

1009 - NON-CONVENTIONAL SOURCES OF ENERGY									
Teaching Schedule Per Week			Progressive Assessment	Examination Schedule (Marks)					
Lectures	Practical	Credits		Theory		Practical Ex.		Total	
3	-	3	25	3Hrs.	100	-	-	125	
Pre-requisite		Source	Semester	Theory	Test	Total	TW	PR	Gr Total
Nil		MCL		75	25	100	-	-	100

Updated on 8/ 8/ 2000

RATIONALE: -The power demand in the country is increasing at a very fast rate & power production is not able to keep pace with the power demand. The resources required for the generation of power are gradually getting exhausted. Therefore it becomes necessary to investigate the possibility of producing energy from non-conventional sources. Researches & efforts are being made to utilize the non-conventional sources of energy for power generation, which in turn can meet the power demand. Looking to this need, this course has been introduced in the third level as an optional course.

COURSE CONTENTS	Hrs	Mks
1. INTRODUCTION	3	5
Difference between conventional sources and renewable sources of energy. Potential and limitations of various renewable sources of energy like solar, wind, hydro-power, tidal, geothermal and bio-mass.		
2. SOLAR ENERGY	18	40
(No mathematical treatment) Solar radiation at earth surface. Non-concentrating solar energy collectors – Flat plate collector: - Construction and working of a typical liquid collector, Solar air collector: -Construction and working of a typical air collector, with absorber details (porous and non-porous type). Concentrating types of solar energy collectors – Focussing collectors: - Working principle of parabolic trough reflector, mirror strip reflector, fresnel lens collector. Non-focussing collector: - Working principle of flat plate collector augmented with mirrors, compound parabolic concentrators. Solar energy storage system – Working principle for following: Thermal storage: - Packed bed storage type; Electrical storage: -Battery storage type. Mechanical storage: -Pumped hydroelectric storage, compressed air storage, fly-wheel storage; Solar Pond: -Principle of operation, description of non-convective solar pond, applications. Applications of solar energy. Water heating: - Natural, forced circulation; Space heating: -Passive heating system-direct gain thermal storage wall, attached sun spaces, roof storage connective loop. Active heating system: -Basic hot water system, basic hot air system. Solar thermal electric conversion: Solar pond electric power plant. Solar electric power generation: -Solar photovoltaics: - Principles, basic photovoltaic system for power generation, application; Solar distillation: - Solar water still; Solar pumping: -Solar pump schematics; Solar furnace: - Schematics. Solar cooker – Box type cooker.		
3. BIO-MASS ENERGY	7	15
Bio mass -A source of energy; Different categories of bio mass. Bio mass conversion technologies – Direct combustion, thermal-chemical conversion; bio-chemical conversion. Classification of bio gas plants: -Continuous type – Single stage process, double stage process. Dome & drum type – Schematics. Types of bio-gas plants (with construction) KVIC digester, common circular fixed dome digester;		
4. WIND ENERGY	10	20
Definition of wind-speed, wind-power and mass of air. Basic components of wind energy conversion: system, physical embodiment of wind-Electric generating system. Classification of W.E.C. systems – According to axis of shaft; Number of blades; The relative position of the rotor following the wind velocity, such as upwind, down wind; According to its size; According to output power; Rotational speed. Construction of horizontal axis type windmill -Single, two, multi-blade types. Application of wind energy. Basic wind energy conversion system with energy storage; Wind assisted gas –Turbine generating unit; Wind energy system with battery storage. Environmental aspects of wind energy system.		
5. SOURCES OF ENERGY	10	20
Geothermal - Sources, schematic arrangement single geothermal energy. Tidal block diagram of single basin and double basin system. Ocean thermal energy conversion – Schematic diagram off Rankine cycle plant. Small scale hydroelectric plant – Components of hydroelectric scheme; Typical arrangement of small hydel power plant.		

Total