Institute for Advanced Manufacturing and Engineering

AME’s Innovative Degree – Solution Based Learning in HE: Enhancing Employability Skills

Ian Wilson
Adriana Ortiz
What Industry expects

- Academic Knowledge
- Practical Experience
- Workplace culture within a manufacturing environment
- Management Experience

What Industry needs
Traditional UK Undergrad program

Year 1

Year 2

Year 3

Year 4

Year 5

Traditional Undergrad program

Semester 1

Semester 2

Semester 1

Semester 2

Semester 1

Semester 2 final year project

Grad work program

BEng

IEng

Academic Knowledge

Practical Experience

Management Experience

workplace culture within a manufacturing environment

What Industry needs
Skills! AME’s Innovative Degree – Industrial Ready Graduates through solution based learning

AME Innovative Approach to the Under grad program

Year 1

Year 2

Year 3

Academic Knowledge
Practical Experience

workplace culture within a manufacturing environment

Management Experience

AME
Extract for Year 1, semester 1

Project (taught)
- Manufacturing systems, project management, piece-part costing

Engineering Materials & Technology 1
- Manufacturing technologies
- Stress, strain, materials

Business input
- Provide “real-world” problem/scenario; Industrial mentors; Industrial process/documentation

Mechanical Science & Mathematics
- Forces, flow, statics
- Algebra, calculus, vectors

Building graduate skills through integrated projects
Live Industrial Project

Module 1
• Taught;
• Underpinning science / engineering;
• Examined;
• University-led;

Integrating project
• Real context (provided by industry);
• Application of theory / principles;
• Joint lead;

Module 2
• Taught;
• Underpinning science / engineering;
• Examined;
• University-led;

Using industry planning processes
Assessment planning

1. Aim:
2. Introduction:
3. Task:
4. Approach:
5. Log book:
6. Deliverables/ assessment:
7. Activity Map:
1. **Aim**

This module is concerned with the current production facility, and requires students to apply the underpinning knowledge gained in the materials & technology module and the Part – assembly manufacturing project module, to enable students to define a **solution** to the proposed production issue. Students will work in groups and will further develop the project management and team-working skills instilled earlier in the course to manage the introduction of a process and materials solution into the manufacturing arena. Wherever possible, products will be specified in conjunction with industry. This coursework aims to develop a number of key capabilities required to undertake a process/ materials improvement project. Specifically these include the application of associated tools and techniques.
2. **Introduction**
This module acts as the first course integrating project where students will be expected to show a detailed and holistic command of manufacturing engineering and an ability to apply this at a business level. This module will be guided with specialist knowledge being offered when required – either in response to a direct student enquiry or where staff believe that this would be beneficial.
The work will integrate a range of previous studies and concurrent modules. New learning will be undertaken specifically in the principles of Materials and manufacturing processes, project management, business costing, fundamentals of Lean In Manufacturing and within dedicated interactions with supporting specialist staff.

3. **Task**
The aim of this module is for students to work in small groups to design and evaluate the production process for the manufacture of a part or assembly.
Within the project an analysis of the part from an engineering science and materials perspective will be required to determine any impact on manufacturing processes, e.g. cost, reliability.
The project team will need to ensure effective project management, including managing project risks as well as ensuring Health, Safety and Environmental risks are properly assessed.
Then, a suitable manufacturing process and sequence will be designed and a full set of manufacturing documentation. Students will need to show effective manufacturing disciplines that embody lean principles.

**Unipart requirements are that:** 99% RFT, no increase in current process cycle time and no increase in labour usage.
4. **Approach**
Working in allocated groups, undertake a process/ materials improvement project

5. **Log book**
You log book should be a live recording of mixed presentational work as it happens typically including evidence of your engagement in Project management, Meetings, Research, Analysis, Creativity, Validation, Use of design tools and techniques, Synthesis and your group decisions made with justification and finally your critical Reflection. (form of the logbook is to be confirmed and approved within the first week of delivery).
Coursework 2 will consist of the record of your progress. It will be marked via your logbook on regular intervals (stage gates). Last stage would be your final project presentation.

6. **Deliverables / Assessment**
Single PDF format report for your group and your individual contribution to be submitted on turnitin Moodle link by 23.55 (09/01/17).
Individual logbook (16/12/2016)
Deliver 15 min presentation of your work and 15 min answer associated questions (15/12/2016), presentation to be uploaded no later than (14/12/2016).
<table>
<thead>
<tr>
<th>Approx. Week no</th>
<th>Activity and Mapping</th>
<th>Activity</th>
<th>location</th>
<th>153MAM</th>
<th>151MAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-13</td>
<td>Maintain log book including minutes of meetings and all live individual work relating to the tasks and your critical reflection on all activities and findings</td>
<td>1-13</td>
<td>Report</td>
<td>LO5</td>
<td></td>
</tr>
<tr>
<td>2-13</td>
<td>Work Breakdown Structure (WBS) allocation of required resources (M,M,M,T). GANTT chart (revised as appropriate) Project risk analysis and project risk management log.</td>
<td>2-13</td>
<td>Appendix</td>
<td>LO4, LO5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>In your report you must consider the ethical principles of a lean improvement activity and its effects on all of the stakeholders.</td>
<td>3</td>
<td>Report</td>
<td>LO1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Identify Value added and non value added activities (value stream mapping), 7 waste analysis of the whole process.</td>
<td>4</td>
<td>Report</td>
<td>LO1, LO2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Calculate lead time and takt time of current state and the difference in takt time and process time? To determine the effective batch size for each product variant, and propose a Yamizumi board to ensure takt time is met</td>
<td>5</td>
<td>Report</td>
<td>LO1, LO2</td>
<td></td>
</tr>
<tr>
<td>5-7</td>
<td>Evaluate the current standard operation charts and make suggestions for improvement and ensure you have considered the health and safety requirements.</td>
<td>5-7</td>
<td>Report</td>
<td>LO3</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Identify if the production is a push or pull type production system and which ones of the 7 business measurements are used and analyse if they are the best ones to use?</td>
<td>6</td>
<td>Report</td>
<td>LO1, LO2</td>
<td></td>
</tr>
<tr>
<td>7-8</td>
<td>Identify opportunities for Error proofing of the process and FMEA</td>
<td>7-8</td>
<td>Report</td>
<td>LO1, LO2</td>
<td></td>
</tr>
<tr>
<td>4-6</td>
<td>Using and manipulating the CES software, identify alternative materials that can meet current product specification.</td>
<td>4-6</td>
<td>Report</td>
<td>LO2</td>
<td></td>
</tr>
<tr>
<td>2-7</td>
<td>Review the current joining method with respect to welding/joining defects and potential sources of such defects. Provide justified recommendations/ suggested solutions to address the identified welding defects and issues such as to increase productivity &amp; minimise scrap.</td>
<td>2-7</td>
<td>LO3, LO4</td>
<td></td>
<td>LO1, LO2</td>
</tr>
<tr>
<td>8</td>
<td>Individually assess (at least one each) the possible alternative materials identified through CES, to include material properties analysis for the current manufacturing processes and application of product in service.</td>
<td>8</td>
<td>Appendix</td>
<td>LO1, LO2</td>
<td></td>
</tr>
<tr>
<td>8-10</td>
<td>Elaborate a future state proposal.</td>
<td>8-10</td>
<td>Report</td>
<td>LO5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Calculate the piece part cost before and after your improvements.</td>
<td>9</td>
<td>Report</td>
<td>LO1</td>
<td>LO2</td>
</tr>
<tr>
<td>11</td>
<td>Present proposal in a 20 minute presentation to the group and your tutors/AME/Unipart representatives [PS, GTS]</td>
<td>11</td>
<td>AME Presentation</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Materials &amp; process</td>
<td>Mechanical science and maths</td>
<td>Project</td>
<td>Graduate Skills, Competences, employer capabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CES material selection analysis, and justification against alternatives</td>
<td>Manual Calculations to prove/ confirm CES software and or materials testing experiment</td>
<td>Project management: Network diagram, work breakdown structure, Gantt chart(s), project risk assessment</td>
<td>Problem solving, Leading teams, effective team working, time management,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process identifier software, process selected and justified against alternatives</td>
<td>Calculate part costs, manpower ratio, basic project payback</td>
<td>Lean: 5s Audit sheet Yamzumi line balancing / man assignment, standard op sheets, H&amp;S risk assessment</td>
<td>Understanding and application of basic Lean principles</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costing: piece part costing, project costing</td>
<td>Budget planning and control</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Communication Skills: Written, Verbal, presentations, Business report, portfolio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Building graduate skills through integrated projects
Solution Based Learning

1. Real Company target identify.
2. Students to investigate and apply knowledge.
3. Students to define a solution to the issue identified and evaluate solution viability.

Facilitator & resources available
For example: Academic guides, Industrial data, Industrial contacts, Field experts support, Industrial mentors.

Building graduate skills through Solution Based Learning
Building graduate skills through integrated projects
Testing the approach....
You tube links

http://www.coventry.ac.uk/ame/

http://www.coventry.ac.uk/ame/study-with-us/
Thank you and Any Questions?