GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Renewable Engineering

Course / Subject Code: 4356402

Course / Subject Name: Energy Conversion Devices & Methodologies

w. e. f. Academic Year:	2024-25
Semester:	5th
Category of the Course:	Program Core

Prerequisite:	**Law of Energy Conservation, Types of Energy sources**
Rationale:	The course is aimed to provide exposure to methods of electricity generation. Generation of Electric Power is most important activity in power system. With growing demand for electric power, it has become more necessary to generate electric power more efficiently. It is possible with advanced technology. This course deals in detail about generation of electric power using thermal (coal) hydro and nuclear energy. These types of power plants need highly skilled technocrats who are capable of operating and maintaining various equipment and auxiliaries to generate uninterrupted power.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Operate and maintain Thermal Power Plant.	U
02	Operate and maintain Hydro Power Plant.	U
03	Operate and maintain Nuclear Power Plant.	U
04	Solve problems related to load curve and load duration curve.	A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	25	25	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Thermal Power Plant Law of Energy conservation, Current scenario of Electrical Power Generation in India, Energy conversion process for thermal power station, Selection criteria for site of thermal power station, Line diagram of thermal power station, Different cycles of Thermal Power Station, Major equipment and auxiliaries of TPS, advantages and disadvantages of Thermal Power Station, Safe Practices of TPS, Pollution generated by thermal power stations and methods to reduce them, Major thermal power plants in Gujarat	14	34
2.	Hydro Power Plant Energy conversion process for hydro-power station (HPS), Selection criteria for site of Hydro Power Station, Classification of Hydro Power Plant with plant layout, Various schemes of Hydro Power Station, Major equipment and auxiliaries of HPS, advantages and disadvantages of Hydro Power Station, Safe Practices of HPS, types of hydro turbines, advantages and disadvantages of Hydro Power Station, Major Hydro power stations of Gujarat	12	28
3.	Nuclear Power Plant Energy conversion process for Nuclear Power Station, Nuclear fusion and fission, Chain reaction, Selection criteria for site of nuclear power station, Line diagram of nuclear power station, Working of nuclear power station, Various types of nuclear reactors, Special precautions for NPS, Advantages and disadvantage of NPS, Major Nuclear power stations in Gujarat	10	24
4.	Variable load on power station Types of loads, Types and importance of load curve, Terms and factors regarding load curve, Load duration curve, Base load and peak load power plants, Numerical related to load curve and load duration curve	06	14
	Total	**42**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
30	**40**	**30**	**-**	**-**	**-**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Principles of Power system	Mehta, V.K.	S. Chand & Co., New Delhi, 2020 ISBN: 978-8121924962
2	Power plant Engineering	Nag, P K	Tata McGraw Hill, New Delhi, 2011 ISBN:978-0-07-064815-9
3	Electrical Power Systems	Uppal S.L.	Khanna publication, New Delhi, 2011 ISBN:978-8174092380
4	Generation and Utilization of Electrical Energy	S. Sivanagaraju	Pearson, New Delhi, 2011 ISBN:978-81-317-33325
5	A course in Power Systems	J.B.Gupta	S K Kataria & sons,2013 ISBN:978-9350143735

(b) Open-source software and website:

1. www.alternative-energy-tutorials.com
2. http://www.mnre.gov.in/
3. http://www.ntpc.co.in/index.php?option=com_content&view=article&id=64&Itemid=34&lang=en
4. http://www.nhpcindia.com/hydro-technology.htm
5. http://www.npcil.nic.in/main/KnowledgePortal.aspx#
6. http://www.powergridindia.com/_layouts/PowerGrid/User/ContentPage.aspx?PId=255&LangID=English

7. http://www.youtube.com/user/EnergyShouldBe

Suggested Course Practical List:

1. Sketch and interpret the line diagram of Thermal Power Station (T.P.S.)
2. Sketch and interpret the line diagram of main cycles Thermal Power Station.
3. Prepare technical report of visit to a nearby T.P.S./Prepare a report on thermal power stations in Gujarat by collecting data from Internet
4. Collect the data from nearest power station for load curve preparation and interpret it.
5. Collect the data from nearest power station for load duration curve preparation and interpret it.
6. Sketch and interpret the line diagram of various types of Hydro Power Station.
7. Prepare technical report of visit to a nearby H.P.S./Prepare a report on Hydro power stations in Gujarat by collecting data from Internet
8. Sketch and interpret the schematic diagram of Nuclear power station & explain the function of each component.
9. Sketch schematic diagram of Nuclear Reactor and explain function of each part.
10. Visit the website of NTPC and prepare a report from the data.
11. Visit the website of NPCIL and prepare a report from the data.

List of Laboratory/Learning Resources Required:

Suggested Project List:

1. Build model to demonstrate layout of Thermal Power Plant.
2. Build working model to demonstrate working or Hydro Power Plant.
3. Prepare charts of various cycles of Thermal Power Plant.
4. Prepare charts of various schemes of Hydro Power Plant.
5. Prepare chart of schematic diagram of Nuclear Power Plant.

Suggested Activities for Students:

1. Present seminar on various topics from course content
2. Visit to nearby Thermal power station
3. Visit to nearby Hydro power station
4. Solve numerical problems regarding load curve and load duration curve.

5. Collect data of conventional generation of India and Gujarat
6. Collect data of generating capacity of non- conventional power plants in India and Gujarat

CO- PO Mapping:

5th Semester	**Energy Conversion Devices & Methodologies (4356402)**						
	POs						
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1 Operate and maintain Thermal Power Plant.	3	2	2	-	2	-	-
CO2 Operate and maintain Hydro Power Plant.	3	2	2	-	2	-	-
CO3 Operate and maintain Nuclear Power Plant.	3	2	2	-	2	-	-
CO4 Solve problems related to load curve and load duration curve.	2	3	-	-	-	-	-

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

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