



# NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

## DEPARTMENT OF ENERGY AND ENVIRONMENT

COURSE PLAN – PART I			
Name of the programme and specialization	B. TECH – ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)		
Course Title	ENERGY AND ENVIRONMENT ENGINEERING		
Course Code	ENIR 11	No. of Credits	2
Course Code of Pre-requisite subject(s)	-		
Session	July 2019	Section (if, applicable)	A and B of the above mentioned specializations
Name of Faculty	Dr. MANDE AMOL BALU (ECE-A), Dr. NIVEDHINI ISWARYA C (ECE-B).	Department	ENERGY AND ENVIRONMENT
Official Email	<a href="mailto:amol.mande17@gmail.com">amol.mande17@gmail.com</a> , <a href="mailto:nive251289@gmail.com">nive251289@gmail.com</a> .	Telephone No.	+91 98432 59724, +91 9944169147.
Name of Course Coordinator(s) (if, applicable)	Prof. Dr. M. PREMALATHA		
Official E-mail	<a href="mailto:latha@nitt.edu">latha@nitt.edu</a>	Telephone No.	+91 9894600407
Course Type (please tick appropriately)	<input type="checkbox"/> Core course	<input type="checkbox"/> Elective course	<input checked="" type="checkbox"/> GIR
<b>Syllabus (approved in BoS)</b>			
<ul style="list-style-type: none"> <li>▪ 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</li> <li>▪ Basics of Solar Energy- Solar Thermal Energy- Solar Photovoltaic- Advantages and Disadvantages-Environmental impacts and safety.</li> <li>▪ Power and energy from wind turbines- India's wind energy potential- Types of wind turbines- Off shore Wind energy- Environmental benefits and impacts.</li> <li>▪ Biomass resources-Biomass conversion Technologies- Feedstock preprocessing and treatment methods- Bioenergy program in India-Environmental benefits and impacts. Geothermal Energy resources –Ocean Thermal Energy Conversion – Tidal.</li> <li>▪ 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.</li> <li>▪ Greenhouse gases – effect, acid rain. Noise pollution. Pollution aspects of various power plants. Fossil fuels and impacts, Industrial and transport emissions- impacts.</li> </ul>			
<b>COURSE OBJECTIVES</b>			
<ul style="list-style-type: none"> <li>➤ To introduce the energy consumption pattern in India and compare it with international scenario</li> <li>➤ To introduce the energy demand and potential of conventional energy resources of India</li> </ul>			





# NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

- To educate on functioning of conventional power plants
- To introduce various feedstocks of biomass along with its biochemical composition
- To teach the different possible methods available for energy conversion of biomass
- 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 source of industrial noise, its characteristics, measures, impacts, foot print 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)
Upon completion of ENIR 11, students should be able to	
1. Describe the present energy resources in India & Conventional vs Non-conventional power generation	POs 1, 2, 3, 4, 5, 8, 9 and 12
2. Describe the Biomass resources, Biomass conversion Technologies, Feedstock pre-processing & Bioenergy Program in India.	
3. Analyze India's wind energy potential and Power and energy from wind turbines with types.	
4. Analyze India's solar energy potential, various solar energy devices and also able to obtain power and energy from the devices.	
5. Describe Air pollution, Water pollution, Soil pollution & Noise pollution and Environmental Impacts of Industrial emissions & Greenhouse gases.	

COURSE PLAN – PART II
<b>COURSE OVERVIEW</b>
Students get exposure to the 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 to get energy from the available resources, also learn about environmental benefits and impacts. Students have an opportunity to study 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	Week 1 to 2	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 & talk, ppt
2	Week 3 to 5	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 & talk, ppt
3	Week 5 (at end)	Quiz	Examination
4	Week 6 to 7	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 & talk, ppt
5	Week 7 (at end)	Mid semester examination	Examination
6	Week 8 to 9	Basics of Solar Energy - Introduction to solar energy, solar radiation, earth and sun geometry, solar energy potential in	Chalk & talk, ppt





		<p>India</p> <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>	
7	Week 9 (at end)	Submission of group activities/mini – project's methodology and group members	Evaluation
8	Week 10 and 11	<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 wind turbines, advantages and difficulties in offshore wind turbines</li> </ul> <p>Environmental benefits and impacts of wind turbines</p> <ul style="list-style-type: none"> <li>- Advantages of wind energy and its limitations,</li> </ul>	Chalk & talk, ppt



		environmental impacts of wind energy	
9	Week 11 (at end)	Group activities/mini project demonstration	Evaluation
10	Week 12 and 13	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 CO <sub>2</sub> 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 & talk, ppt

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

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Quiz	End of week 5	20 minutes	10
2	Mid semester examination	End of week 7	90 minutes	30
3	Methodology submission	End of week 9	1 day	10
4	Group activity/mini-project evaluation	End of week 11	1 day	20
CPA	Compensation Assessment*	Week 13	90 minutes	30
5	Final Assessment *	Week 14-15	90 minutes	30

\*mandatory; refer to guidelines on page 7

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed)

Feedback about the course will be collected by institute through student's MIS portal

**COURSE POLICY** (including compensation assessment to be specified)

**MODE OF CORRESPONDANCE (E-mail/phone)**

Students can meet the course faculty in Department of Energy and Environment (DEE-MAIN) or contact at [latha@nitt.edu](mailto:latha@nitt.edu).

**COMPENSATION ASSESSMENT POLICY**

Compensation assessment will be conducted **ONLY** for students who miss **mid semester**





## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

**examination** on valid/genuine reasons of medical or other emergencies. There is no Compensation assessment for Quiz-1.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- 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.
- The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION, IF ANY**

**Text Books and Reference**

1. 'Boyle, G. 2004.' *Renewable energy: Power for a sustainable future*. Oxford University press.
2. B H Khan, 'Non Conventional Energy Resources'-The McGraw -Hill Second edition.
3. G. D. Rai, 'Non conventional energy sources', Khanna Publishers, New Delhi, 2006.
4. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd Edition, Prentice Hall, 2003.
5. 'Unleashing the Potential of Renewable Energy in India' -World bank report.
6. Godfrey Boyle, Bob Everett and Janet Ramage. 2010. 'Energy Systems and Sustainability. Power for a sustainable future'. Oxford University press.

**FOR APPROVAL**

Course Faculty

Abmunde  
graci

CC- Chairperson

STRANGE

HOD

[Signature]



## NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

### Guidelines

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

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