge about bio – energy	b,c		
5. Have knowledge about solar energy.	b,c		

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

Draft Lecture Schedule

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I GENERAL			
1.	Primary energy sources	No	
2.	Direct energy - conversion	No	

3.	Comparison with conventional energy-conversion devices.	No	[T1 & R1,R3]
4.	SOLAR ENERGY – Principles of solar energy collection	No	
5.	Solar radiation – measurement instruments	No	
6.	Data and estimation	No	
7.	Types of collectors	No	
8.	Characteristics and design principles of different types of collectors	No	
9.	Testing of collectors	No	
UNIT II	**SOLAR ENERGY APPLICATIONS**		
10.	Solar thermal applications	No	[T1,T2 & R1,R3]
11.	Water heaters	No	
12.	Air heaters performance	No	
13.	Air heaters applications	No	
14.	Simple calculations on solar cooling	No	
15.	Solar drying	No	
16.	Solar ponds	No	
17.	Solar tower concepts	No	
18.	Solar furnace	No	
UNIT III	**WIND AND TIDAL ENERGY**		
19.	Energy from the wind	No	[T1 & R1,R2]
20.	General theory of windmills	No	
21.	Design aspects of horizontal axis windmills	No	
22.	Design aspects of vertical axis windmills	No	
23.	Aapplications. Energy from tides and waves	No	
24.	Working principles of tidal plants	No	
25.	Working principles of ocean thermal energy conversion plants	No	
26.	power from geothermal energy	No	
27.	principles of working of geothermal power plants	No	
UNIT IV	**BIO – ENERGY**		
28.	Energy from bio – mass	No	[T1,T2 & R2,R3]
29.	Bio – gas plants Various types	No	
30.	Design principles of bio – gas plants	No	
31.	Bio –gas plants applications	No	
32.	Energy from waste burning	No	
33.	Power plants	No	
34.	Utilization of industrial wastes	No	
35.	utilization of municipal wastes	No	
36.	Energy from the agricultural wastes	No	
37.			
UNIT V	**DIRECT ENERGY CONVERSION**		
38.	(Description, principle of working and basic design aspects only) Magneto hydrodynamic systems,	No	

39.	Thermo electric generators	No	[T1 & R1,R3]
40.	Thermionic generators	No	
41.	fuel cells	No	
42.	Solar cells types, e.m.f. generated	No	
43.	Power output	No	
45.	Tosses and efficiency and applications	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	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

Prepared by: **Dated :**

Dr.S. Buvaneshwari , Assistant Professor , Department of Civil

Addendum

ABET Outcomes expected of graduates of B.Tech / civil/ 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
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
Dr.S. Buvaneshwari	

Course Coordinator **HOD/CIVIL**