Subject Description Form

Subject Code	**BSE4412**
Subject Title	**Renewable Energy**
Credit Value	3
Level	4
Pre-requisite Co-requisite Exclusion	BSE2216 Engineering Thermodynamics or BSE2214 HVACR Fundamentals II or BSE 2280 HVACR Fundamentals, or equivalent. Nil Nil
Objectives	1. To provide students with knowledge on renewable energy resources and potential applications. 2. To enable students to design and test major renewable energy application systems. 3. To understand the importance of renewable energy in solving the environmental problems associated with the use of conventional fossil fuels.
Intended Learning Outcomes	Upon successful completion of the subject, students are expected to: a) be able to use the fundamentals of the subject for analysing the energy performance of main renewable energy systems; b) have the ability to design and do T/C of major renewable energy systems; and c) be able to apply the basic knowledge for promoting renewable energy applications.
Subject Synopsis/ Indicative Syllabus	Energy use and environment: climate change and human activity; Carbon dioxide and green house effect; renewable energy use and environment. Solar thermal applications: solar radiation data; active systems and passive systems. Solar electricity generation: solar concentrators; solar cells; thin films; photovoltaic systems; building integrated photovoltaics. Geothermal energy: geothermal resources; thermal application and power generation. Wind energy: wind resource; wind characteristics; wind turbine types and wind power generation. Biomass energy: various resources; biomass for fuels; direct application for cooking and power generation. Ocean energy: ocean thermal energy; wave power and tidal power.
Teaching/Learning Methodology	The realisation of the subject aims will be primarily on the basis of lectures and student seminars under adequate guidance from subject lecturers. Appropriate arrangement for tutorials will be made to give sufficient guidelines for students to prepare seminar reports. Two workshops/lab measurements/site visits will be organized to enhance the studies. Students will also be directed to complete a self−reading programme to enhance understanding of the subject contents. Tutorial work will mainly focus on helping students prepare seminar reports and understand general problems related to the subjects.

<table>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td></td><td></td><td></td></tr>
<tr><td>Coursework*</td><td>100</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100</td><td colspan="6"></td></tr>
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* For details, please refer to the 2020/21 Semester 1 Subject teaching scheme/schedule.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>21 Hrs.</td></tr>
<tr><td>▪ Seminars</td><td>12 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>3 Hrs.</td></tr>
<tr><td>▪ Workshops/Labs</td><td>3 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self study</td><td>78 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>

Twidell, J. and Wein, T. Renewable Energy Resources, Cambridge University Press, 1986.

Johansson, T. et al. Renewable Energy: Sources for Fuel and Electricity, Island Press, Washington, 1993

The Environmental Impacts of Renewable Energy, OECD, Paris. 1988.

Duffie J.A. and William, A.B., Solar Engineering of Thermal Process, John Wiley & Sons, Inc., 1991.

Athienitis, A.K. and M. Santamouris, Thermal Analysis and Design of Passive Solar Buildings, James & James (Science Publishers) Ltd., London, 2002.

Steven Winter Associates, Passive Solar Design and Construction Handbook, New York, Wiley, 1998.

Strong, S.J. and William, G.S., The Solar Electric House, Sustainability Press, Massachusetts, 1993.

Manwell, J.F., J.G. McGowan and A.L. Rogers, Wind Energy Explained Theory, Design and Application, John Wiley & Sons, Ltd., England, 2003

Bowen, R., Geothermal Resources, Applied Science Publishers London, 1979.

Milora, S.L., Geothermal Energy as a Source of Electric Power: thermodynamic and economic design criteria, Cambridge, MIT Press, 1976.

Wortman, A.J., Introduction to Wind Turbine Engineering, Butterworth Publishers, Boston, 1983.

Ross, D., Power from the Waves, Oxford University Press, Oxford, 1995.

Boyles, D.T., Bio-Energy: Technology, Thermodynamics and Costs, Halsted Press, New York, 1984.

Paul Gipe, Wind Power, James & James (Science Publishers) Ltd, London, 2004.

Robert Foster, Majid Ghassemi and Alma Cota, Solar Energy-Renewable Energy and the Environment, CRC Press, New York, 2010.

John Wiley and Sons: Handbook of Clean Energy Systems (ISBN: 978-1-118-38858-7), 2014.

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	Journals (International Journal of): Solar Energy; Solar Energy Engineering; Wind Engineering; Renewable Energy; Energy Research; Energy, Applied Energy; Green Energy. 杨洪兴，吕琳，彭晋卿，周伟：太阳能建筑一体化技术与应用。北京：中国建筑工业出版社，ISBN 978-7-112-18286-2，2015 年 10 月第二版，2015 年第八次印刷。 张晴原，杨洪兴：建筑用标准气象数据手册。北京：中国建筑工业出版社，ISBN 978-7-112-13770-1，2012 年 3 月第一版。 杨洪兴：太阳能光伏建筑一体化工程实例。北京：中国建筑工业出版社，ISBN 978-7-112-13985-9，2012 年 5 月第一版。 杨洪兴，吕琳，马涛：太阳能-风能互补发电技术及应用。中国建筑工业出版社，ISBN 978-7-112-17328-0，2015 年 1 月第一次印刷。