GUJARAT TECHNOLOGICAL UNIVERSITY

ENERGY ENGINEERING (39)

ENERGY EFFICIENCY IN BUILDINGS

SUBJECT CODE: 2723916

SEMESTER: II

Type of course: Elective III

Prerequisite: Basic knowledge of Renewable Energy

Rationale: The course provides basic understanding of Energy Efficient Buildings.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Climate and Buildings** Historic buildings – Modern architecture – Examples from different climate zones – Thermal comfort – Solar geometry and shading – Heating and cooling loads –Energy estimates and site planning – Integrative Modeling methods and building simulation.	**12**	26%
2	**Principles of Energy conscious building design** Energy conservation in buildings – Day lighting – Water heating and photovoltaic systems – Advances in thermal insulation – Heat gain/loss through building components – Solar architecture.	**10**	23%
3	**Passive solar design** Passive solar heating – Direct gain – Thermal storage wall – Sunspace – Convective air loop –Passive cooling – Ventilation – Radiation – Evaporation and Dehumidification – Mass effect –Design guidelines.	**11**	25%

4	**Energy conservation in building** Air conditioning – HVAC equipments – Computer packages for thermal design of buildings and performance prediction – Monitoring and instrumentation of passive buildings – Control systems for energy efficient buildings – Illustrative passive buildings – Integration of emerging technologies – Intelligent building design principles.	**12**	26%

Reference Books:

1. Sodha, M.,Bansal, N.K., Bansal,P.K. Kumar, A.. and Malik, M.A.S.," Solar Passive Buildings", Pergamon Press, 1986.
2. J.L. Threlkeld, Thermal Environmental Engineering, Prentice Hall, 1970.
3. J.R. Williams, Passive Solar Heating, Ann Arbar Science, 1983.
4. R.W. Jones, J.D. Balcomb, C.E. Kosiewiez, G.S. Lazarus, R.D. McFarland and W.O. Wray, Passive Solar Design Hanbook, Vol.3, Report of U.S. Department of Energy (DOE/CS-0127/3), 1982.
5. J.K. Nayak and J.A. Prajapati Hadbook on Energy Consious Buildings, Solar Energy Control MNES, 2006.
6. Energy Conservation Building Codes 2006; Bereau of Energy Efficiency.
7. Solar Thermal Energy Storage, H. P. Garg et.al, D. Reidel Publishing Company (1985)
8. T.A. Markus and R.N. Morris, Building, Climate and Energy Spottwoode Ballantype Ltd-, London U.K. (1980).
9. Energy storage technologies, a reading material prepared by Dr. D. Buddhi, School Of Energy And Environmental Studies, DAVV, Indore.
10. J.A. Clarke, Energy Simulation in Building Design (2e) Butterworth 2001.
11. BC 2007 Manual, Bureau of Energy Efficiency, New Delhi.

Course Outcome: After learning the course the students should be able:

1. Able to finding out the opportunities and energy saving in Buildings.
2. Understand about element & design or model of passive type of buildings
3. Learn about heat transmission in Buildings.
4. Learn the design and methods related to energy efficient buildings.

List of Open Source Software/learning website:
www.nptel.iitm.ac.in/courses/;
http://ocw.mit.edu/courses/energy-courses/

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.