



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Mechanical Engineering)

Semester: VII

Course Code: 202090706

Course Title: Energy Conservation and Management

Course Group: Professional Elective Course - IV

Course Objectives: To impart basic knowledge to the students about current energy scenario, energy conservation, audit and management. To inculcate among the student's systematic knowledge and skill about assessing the energy efficiency, energy auditing and energy management.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	0	3	50 / 18	50 / 17	--	--	100 / 35

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	<p>Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, Indian energy scenario, energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, Energy security, energy conservation and its importance, energy strategy for the future, Energy Conservation Act 2001 and its features. Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers</p> <p>Basics of Energy its various forms and conservation: Electricity basics - Direct Current and Alternative Currents, electricity tariff, Thermal Basics-fuels, thermal energy contents of fuel, temperature and pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity and heat transfer.</p>	06



2	<p>Energy Efficiency in Thermal Utilities and systems:</p> <p><u>Boilers:</u> Types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, Boiler efficiency calculation, Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation.</p> <p><u>Steam System:</u> Properties of steam, assessment of steam distribution losses, steam trapping, condensate and flash steam recovery system, identifying opportunities for energy savings, thermo-compressor, condensate pumping, Efficient Steam utilization and energy saving opportunities.</p> <p><u>Furnaces:</u> Performance evaluation of a typical furnace. Induction furnace, general fuel economy measures in furnaces, excess air, heat distribution, temperature control, draft control, waste heat recovery.</p> <p><u>Cogeneration:</u> Definition, need, application, advantages, Basic thermodynamic cycles, main types of cogeneration system, steam turbine efficiency, tri-generation</p>	14
3	<p>Energy efficiency in electrical utilities and system:</p> <p>Energy efficiency for electric motors, lighting systems, Fluorescent Lighting, LED Lighting, Tips for Energy Conservation, Products for Energy Conservation in lighting system</p>	03
4	<p>Energy Management & Audit:</p> <p>Define energy audit, need, types of energy audit, audit process, Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations and energy audit report.</p> <p>Define Energy management, approach-understanding energy costs, Bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering</p>	10
5	<p>Financial Management, Energy Monitoring and Targeting:</p> <p>Investment-need, financial analysis techniques simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs).</p> <p>Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques – energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)</p>	12
Total		45

Reference Books:

1	Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, CRC Press
2	Bureau of Energy Efficiency Reference book: No.1, 2, 3, 4.
3	Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press
4	Energy Management Handbook, W.C. Turner, John Wiley and Sons



5	Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation edited by E J Wilson and D Gerard, Blackwell Publishing
6	Energy engineering and management, Amlan Chakrabarti, PHI
7	Energy conservation and management Handbook, Frank Kreith, Goswami, CRC Press

Supplementary learning Material:	
1	http://nptel.iitm.ac.in/
2	www.bee.com
3	www.powermin.nic.in

Pedagogy:	
<ul style="list-style-type: none"> • Direct classroom teaching • Audio Visual presentations/demonstrations • Assignments/Quiz • Interactive methods • Seminar/Poster Presentation • Industrial/ Field visits 	

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom’s Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
10%	15%	30%	30%	10%	5 %	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To understand the basic knowledge of different terms & principles of energy conservation	15
CO-2	To apply the knowledge of energy audit for the energy management and operation of energy audit instruments.	25
CO-3	To analyze the energy saving area and improvement in efficiency of various thermal utilities and systems	30
CO-4	To infer the concept of financial management, energy monitoring and targeting	30

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025



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