WASTE AND ENERGY MANAGEMENT

I Semester: MBA								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
CMBC08	**Elective**	3	-	-	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

The objective of the course is to provide insights into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspects of waste to energy. The various sources of waste generation is analysed with a focus on its potential for energy production. Various technological options available for the production of energy form waste will delineated along with economics of using alternate sources.

II. COURSE OBJECTIVES:

The students will try to learn:

I. Types of energy audit, energy index, cost index, pie charts, sankey diagrams, load profiles, energy conservationschemes.
II. The factors affecting efficiency, variable speed and variable duty cyclesystems.
III. Solar passive architecture, adoption to sustainable resources such as PVmodules, solarheating.
IV. Economic valuation methods and time value of money that helps organization to take investment decision.
V. Energy conservation checklist, energy conservation opportunities in boilers,heat pumps and coolingsystems.

III. COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1:	Summarize the basic concept of energy audit, Cost index that reduce energy consumption of product and lower operating costs in the organization.
CO 2:	Narrate about Energy conservation schemes that minimize energy cost without affecting production and quality.
CO 3:	Analyze the factors affecting efficiency and voltage variation in the organization.
CO 4:	Demonstrate good lighting system design and practice to balance the art and the science of lighting resources.
CO 5:	Describe about various sustainable resources that reduces inequality within and among countries.
CO 6:	Discuss about energy audit conservations that provides cost benefits to the organization.
CO 7:	Evaluate the discount concept and time value of money in the modern business to foster the goals of the organization.
CO 8:	Examine the cost concepts and determinants of cost for the fixation of manufacturing cost of product.
CO 9:	Discuss energy conservation checklist that identify the areas deserving tighter control to save energy expenditure.
CO 10:	Identify energy conservation opportunities that improve the thermal efficiency for heat recovery.

IV. SYLLABUS:

UNIT-I	**BASIC PRINCIPLES OF ENERGY AUDIT:**	**Classes:08**

Energy audit-definitions, concept, types of energy audit, energy index, cost index, pie charts,Sankey diagrams, load profiles, energy conservation schemes, energy audit of industries, energy saving potential, energy audit of process industry, and thermal power station.

UNIT-II	ENERGY EFFICIENT MOTORS, POWER FACTOR IMPROVEMENT & LIGHTING:	Classes:10
Energy efficient motors, factors affecting efficiency, variable speed, variable duty cycle systems, effect of Voltage variation on motors, motor energy audit. Power factor- methods of improvement, location of capacitors, Pf with nonlinear loads- Good Lighting system design and practice, lighting control, lighting energy audit.		
UNIT-III	**ENERGY EFFICIENT BUILDINGS**	**Classes:09**
Green Buildings, Intelligent Buildings, Rating of Buildings, Efficient use of Buildings, Ventilation Solar Passive Architecture. Adoption to sustainable resources such as PV modules, Solar heating, Cooling Techniques, Energy audit and conservation opportunities.		
UNIT-IV	**ECONOMIC ASPECTS AND ANALYSIS**	**Classes:10**
Economics Analysis, Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis-calculation of simple payback method, net present worth method-Applications of cycle costing analysis, return of investment.		
UNIT-V	**ENERGY CONSERVATION OPPORTUNITIES**	**Classes:08**
Energy conservation checklist, Energy conservation opportunities in boilers, Heat pumps and cooling systems, chilled water Plants and Central air- conditioning systems, Water Heaters and coolers, Compressors and Fans.		

Text Books:

1. Ram Chandra, "Environmental Waste Management", CRC Press, 1st Edition, 2020.
2. John Pichtel, "Waste management practices: municipal, hazardous, and industrial", CRC Press, 2nd Edition, 2014.
3. Lawrence K. Wang, Yung-Tse Hung, Nazih K. Shammas, "Handbook of advanced industrial and hazardous wastes treatment" , CRC Press, 3rd Edition, 2010.
4. Sasikumar K and Sanoop Gopikrishna, "Solid Waste Management", Prentice Hall India Learning Private Limited, 1st Edition, 2009.
5. William C. and Blackman Jr, "Basic Hazardous Waste Management", CRC Press, 3rd Edition, 2001.
6. W.R.MurphyandG.McKayButterworth, "Energy Management", Heinemann Publications, 3rd Edition,1999.
7. John .C. Andreas, "Energy Efficient Electric Motors",Marcel Dekker Inc. Ltd, 2nd Edition, 1995.

Reference Books:

1. Paul o' Callaghan, "Energy management" Mc-Graw Hill Book Company, 1st Edition,1998.
2. W.C.Turner," Energy management hand book", John Wiley and sons, 2nd Edition,1999.

Web References:

1. http://www.enerylens.com/articles/energy-management.com
2. http://www.siemens.com/articles/emergy-management.html

E-Text Books:

1. http://www.en.wikipedia.rg/wiki/energy-management-systems.com
2. http://www.search.gmx.net/energymanagement/lookhere.com
3. https://www.eolss.net/ebooklib/bookinfo/waste-management-minimisation.aspx
4. https://www.free-ebooks.net/sociology/Waste-Management
5. https://www.kobo.com/us/en/ebook/handbook-of-solid-waste-management