



MECHANICAL ENGINEERING

COURSE INFORMATION SHEET

PROGRAMME: Mechanical Engineering(A)	DEGREE: B.TECH
COURSE: ADVANCED ENERGY ENGINEERING	SEMESTER: S7 CREDITS: 3
COURSE CODE: ME403 REGULATION: KTU 2015	COURSE TYPE: Theory
COURSE AREA/DOMAIN: THERMAL ENGINEERING	CONTACT HOURS: 4
CORRESPONDING LAB COURSE CODE (IF ANY): -	LAB COURSE NAME: -

SYLLABUS:

UNIT	DETAILS	HOURS
1	Introduction to the course. Global and Indian energy resources, Energy Demand and supply. Components, layout and working principles of steam, hydro, nuclear, gas turbine and diesel power plants.	7
2	Solar Energy- passive and active solar thermal energy. Solar collectors. Solar thermal electric systems. Solar photovoltaic systems. Economics of solar power, Sustainability attributes.	7
3	Wind Energy-Principle of wind energy conversion system. Wind data and energy estimation. Wind turbines. Aerodynamics of wind turbines. Wind power economics, Introduction to solar-wind hybrid energy systems.	7
4	Biomass Energy Biomass as a fuel. Thermo-chemical. Bio-chemical and agro-chemical conversion of biomass. Pyrolysis, gasification. Combustion. Fermentation, transesterification, economics of biomass power generation, future prospects.	6

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5	Other Renewable Energy sources Brief account of Geothermal. Tidal. Wave, MHD power generation. Small, mini and micro hydro power plants. Fuel cells general description, types, applications. Hydrogen energy conversion systems, hybrid systems- Economics and technical feasibility.	8
6	Environmental impact of energy conversion. Ozone layer depletion, global warming, greenhouse effect. Loss of biodiversity, eutrophication, acid rain. Air and water pollution, land degradation, thermal pollution. Sustainable energy, promising technologies, development pathways.	7

TEXT / REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1	Jefferson W Tester et.al., Sustainable Energy: Choosing Among Options, PHI, 2006
1	David Merick, Richard Marshall, Energy, Present and Future Options, Vol.I & II, John Wiley & Sons, 2001
2	P K Nag, Power Plant Engineering, TMH, 2002
2	Godfrey Boyle, Renewable Energy : Power for a Sustainable Future, Oxford University Press, 2012
3	Tiwari G N, Ghosal M K, Fundamentals of renewable energy sources, Alpha Science International Ltd., 2007
3	Roland Wengenmayr, Thomas Buhrke, Renewable Energy: Sustainable energy concepts for the future, Wiley VCH, 2012
4	Twidell J W and Weir A D, Renewable Energy Resources, UK, E&F.N. Spon Ltd., 2006

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
		NIL	

COURSE OBJECTIVES:

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 JYOTHI HILLS, VETTIKATTI P.O., CHERUTHURUTHY, THRISSUR. PIN-679531 PH: +91 4884 259000, 274423 FAX: 04884-274777



NBA accredited B.Tech Programmes in Computer Science & Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering and Mechanical Engineering valid for the academic years 2016-2022. NBA accredited B.Tech Programme in Civil Engineering valid for the academic years 2019-2022.

Sl.No	DESCRIPTION
1	To give an idea about global energy scenario and conventional energy sources
2	To understand solar, wind and Biomass energy
3	To know concepts of other renewable energy sources
4	To create awareness on the impacts of energy conversion and importance of sustainable energy

COURSE OUTCOMES:

Sl.No	DESCRIPTION	PO & PSO MAPPING
C402.1	The students will be able to understand global energy scenario.	PO2,PO3,PO6,PO7,PO10,PO12,PSO3
C402.2	Students will have an understanding about the conventional power plants.	PO1,PO2,PO3,PO6,PO10,PO12,PSO3
C402.3	The students will become aware of different renewable energy sources and choose sustainable energy for development.	PO1,PO3,PO6,PO7,PO10,PO12,PSO3
C402.4	The students will be aware about the impacts of energy conversion and importance of sustainable energy.	PO1,PO2,PO3,PO6,PO7,PO8,PO10,PSO3
C402.5	The students will be able to analysis the technical feasibility of non-conventional energy resources.	PO1,PO2,PO3,PO4,PO5,PO7,PO8,PO10,PO11,PO12,PSO1,PSO2,PSO3
C402.6	The students will be able to design solar, wind and biomass energy systems.	PO1,PO2,PO3,PO4,PO7,PO9,PO10,PO12,PSO1,PSO2,PSO3

COURSE OUTCOMES VS PO MAPPING:

Sl.No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C402.1	-	1	1	-	-	3	3	-	-	2	-	2
C402.2	3	1	1	-	-	2	-	-	-	1	-	1
C402.3	2	-	1	-	-	1	3	-	-	1	-	1
C402.4	3	2	1	-	-	3	3	-	-	1	-	2

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C402.5	3	3	2	3	1	-	1	2	1	1	3	2
C402.6	3	3	3	2	-	-	1	-	1	1	2	1
Avg	2.8	2	1.5	2.5	1	2.25	2.2	2	1	1.17	2.5	1.5

COURSE OUTCOMES VS PSO MAPPING:

Sl.No	PSO1	PSO2	PSO3
C402.1	-	-	1
C402.2	-	-	1
C402.3	-	-	2
C402.4	-	-	2
C402.5	3	1	2
C402.6	3	2	2
Avg	3	1.5	1.67

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JUSTIFICATION FOR MAPPING:

Sl.No	PO & PSO MAPPED	JUSTIFICATION
C402.1	PO2, PO3, PO6, PO7, PO10, PO12, , PSO3,	By understanding the energy scenario students can design suitable energy solution for the sustainable development of the society.
C402.2	PO1, PO2, PO3, PO6, PO10, PO12, , PSO3,	By understanding functioning of conventional power plants, students can interpret the energy demand scenario and can propose solutions.
C402.3	PO1, PO3, PO6, PO7, PO10, PO12, , PSO3,	Analysing different nonconventional energy resources will lead to choose sustainable energy for development.
C402.4	PO1, PO2, PO3, PO6, PO7, PO8, PO10, PO12, , PSO3,	Awareness on the impacts of energy conversion on the environment for the sustainable development of society.



C402.5	PO1, PO2, PO3, PO4, PO5, PO7, PO8, PO9, PO10, PO11, PO12, , PSO1, PSO2, PSO3,	Analysing the economical and technical feasibility of non-conventional energy resources will help to design a suitable system.
C402.6	PO1, PO2, PO3, PO4, PO7, PO9, PO10, PO11, PO12, , PSO1, PSO2, PSO3,	Formulate solutions for complex energy problems with solar, wind and biomass energy and design system components or processes that meet the specified needs with appropriate consideration for the public health, safety, and socio-environmental considerations.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION

REQUIREMENTS:

Sl.No	DESCRIPTION	PROPOSED ACTIONS
1	Ocean current power generation	Special class with video tutorial

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

Sl.No	DESCRIPTION
1	Under water turbines

WEB SOURCE REFERENCES:

Sl.No	DESCRIPTION
1	http://nptel.ac.in/courses/122104015/

DELIVERY / INSTRUCTIONAL METHODOLOGIES:

<input checked="" type="checkbox"/> CHALK & TALK	<input checked="" type="checkbox"/> STUD. ASSIGNMENT	<input checked="" type="checkbox"/> WEB RESOURCES	<input checked="" type="checkbox"/> NPTEL/OTHERS
<input checked="" type="checkbox"/> LCD/SMART BOARDS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> WEBINARS

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ASSESSMENT METHODOLOGIES-DIRECT:

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<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input checked="" type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> Others		

ASSESSMENT METHODOLOGIES-INDIRECT:

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK,ONCE)	<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
<input type="checkbox"/> ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	<input type="checkbox"/> Others

INNOVATIONS IN TEACHING/LEARNING/EVALUATION PROCESSES:

Sl.No	DESCRIPTION
1	Previous solved university question paper is available for students from Answer repository.

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