



**TEERTHANKER MAHAVEER UNIVERSITY
UNIVERSITY POLYTECHNIC**

OPEN ELECTIVE COURSES

Under

Choice Based Credit System

[w.e.f. 2020-21]

Generic Elective Courses (GEC)

Course Code: OEPOL10 1	Generic Elective Course I – Semester-V Non-Conventional Energy Sources	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the generation of electricity from various Non-Conventional sources of energy.	
CO2.	Understanding and applying the theories, principles and technology of solar energy, Utilization and conversion of it to electricity generation.	
CO3.	Understanding and applying the concepts, theories & principles of wind energy conversion in electricity generation.	
CO4.	Understanding the operational methods of ocean energy to electricity generation.	
CO5.	Understanding the concepts, theories and principles of geothermal energy.	
Course Content:		
Unit-1:	Introduction: Energy sources conventional and non-conventional, their availability, Recent trends in Power Generation, Interconnected Generation of Power Plants.	6 Hours
Unit-2:	Solar Power Generation: Solar radiations, solar energy collectors; flat plate and focusing type, energy balance equation and collector efficiency, photovoltaic cells applications of solar energy; solar pumping, solar green houses.	6 Hours
Unit-3:	Bio-energy: Biomass, Power Generation by using gassifiers. Biogas Plants, Smokeless Chulhas. Hydro Electric Generation Selection of site, basic definitions, capacity calculations, classification, elements of hydroelectric plant and operation of hydro-electric plant, hydro-electric generator choice of size and number of generating Units.	6 Hours
Unit-4:	Wind Power Generation: Wind surveys, Basic principles of wind energy conversion, basic components of Wind Energy Conversion Systems (WECS), wind machines, schemes of wind power generation and control.	6 Hours
Unit-5:	Magneto Hydro Dynamic (MHD) Power Generation: Basic principles of Magneto Hydro Dynamic (MHD), MHD systems types of MHD material, electrical conditions; voltage and power output, gas conductivity, application.	6 Hours
Text Books:	<ol style="list-style-type: none"> 1. Christopher A. Simon, <i>Alternate Source of Energy</i>, Rowman and Little Field Publishers Inc., 2007. 2. C.L. Wadhwa, <i>Generation, Distribution and Utilization of Electric Energy</i>, New Age International, Publishers, 2007. 3. G.D Rai, <i>Non-Conventional Energy Sources</i>, Khanna Publishers, 2005. 4. S. Rao and B.B. Parulekar, <i>Energy Technology: Non-Conventional, Renewable and Conventional</i>, Khanna Publishers, 2005. 	
Reference Books:	<ol style="list-style-type: none"> 1. Bansal NK, <i>Renewable Energy Sources and Conversion Technology</i>, Manfred Kleemann, Michael Meliss, Tata McGraw Hill Publishing Co. Ltd New Delhi. 2. Dayal Maheshwar, <i>Energy Today and Tomorrow</i>; Publications Division, Ministry of Information and Broadcasting, Govt. of India, New Delhi. 3. Rao S and Parulekar BB, <i>Energy Technology (non-conventional, renewable and conventional)</i>, Khanna Publishers, New Delhi. 4. Singal RK, <i>Non-Conventional Energy Resources</i>, SK Kataria and Sons, New Delhi. <p>*Latest editions of all the suggested books are recommended.</p>	

Course Code: OEPOL102	Generic Elective Course I – Semester-V Power Plant Engineering	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the function of different elements of steam, hydro, diesel, nuclear etc.	
CO2.	Understanding the working of different power plants.	
CO3.	Understanding the working of power plants based unconventional energy source	
CO4.	Understanding Gas Turbine Plant, Nuclear Power Station.	
CO5.	Analyzing the economics of power plants.	
Course Content:		
Unit-1:	Thermal Power Plants: Introduction- power and energy, sources of energy Basic thermodynamic cycles, various components of steam power plant layout pulverized coal burners- Fluidized bed combustion-coal handling system sash handling systems- Forced draft and induced draft fans- Boilers-feed pumps Super heater regenerator-condenser- de-aerators-cooling tower.	6 Hours
Unit-2:	Hydro Electric Power Plants: Layout-dams-selection of water turbines-types-pumped storage hydro plants.	6 Hours
Unit-3:	Gas & Diesel Power Plants: Types, open and closed cycle gas turbine, methods to improve performance-reheating, inter-cooling, regeneration advantage and disadvantages- Diesel engine power plant-component and layout.	6 Hours
Unit-4:	Non-Conventional Power Generation: Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation.	6 Hours
Unit-5:	Nuclear Power Plants: Principles of nuclear energy- Fission reactions-nuclear reactor-nuclear power plants.	6 Hours
Text Books:	1. A Course in Power Plant Engineering by Arora and Domkundwar, Dhanpat Rai and Co. Pvt. Ltd., New Delhi. 2. Power Plant Technology, M.M. El-Wakil McGraw Hill 1984. 3. An introduction to power plant technology by G.D. Rai Khanna Publishers, Delhi.	
Reference Books:	1. Power Plant Engineering by P.K. Nag, Tata McGraw Hill, Second Edition, Fourth reprint 2003. 2. Power station Engineering and Economy by Bernhardt G.A. Skrotzki and William A. 3. Vopat Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002. *Latest editions of all the suggested books are recommended.	

Generic Elective Courses (GEC)

Course Code: OEPOL10 3	Generic Elective Course II – Semester-VI Non-Conventional Energy Sources	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the generation of electricity from various Non-Conventional sources of energy.	
CO2.	Understanding and applying the theories, principles and technology of solar energy, Utilization and conversion of it to electricity generation.	
CO3.	Understanding and applying the concepts, theories & principles of wind energy conversion in electricity generation.	
CO4.	Understanding the operational methods of ocean energy to electricity generation.	
CO5.	Understanding the concepts, theories and principles of geothermal energy.	
Course Content:		
Unit-1:	Introduction: Energy sources conventional and non-conventional, their availability, Recent trends in Power Generation, Interconnected Generation of Power Plants.	6 Hours
Unit-2:	Solar Power Generation: Solar radiations, solar energy collectors; flat plate and focusing type, energy balance equation and collector efficiency, photovoltaic cells applications of solar energy; solar pumping, solar green houses.	6 Hours
Unit-3:	Bio-energy: Biomass, Power Generation by using gassifiers. Biogas Plants, Smokeless Chulhas. Hydro Electric Generation Selection of site, basic definitions, capacity calculations, classification, elements of hydroelectric plant and operation of hydro-electric plant, hydro-electric generator choice of size and number of generating Units.	6 Hours
Unit-4:	Wind Power Generation: Wind surveys, Basic principles of wind energy conversion, basic components of Wind Energy Conversion Systems (WECS), wind machines, schemes of wind power generation and control.	6 Hours
Unit-5:	Magneto Hydro Dynamic (MHD) Power Generation: Basic principles of Magneto Hydro Dynamic (MHD), MHD systems types of MHD material, electrical conditions; voltage and power output, gas conductivity, application.	6 Hours
Text Books:	5. Christopher A. Simon, <i>Alternate Source of Energy</i> , Rowman and Little Field Publishers Inc., 2007. 6. C.L. Wadhwa, <i>Generation, Distribution and Utilization of Electric Energy</i> , New Age International, Publishers, 2007. 7. G.D Rai, <i>Non-Conventional Energy Sources</i> , Khanna Publishers, 2005. 8. S. Rao and B.B. Parulekar, <i>Energy Technology: Non-Conventional, Renewable and Conventional</i> , Khanna Publishers, 2005.	
Reference Books:	5. Bansal NK, <i>Renewable Energy Sources and Conversion Technology</i> , Manfred Kleemann, Michael Meliss, Tata McGraw Hill Publishing Co. Ltd New Delhi. 6. Dayal Maheshwar, <i>Energy Today and Tomorrow</i> ; Publications Division, Ministry of Information and Broadcasting, Govt. of India, New Delhi. 7. Rao S and Parulekar BB, <i>Energy Technology (non-conventional, renewable and conventional)</i> , Khanna Publishers, New Delhi. 8. Singal RK, <i>Non-Conventional Energy Resources</i> , SK Kataria and Sons, New Delhi. *Latest editions of all the suggested books are recommended.	

Course Code: OEPOL104	Generic Elective Course II – Semester-VI Power Plant Engineering	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the function of different elements of steam, hydro, diesel, nuclear etc.	
CO2.	Understanding the working of different power plants.	
CO3.	Understanding the working of power plants based unconventional energy source	
CO4.	Understanding Gas Turbine Plant, Nuclear Power Station.	
CO5.	Analyzing the economics of power plants.	
Course Content:		
Unit-1:	Thermal Power Plants: Introduction- power and energy, sources of energy Basic thermodynamic cycles, various components of steam power plant layout pulverized coal burners- Fluidized bed combustion-coal handling system sash handling systems- Forced draft and induced draft fans- Boilers-feed pumps Super heater regenerator-condenser- de-aerators-cooling tower.	6 Hours
Unit-2:	Hydro Electric Power Plants: Layout-dams-selection of water turbines-types-pumped storage hydro plants.	6 Hours
Unit-3:	Gas & Diesel Power Plants: Types, open and closed cycle gas turbine, methods to improve performance-reheating, inter-cooling, regeneration advantage and disadvantages- Diesel engine power plant-component and layout.	6 Hours
Unit-4:	Non-Conventional Power Generation: Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation.	6 Hours
Unit-5:	Nuclear Power Plants: Principles of nuclear energy- Fission reactions-nuclear reactor-nuclear power plants.	6 Hours
Text Books:	1. A Course in Power Plant Engineering by Arora and Domkundwar, Dhanpat Rai and Co. Pvt. Ltd., New Delhi. 2. Power Plant Technology, M.M. El-Wakil McGraw Hill 1984. 3. An introduction to power plant technology by G.D. Rai Khanna Publishers, Delhi.	
Reference Books:	4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill, Second Edition, Fourth reprint 2003. 5. Power station Engineering and Economy by Bernhardt G.A. Skrotzki and William A. 6. Vopat Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002. *Latest editions of all the suggested books are recommended.	