DM943 Sustainable Product Design and Manufacturing

Module Registrar: Dr Winifred Ijomah

Taught To (Course): MSc in Sustainable Product Development, Computer Aided Engineering Design, Product Engineering Design

Other Lecturers Involved:
Dr X T Yan

Credit Weighting: 10
Semester: 1

Assumed Prerequisites:
Knowledge of design and manufacture process

Compulsory/Optional/ Elective Class:
Academic Level: 5

Module Format and Delivery (hours):

<table>
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<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Project</th>
<th>Private Study</th>
<th>Total</th>
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<tr>
<td>24</td>
<td>10</td>
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<td>26</td>
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Educational Aim

One of the major challenges of modern industry is to address the need for sustainable product development and manufacturing. International legislation and increasing costs of fiscal instruments such as the landfill tax now aim to force producers to reduce the environmental impacts of their products and processes. Accelerating globalization and industrialization continues to exacerbate complexity of sustainability. Whilst manufacturers are constantly required to lower their costs and maintain their competitiveness, legislations require them to look at lifecycle costs. This module addresses these global concerns by studying lifecycle considerations for a sustainable and profitable product development and manufacture. The latest environmental legislation will also be studied along with product development concepts and strategies that will enable industry to meet these increasingly severe competitive, environmental and legislative pressures. The associated practical, hands-on sessions maximize the usefulness of the skills acquired in real-life operational industry setting.

Learning Outcomes

On completion of the module the student is expected to be able to

LO1 To understand the importance of sustainable product development and sustainable manufacturing and how to establish competitive advantage (e.g. via operational efficiency and effectiveness, new opportunities and enhanced enhancing marketing and customer goodwill).

LO2 To understand product lifecycle and various life phases in sustainable product developments.

LO3 To understand rationale for a new manufacture approach/sustainable manufacture/Environmental impacts of manufacture.

LO4 To understand of remanufacture concept, Benefits of remanufacture to industry and its significance as a key strategy in waste management and environmentally conscious manufacture.

LO5 To appreciate Design-for-remanufacture (DFRem) concept and approaches

Syllabus
The module will teach the following topic:

- Lifecycle activities, life phases and lifecycle decision making.
- Sustainable Development concept and background (i.e. Theory and history)
- Environmental legislation affecting manufacturing,
- General reuse/reclaim processes: their definitions and differentiation, as well as their economic, social and environmental impacts.
- Remanufacturing: history drivers, issues/problems, current and future developments
- The remanufacture concept and its significance
- Remanufacture V conventional manufacture, repair, reconditioning and recycling
- Benefits of remanufacture to industry (e.g. reductions in production cost, processing, energy use and raw material and waste production).
- Impact of remanufacture in enhancing product development process.
- Characteristics of remanufacturable products
- Technical and non-technical hindrances to remanufacturing
- Design and manufacture issues assisting and hindering remanufacture

Assessment of Learning Outcomes

Criteria

LO1  To understand the importance of sustainable product development and sustainable manufacturing and how to establish competitive advantage (e.g. via operational efficiency and effectiveness, new opportunities and enhanced enhancing marketing and customer goodwill)
C1  Describe the process of sustainable product development;
C2  Identify the benefits of sustainable product developments in enabling competitive edge.

LO2  To understand product lifecycle and various life phases in sustainable product developments.
C1  Describe the life-phases of product development and understand the significance of decisions made on lifecycle phases and environment.
C2  Develop simple life-cycle models to apply the theory in product sustainability analysis and evaluation.

LO3  To understand rationale for a new manufacture approach/ sustainable manufacture /Environmental impacts of manufacture
C1  Describe the new manufacture approach and impacts on environment and sustainability.
C2  Develop simple Life Cycle (LCA) evaluation of products and apply this to illustrate the environmental impacts of their remanufacturing.

LO4  To understand of remanufacture concept. Benefits of remanufacture to industry and its significance as a key strategy in waste management and environmentally conscious manufacture.
C1  Describe the essential differentiating factors between the various reuse/reclaim approaches

LO5  To appreciate Design-for-remanufacture (DFRem) concept and approaches
C1  To be able to undertake simple product evaluation and redesign in order to enhance product remanufacturability.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages: www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/ )

12 principles relating to the assessment and feedback developed by the University will be incorporated in the feedback and assessment of the module, including:

Students will be provided with model answers for assessment tasks before issuing each assignment, together with a piece of sample work against all assessment criteria.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

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<tr>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tr>
<td>Number</td>
<td>Duration</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines:

Weeks 5 and 11 at 12 noon.

Resit Assessment Procedures:

Students need to gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be if appropriate re-examined during the August diet. This re-examination will consist entirely of coursework / exam.

PLEASE NOTE:
Students need to gain a summative mark of 50% to pass the module. Non graduating students who fail the module at the first attempt will be re-examined during the August diet.

Recommended Reading

International Journal of Artificial Intelligence for Engineering Design, Analysis and Manufacturing

International Journal of Concurrent Engineering: Research & Applications


Steinhilper R “Remanufacturing: The Ultimate Form of Recycling” Fraunhofer IRB Verlag, D-70569 Stuttgart; ISBN 3-8167-5216-0


Additional Student Feedback

(Please specify details of when additional feedback will be provided)

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Session: 2011/2012

APPROVED

Course Director Signature: Dr Kepa Mendibil

Date of Last Modifications: 15 September 2011
## MODULE TIMETABLE

**Module Code:** DM943  
**Module Title:** Sustainable Product Design and Manufacturing

### Brief Description of Assessment:
Course work – to show the results of investigation of visualisation techniques;  
Project work: to demonstrate the competence in developing advanced product models in helping product development as Group report.

### Assessment Timing:
Indicate on the table below the Start/Submission dates for each Assignment/Project and the timing of each Exam/Class Test(s).

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