




Module co-ordinators	Dr Craig Meskell, School of Engineering
What will you learn from this elective	<p>The detailed syllabus is:</p> <ol style="list-style-type: none">1. Introduction to energy supply. Energy flow from raw resource to end use. Variations of energy demand in different countries and correlation with wellbeing.2. Energy Trilemma: Security of supply, cost, and environmental impact.3. Units of energy and power4. Physical principles underlying turbines and heat engines5. Wind power. Physics of raw resource; physics of conversion to electricity; impact of intermittency.6. Storage technologies.7. Tidal power: tidal barrage; tidal streams.8. Solar power: Photovoltaic; concentrating solar power; biomass.9. Nuclear power: basic nuclear physics, nature of a nuclear power plant, nuclear waste. <p>Energy end use – opportunity for energy reduction.</p>
Student Workload	100-110 hours
Assessment Components	2 hour in person exam plus 2 assignments
Indicative Reading List	<p>David J.C. MacKay, Sustainable Energy – without the hot air. ISBN 978-0-9544529-3-3.</p> <p>Tom Murphy Energy and Human Ambitions on a Finite Planet ISBN 978-0-578-86717-5</p> <p>Clack, C.T.M., et al., Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar. Proceedings of the National Academy of Sciences of the United States of America, 2017. 114(26): p. 6722-6727.</p> <p>Jacobson, M.Z., et al., Low-cost solution to the grid reliability problem with 100% penetration of intermittent wind, water, and solar for all purposes. Proceedings of the National Academy of Sciences of the United States of America, 2015. 112(49): p.15060- 15065.</p>
Learning Outcomes	<p>At the end of this module you will be able:</p> <ul style="list-style-type: none">• to quantify the scale of the energy supply and demand task in Ireland and globally;• to state the conflicting drivers of energy policy (i.e. the energy trilemma);• to appreciate the significance of energy and power units;• to describe and compare various electrical power generation technologies;

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- to estimate the potential contribution of a particular technology.
 - to think critically about the necessary trade-offs when choosing one technology or another.