Kadi SarvaVishwavidyalaya's
LDRP Institute of Technology & Research
Gandhinagar-382 015

B. E. Semester: 4 Mechanical Engineering
Subject Name: NONCONVENTIONAL ENERGY SOURCES (ME-403)

A. Course Objective:

- To present a problem oriented in depth knowledge of NON CONVENTIONAL ENERGY SOURCES
- To address the underlying concepts and methods behind NON CONVENTIONAL ENRRGY SOURCES.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
ME404	**NON CONVENTIONAL ENERGY SOURCES**	3	0	0	3	3	3	70	30	20	-	120

C. Detailed Syllabus

1. **Introduction** : Energy needs, conventional energy sources, non-conventional energy sources
2. **Solar radiation & its measurement** : solar constant, spectral distribution of solar radiation, beam, diffuse and global radiation, attenuation of beam radiation, basic earth-sun angles, local solar time, derived solar angles, sunrise, sunset and day length.
3. **Flat plate collectors** : Construction & working, performance analysis, collector efficiency, transmissivity of a cover system, transmissivity – absorptivity product, overall loss coefficient, collector efficiency factor, heat removal factor, selective surfaces.
4. **Concentrating Collectors**:Types, concentration ratio, cylindrical parabolic collector, its thermal performance, orientation and tracking requirement, materials of concentrating collectors, central receiver collector.
5. **Applications of solar energy** : Solar air heaters-types, solar driers, storage of solar energy-thermal storage, solar pond – non convecting & salt gradient, solar water heaters, solar heating & cooling of buildings, photovoltaics - solar cells & its applications, solar distillation, solar still, solar cooker, solar refrigeration, application of solar energy in space.
6. **Wind Energy** : Introduction, principles of wind energy conversion, wind energy estimation, site election, wind energy conversion system – classification – advantages and disadvantages, wind machines – analysis of aerodynamic forces acting on the blade – performance, energy storage, application , safety and environmental aspects.
7. **Energy from Biomass** : Biomass conversion technologies, Biogas generation plants – classification – advantages and disadvantages – constructional details – site selection – digester design consideration – filling a digester for starting – maintaining biogas production and utilization of biogas and plant waste – biogas plant scope and future.
8. **Geothermal Energy** :Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geopressured hot dry rock, magma. advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

9. **Energy from the ocean** :Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India.
10. **Energy from tides:** basic principle of tidal power, tidal power plants, tidal Energy systems, advantages, limitation and scope of tidal energy. Wave energy and power from wave, wave energy conversion devices, advantages and disadvantages of wave energy.
11. **Magneto Hydro Dynamic (MHD) Power Generation** :Principle, various systems, and future prospects.
12. **Energy Management** :Energy economics, energy conservation, energy audit, general concept of total energy system, scope of alternative energy system in India.

D. Lesson Planning

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1st ,2ed ,3ed	Unit 1	20 % .	1,2
2	4th ,5th ,6th	Unit 2	20 %	3,4
3	7th ,8th ,9th	Unit 3	20 %	5,6
4	19th ,11th ,12th	Unit 4	20 %	7,8,9
5	13th ,14th ,15th	Unit 5	20 %	10,11,12

E. Instructional Method & Pedagogy

1. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2. Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
3. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4. One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
5. Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7. The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures. Experiments shall be performed in the laboratory related to course contents. Suggested list of experiment is given below

F. Students Learning Outcomes

- The student can identify different areas of NON CONVENTIONAL ENERGY SOURCES
- Can find the applications of all the areas in day to day life.

G. Recommended Study Materials:

1. Solar Energy by S. P. Sukhatme , Tata Mc Graw Hill
2. Solar Energy Utilization by G. D. Rai , Khanna Pub.
3. Non- Conventional Energy Source by G. D. Rai , Khanna Pub.
4. Web base resources: www.sciencedirect.com ,www.ocw.mit.edu,nptl.ac.in