

| Course code | Course Name | L-T-P- Credits | Year of Introduction |
|--|---|----------------|----------------------|
| CH361 | ENERGY ENGINEERING | 3-0-0-3 | 2016 |
| Prerequisite : Nil | | | |
| Course Objectives | | | |
| <ul style="list-style-type: none"> To familiarize the students with various conventional & non-conventional energy sources To develop understanding about energy harnessing methodology for sustainable development. | | | |
| Syllabus | | | |
| General classification of energy, world and Indian energy resources and energy consumption,. Conventional energy resources Solar energy Wind energy and applications. Ocean energy, tidal energy, geothermal energy. Biomass energy resources Fuel cells. Magneto hydro dynamic power generation Energy conservation in different chemical process plants- Energy Audit, electrical energy conservation in chemical Process plants | | | |
| Expected Outcome | | | |
| The students will be able to | | | |
| <ol style="list-style-type: none"> Identify different sources of energy. Differentiate conventional and non conventional resources. Apply the knowledge on different energy harnessing technology to related practical problem. Aware importance of effective utilization of energy in process plants & daily life. | | | |
| Text Books | | | |
| <ol style="list-style-type: none"> Rao S. & Parulekar B.B., Energy Technology, Khanna Publishers. Bansal N.K., Kleeman M. & Meliss M., Renewable Energy Sources & Conversion Tech., Tata McGraw Hill. Goldmberg J., Johansson, Reddy A.K.N. & Williams R.H., Energy for a Sustainable World, John Wiley | | | |
| References: | | | |
| <ul style="list-style-type: none"> Sukhatme S.P., Solar Energy, Tata McGraw Hill Mittal K.M., Non-Conventional Energy Systems, Wheeler Publications. Venkataswarlu D.I, Chemical Technology, S. Chand Pandey G.N., A Text Book on Energy System and Engineering, Vikas Publishing. Rai G.D., Non-Conventional Energy Sources, Khanna Publishers. | | | |
| Course Plan | | | |
| Module | Contents | Hours | Sem. exam marks |
| I | Energy, general classification of energy, world energy resources and energy consumption, Indian energy resources and energy consumption, energy Crisis, energy alternatives | 6 | 15% |
| II | Conventional energy resources, Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants, efficiency, merits and demerits of the above power plants, combustion processes, fluidized bed combustion. | 6 | 15% |

| FIRST INTERNAL EXAMINATION | | | |
|------------------------------------|---|---|-----|
| III | Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, energy plantations. Wind energy, types of windmills, types of wind rotors, Darrieus rotor and Savonius rotor, wind electric power generation, wind power in India, economics of wind farm generation, wind power in India, economics of wind farm. | 8 | 15% |
| IV | Ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy. Biomass energy resources, thermochemical and biochemical methods of biomass conversion, combustion, gasification, pyrolysis, biogas | 7 | 15% |
| SECOND INTERNAL EXAMINATION | | | |
| V | Fuel cells, alkaline fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, solid oxide fuel cell, solid polymer electrolyte fuel cell. magneto hydro dynamics, open cycle and closed cycle systems, magneto hydro dynamic power generation | 7 | 20% |
| VI | Energy conservation in chemical process plants, energy audit energy saving in heat exchangers, distillation columns, dryers, ovens and furnaces and boilers, steam economy in chemical plants, energy conservation in petroleum, fertilizer and steel industry, cogeneration, pinch technology, recycling for energy saving, electrical energy conservation in chemical Process plants, environmental aspects of energy use. | 8 | 20% |
| END SEMESTER EXAM | | | |

Question Paper Pattern:

Maximum Marks: 100

Exam Duration: 3 Hours

Part A: There shall be **Three questions** uniformly covering Modules 1 and 2, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

Part B: There shall be **Three questions** uniformly covering Module 3 and 4, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

Part C: There shall be **Three questions** uniformly covering Module 5 and 6, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 20 marks for all the subdivisions put together. (2 x20= 40 Marks)