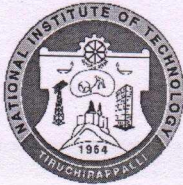


NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF ENERGY AND ENVIRONMENT

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech.- Electrical and Electronics Engineering (EEE) – A nd B Section		
Course Title	ENERGY AND ENVIRONMENT ENGINEERING		
Course Code	ENIR 11	No. of Credits	02
Course Code of Pre-requisite subject(s)	-		
Session	Jul 2023	Section (if, applicable)	NA
Name of Faculty	Dr. Damodhara Siva Krishna Rao Dr VM Jaganathan	Department	Energy and Environment
Official Email	<a href="mailto:damodharsiva@nitt.edu">damodharsiva@nitt.edu</a> <a href="mailto:vmjagan@nitt.edu">vmjagan@nitt.edu</a>	Telephone No.	-
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	Core course <input checked="" type="checkbox"/>	Elective course	<input type="checkbox"/>
<b>Syllabus (approved in BoS)</b>			
Unit – 1 [4 Hours]: Present Energy resources in India and its sustainability: Different types of conventional Power Plant, Energy Demand Scenario in India, Advantage and Disadvantage of conventional Power Plants, Conventional vs Non-conventional power generation. Unit – 2 [4 Hours]: Basics of Solar Energy: Solar Thermal Energy; Solar Photovoltaic: Advantages and Disadvantages, Environmental impacts and safety. Unit – 3 [4 Hours]: Wind Energy: Power and energy from wind turbines, India's wind energy potential, Types of wind turbines, Offshore Wind energy, Environmental benefits and impacts. Unit – 4 [4 Hours]: Biomass Resources: Biomass conversion Technologies, Feedstock pre processing and treatment methods, Bioenergy program in India, Environmental benefits and impacts; Other energy sources: Geothermal Energy resources, Ocean Thermal Energy Conversion, Tidal Energy. Unit – 5 [4 Hours]: Air pollution: Sources, effects, control, air quality standards, air pollution act, air pollution measurement; Water Pollution: Sources and impacts; Soil Pollution: Sources and impacts, disposal of solid waste; Noise pollution. Unit – 6 [4 Hours]: Greenhouse gases: effect, acid rain; Pollution aspects of various power plants; Fossil fuels and impacts, Industrial and transport emissions impacts			
<b>COURSE OBJECTIVES</b>			
> To introduce the energy consumption pattern in india and compare it with international scenario > To introduce the energy demand and potential of conventional energy resources of india >To educate on functioning of conventional power plants > To introduce various feedstocks of biomass along with its biochemical composition			



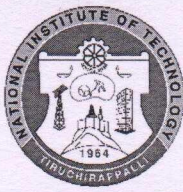
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- To introduce the function of ocean, tidal and geothermal energy power plants in terms of potential and energy cycles
- To educate on the sources, composition, impacts and control measures of air pollution and water pollution
- To introduce the various sources of industrial noise, its characteristics, measures, impacts, footprint and control methods.
- To discuss on green house gases, various impacts of fossil fuel use and pollutants from power plants
- To introduce the basics of solar energy and its applications in day-to-day life, and to teach the working principle of solar thermal and electrical devices.
- To introduce the advantages and disadvantages of use of solar energy, and to educate about the environmental impact of the solar devices and safety procedures to follow while handling it.
- To teach the working principle and basics of wind turbines, to introduce the wind energy potential and installed capacity of wind turbines in India.
- To introduce the different types of wind turbines used to harness the wind energy, and to introduce the offshore wind energy technology.
- To educate about the benefits of the wind energy and its impact on the environment

### MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
CO1: Ability to describe the principal energy sources and the current energy systems in India.	<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"></div>
CO2: Ability to contrast between different energy systems, their advantages and disadvantages.	
CO3: Ability to comprehend the impacts of using different energy resources.	
CO4: Ability to explain environmental pollution sources and methods to avoid them.	

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	3	3	1	3	3	3	3	2	1	3
CO2	3	2	2	2	2	2	3	1	3	3	3	3	1	1	3
CO3	2	2	3	3	2	3	3	1	3	3	3	3	3	1	3
CO4	2	1	3	3	1	3	3	1	3	3	3	3	3	1	3



**COURSE PLAN – PART II**

**COURSE OVERVIEW**

Students get exposure on energy resources in India and different type of conventional Power Plants, and they also will be taught about the basics of solar energy (solar thermal and photovoltaic) and wind energy (different types of wind turbines) with applications. Consequently, they will understand the operation of wind turbines/solar devices and learn about environmental benefits and impacts. Students will know about the impact of air pollution, water pollution, noise pollution & disposal of solid waste, and further they will be exposed to greenhouse gases, acid rain & fossil fuels and impacts, industrial and transport emissions impacts.

**COURSE TEACHING AND LEARNING ACTIVITIES**

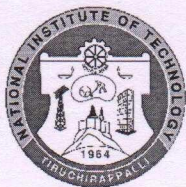
( Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1 - 3 Weeks	Present Energy resources in India and its sustainability - Different type of conventional Power Plant-- Energy Demand Scenario in India - Advantage and Disadvantage of conventional Power Plants – Conventional vs Non-conventional power generation	Chalk and Talk/ ppt
2	4-6 weeks	Biomass: renewable energy source. Constituents of biomass, feedstock sources, various biomass conversion technologies, Lipids - overview, Thermo chemical method of biomass conversion, Biochemical method of biomass conversion, biomass pre-treatment methods: Acid, Alkali, Ozone and biological, resources (fungal degradation). Geothermal energy resources, Technology for utilization of geothermal resources: various power plants. Ocean thermal energy conversion: Open and closed cycle system. Tidal: Introduction and working principle	Chalk and Talk/ ppt
3	7-8 weeks	Air pollution - Sources, effects, control, air quality standards, air pollution act, air pollution measurement. Water pollution Sources and impacts, Soil pollution - Sources and impacts, disposal of solid waste	Chalk and Talk/ ppt



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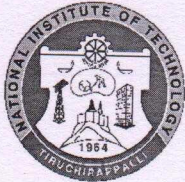
4	9 Week (end)	Mid Sem exam	Examination
5	9-10 week	<p>Basics of Solar Energy</p> <ul style="list-style-type: none"> <li>- Introduction to solar energy, solar radiation, earth and sun geometry, solar energy potential in India</li> </ul> <p>Solar Thermal Energy</p> <ul style="list-style-type: none"> <li>- Working principle of solar thermal collectors, different types of solar thermal collectors, thermal heat storage</li> </ul> <p>Solar Photovoltaic</p> <ul style="list-style-type: none"> <li>- Working principle of PV cell, types of PV cell, efficiency and performance of PV cell, recent advances in PV technology</li> </ul> <p>Advantages &amp; Disadvantages of Solar Energy</p> <p>Environmental Impact &amp; Safety</p> <ul style="list-style-type: none"> <li>- CO<sub>2</sub> mitigation and carbon credits, Environmental payback period, LCA analysis, disposal of solar devices, Safety measures in handling the solar Devices</li> </ul>	Chalk and Talk/ ppt
6	Week 10 (at end)	Objectives and methodology submission for project	Evaluation
7	11-12 Week	<p>Power and energy from wind turbines</p> <p>India's wind energy potential</p> <ul style="list-style-type: none"> <li>- Wind energy potential and installed capacity in India</li> </ul> <p>Types of wind turbines</p> <ul style="list-style-type: none"> <li>- horizontal axis wind turbines (HAWTs) and the vertical axis wind turbines (VAWTs)</li> </ul> <p>Offshore wind energy</p> <ul style="list-style-type: none"> <li>- Offshore wind energy potential, types of offshore</li> </ul>	



		wind turbines, advantages and difficulties in offshore wind turbines Environmental benefits and impacts of wind turbines - Advantages of wind energy and its limitations, environmental impacts of wind energy	
8	Week 13 (end)	Result and Report submission for Project	Evaluation
9	13-15 Weeks	Noise Pollution: Noise - Definition - Characteristics; Industrial noise effects; Sound pressure, power, intensity-relationship; Types of noise exposure; Ambient air quality standards in respect of noise; OSHA regulations for noise exposure, Noise foot print; Industrial noise control, Green House Gases (GHG): composition of atmosphere; anthropogenic sources for GHG; percentages (typical) of air pollutants, global trends in CO2 emission and concentration - various impacts; Acid rain - adverse effects and transboundary acidification; remedies  Pollution aspects of various power plants - various pollutants from power plants, Environmental and health impacts of coal, oil and gas based power plants Industrial and transport emissions	Chalk and Talk/ ppt

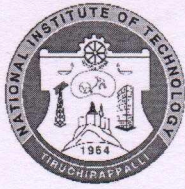
**COURSE ASSESSMENT METHODS** (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Project- Objectives and Methodology Review	Week 5		20
2	Mid Semester Examination	Week 7	90 minutes	20
3	Project-Results and report submission	Last week of semester	--	30
4	Final Assessment * (End semester exam)	As per Academic Calendar	2-3 hours	30
CPA	Compensation Assessment*	As per Academic Calendar	90 minutes	20



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*mandatory; refer to guidelines on page 7				
<b>COURSE EXIT SURVEY</b>				
Feedback must be given through MIS portal, at the end of the semester. Feedback to the instructor can also be given anytime during the semester through emails.				
<b>COURSE POLICY</b> (including compensation assessment to be specified)				
<b>MODE OF CORRESPONDENCE</b>				
Students can meet me in our department or email us at <a href="mailto:adityakumar@nitt.edu">adityakumar@nitt.edu</a> ; <a href="mailto:damodharsiva@nitt.edu">damodharsiva@nitt.edu</a> ; <a href="mailto:latha@nitt.edu">latha@nitt.edu</a>				
<b>COMPENSATION ASSESSMENT POLICY</b>				
Compensation Assessment will be conducted only for students who miss Quiz-I or Quiz-II on valid/genuine grounds of medical or other emergencies.				
<b>ATTENDANCE POLICY</b> (A uniform attendance policy as specified below shall be followed)				
<ul style="list-style-type: none"> <li>➤ At least 75% attendance in each course is mandatory.</li> <li>➤ A maximum of 10% shall be allowed under On Duty (OD) category.</li> <li>➤ Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.</li> </ul>				
<b>ACADEMIC DISHONESTY &amp; PLAGIARISM</b>				
<ul style="list-style-type: none"> <li>➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.</li> <li>➤ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.</li> <li>➤ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.</li> <li>➤ The above policy against academic dishonesty shall be applicable for all the programmes.</li> </ul>				
<b>ADDITIONAL INFORMATION, IF ANY</b>				
<b>References</b>				
<ul style="list-style-type: none"> <li>• Boyle, G. 2004.' Renewable energy: Power for a sustainable future'. Oxford University press.</li> <li>• B H Khan, 'Non Conventional Energy Resources'-The McGraw –Hill Second edition.</li> <li>• G. D. Rai, 'Non conventional energy sources', Khanna Publishers, New Delhi, 2006.</li> <li>• Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd</li> </ul>				

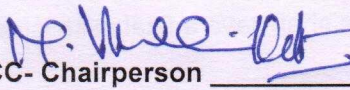


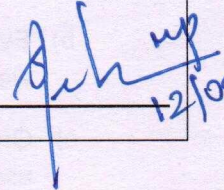
Edition, Prentice Hall, 2003.

- 'Unleashing the Potential of Renewable Energy in India' –World bank report.
- Godfrey Boyle, Bob Everett and Janet Ramage.2010.'Energy Systems and Sustainability. Power for a sustainable future'. Oxford University press.

FOR APPROVAL

  
D.V.M. JAGANNATHAN  
Course Faculty \_\_\_\_\_

  
N. V. S. Reddy  
CC- Chairperson \_\_\_\_\_

  
HOD \_\_\_\_\_  
12/09/20



## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

### Guidelines

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.