

Subject Description Form

Subject Code	EE461
Subject Title	Energy Efficient Design
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	<ol style="list-style-type: none"> 1. To present fundamental concepts on energy efficiency. 2. To provide a framework of knowledge on how to design buildings, installations and products which operate in a more energy-efficient manner. It also covers overall financial analysis of energy efficiency projects and products.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. To understand energy consumption profiles of cities and buildings. b. To explain principle of operations of various designs in energy efficient systems. c. To assess and discuss energy audit procedures. d. To compare relative advantages and disadvantages on among various energy saving systems. e. To carry out simple financial analysis on energy saving projects and products. f. To communicate logically and lucidly through discussion and presentations. g. To recognize the need for, and developed an ability to engage in life-long learning. h. To develop critical thinking, and systematic thinking in perceiving, understanding and solving practical problems.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. Introduction: Energy Consumption profile in a country/city and buildings, importance of energy efficiency, usual assumptions used, benchmarking of energy consumption in various sectors. 2. Efficient use of energy: Efficient use of in buildings, factories, transport systems and other sectors, techniques for measuring and monitoring energy use, new demand of energy. 3. Approaches and design: Optimizing the performance of electrical appliances, products and systems, design principles to minimize energy use in buildings and devices. 4. Energy saving device & systems: Energy saving lighting systems; variable speed drive systems, smart windows, active solar & building integrated photovoltaic system, energy efficient HVAC (Heating, Ventilation and Air-Conditioning) systems, ice-storage systems, energy storage systems. 5. Evaluation methods & energy audit: Type of energy audits, their objectives, procedures, measurement equipment, possible outcomes, case studies of the energy audit. 6. Financial analysis: Assessment of relative costs of energy conservation and energy production in various applications, concept of total-life-cost, planning and financing for energy efficiency projects of buildings.

Teaching/Learning Methodology	<p>The concept of design of energy efficient buildings and products will be presented through lectures, tutorials, and seminars on real daily cases. Students will be required to form groups to work through a mini-project for a selected type of energy efficient products. Tutorials will be structured on different sessions with specific issue on efficient energy design and will require sufficient contribution from students. Students will also learn through active participation in the presentation of their project works and case studies in seminars and discussion among students.</p> <table border="1" data-bbox="432 383 1463 618"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="8">Outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th>f</th> <th>g</th> <th>h</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Tutorials</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Mini-project</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>										Teaching/Learning Methodology	Outcomes								a	b	c	d	e	f	g	h	Lectures	✓	✓	✓	✓	✓	✓			Tutorials	✓	✓	✓	✓	✓	✓			Mini-project							✓	✓																										
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Reading List and References	<p>Reference books:</p> <ol style="list-style-type: none"> 1. J. Lal, Energy-efficient Building Systems: Green Strategies for Operation and Maintenance, New York: McGraw-Hill, 2007 2. J. Trost, Design of Mechanical and Electrical Systems in Buildings, Upper Saddle River, N.J.: Pearson/Prentice Hall, 2003 3. C. Beggs, Energy: Management, Supply and Conservation, Oxford: Butterworth-Heinemann, 2002 4. P. Bertoldi, A. Ricci and A.D. Almedia, Energy Efficiency in Household Appliances and Lighting, Berlin, New York: Springer, 2001 5. W.T.Grondzik and A.G.Kowk, Mechanical and Electrical Equipment for Buildings, Wiley, 2014. 																																																																															