Twinning Engineering Programmes (TEP)
Mechanical Engineering

NU Programmes Code : H302
UNSW Programmes Code : 3707
KU LEUVEN Programmes Code :

UNDERGRADUATE CATALOG BE.61
ID.611075XXXX - 651075XXXX
Twinning Engineering Programmes (TEP)
Mechanical Engineering

Mechanical Engineering is one of the most diversified fields in engineering. It involves the design, analysis and control of mechanical systems, the understanding and use of materials, and the generation and use of mechanical power.

Mechanical Engineering is also very compatible with other engineering fields such as electrical engineering in control systems and energy processes, civil engineering in applied mechanics, nuclear engineering in power systems and material properties, chemical engineering in energy and transport phenomena, industrial engineering in manufacturing methods, and agricultural engineering in mechanical systems.

Structures and Components

<table>
<thead>
<tr>
<th></th>
<th>TU</th>
<th>Collaborative universities</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General Courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Part I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1 Social Sciences</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>1.1.2 Humanities</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1.1.3 Science and Mathematics</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1.1.4 Languages</td>
<td>9</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>1.2 Part II</td>
<td>7</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>2. Engineering Major Course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Basic Courses</td>
<td>24</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>2.1.1 Basic Mathematic and Sciences Courses</td>
<td>17</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>2.1.2 Basic Engineering Courses</td>
<td>7</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>2.2 Major Courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.1 Compulsory Engineering Courses</td>
<td>37</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>2.2.2 Technical Electives Courses</td>
<td>0</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>3. Free Electives</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>145</td>
</tr>
</tbody>
</table>

Remarks:
10 Credits at NU convert to 3 credits at TU
1.5 Credits at UNSW convert to 1 credit at TU
1.5 Credits at KU LEUVEN convert to 1 credit at TU
12 Credits at RMIT University convert to 3 credits at TU
Details of the Curriculum

1. General Courses 30 credits
   1.1 General Courses – Part 1 21 credits
      1.1.1 Social Sciences (2 Courses) 6 credits
         TU100 3 credits
         TU109 3 credits
      1.1.2 Humanities (1 Course) 3 credits
         TU108 3 credits
      1.1.3 Sciences and Mathematics (1 Course) 3 credits
         TU107 3 credits
      1.1.4 Languages (6 Courses) 9 credits
         TU050* 3 credits
         TU104 3 credits
         TU105 3 credits
         TU106 3 credits
         EL214* 0 credit
         EL215* 0 credit
         * Credits are not counted
   1.2 General Courses – Part 2 9 credits
      List of courses from TU 7 credits
         SC123 3 credits
         SC173 1 credit
         CN101 3 credits
      List of courses from NU At least 2 credits
         H61RES 3 credits
         H63BPE 3 credits
         MM2MN1 3 credits
         MM3MN2 3 credits
         N11440 3 credits
         N12105 3 credits
         N12814 3 credits
         N12412 3 credits
         N11413 3 credits
         N12403 3 credits
      List of course from UNSW
         GENC6007 4 credits
         GENL0230 2 credits
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENC7003</td>
<td>4 credits</td>
</tr>
<tr>
<td>GENT0708</td>
<td>4 credits</td>
</tr>
<tr>
<td>GENC7002</td>
<td>4 credits</td>
</tr>
<tr>
<td>GENC6004</td>
<td>4 credits</td>
</tr>
</tbody>
</table>

**List of course from KU LEUVEN**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2MANE</td>
<td>2 credits</td>
</tr>
<tr>
<td>T3MGME</td>
<td>2 credits</td>
</tr>
<tr>
<td>T2COME</td>
<td>2 credits</td>
</tr>
<tr>
<td>A07M9A</td>
<td>2 credits</td>
</tr>
</tbody>
</table>

**List of course from RMIT**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT1046</td>
<td>3 credits</td>
</tr>
<tr>
<td>ACCT1014</td>
<td>3 credits</td>
</tr>
<tr>
<td>MKTG1069</td>
<td>3 credits</td>
</tr>
<tr>
<td>HUSO1081</td>
<td>3 credits</td>
</tr>
<tr>
<td>MKTG1065</td>
<td>3 credits</td>
</tr>
<tr>
<td>MKTG1086</td>
<td>3 credits</td>
</tr>
<tr>
<td>BAFI1008</td>
<td>3 credits</td>
</tr>
<tr>
<td>LAW2442</td>
<td>3 credits</td>
</tr>
<tr>
<td>BUSM4550</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

---

**2. Engineering Major Course**

**2.1 Basic Courses**

**2.1.1 Basic Mathematic and Sciences Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC133</td>
<td>3 credits</td>
</tr>
<tr>
<td>SC134</td>
<td>3 credits</td>
</tr>
<tr>
<td>SC183</td>
<td>1 credit</td>
</tr>
<tr>
<td>SC184</td>
<td>1 credit</td>
</tr>
<tr>
<td>MA111</td>
<td>3 credits</td>
</tr>
<tr>
<td>MA112</td>
<td>3 credits</td>
</tr>
<tr>
<td>MA214</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

**2.1.2 Basic Engineering Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME100</td>
<td>3 credits</td>
</tr>
<tr>
<td>CE100</td>
<td>0 credit</td>
</tr>
<tr>
<td>CE101</td>
<td>1 credit</td>
</tr>
<tr>
<td>IE121</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

**2.2 Major Courses**

**2.2.1 Compulsory Courses**

**109 credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC133</td>
<td>3 credits</td>
</tr>
<tr>
<td>SC134</td>
<td>3 credits</td>
</tr>
<tr>
<td>SC183</td>
<td>1 credit</td>
</tr>
<tr>
<td>SC184</td>
<td>1 credit</td>
</tr>
<tr>
<td>MA111</td>
<td>3 credits</td>
</tr>
<tr>
<td>MA112</td>
<td>3 credits</td>
</tr>
<tr>
<td>MA214</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME100</td>
<td>3 credits</td>
</tr>
<tr>
<td>CE100</td>
<td>0 credit</td>
</tr>
<tr>
<td>CE101</td>
<td>1 credit</td>
</tr>
<tr>
<td>IE121</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

**85 credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC133</td>
<td>3 credits</td>
</tr>
<tr>
<td>SC134</td>
<td>3 credits</td>
</tr>
<tr>
<td>SC183</td>
<td>1 credit</td>
</tr>
<tr>
<td>SC184</td>
<td>1 credit</td>
</tr>
<tr>
<td>MA111</td>
<td>3 credits</td>
</tr>
<tr>
<td>MA112</td>
<td>3 credits</td>
</tr>
<tr>
<td>MA214</td>
<td>3 credits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME100</td>
<td>3 credits</td>
</tr>
<tr>
<td>CE100</td>
<td>0 credit</td>
</tr>
<tr>
<td>CE101</td>
<td>1 credit</td>
</tr>
<tr>
<td>IE121</td>
<td>3 credits</td>
</tr>
<tr>
<td>Course</td>
<td>Credits</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>ME200</td>
<td>2</td>
</tr>
<tr>
<td>ME210</td>
<td>3</td>
</tr>
<tr>
<td>ME220</td>
<td>3</td>
</tr>
<tr>
<td>ME230</td>
<td>3</td>
</tr>
<tr>
<td>ME240</td>
<td>3</td>
</tr>
<tr>
<td>ME310</td>
<td>3</td>
</tr>
<tr>
<td>ME322</td>
<td>3</td>
</tr>
</tbody>
</table>

Non-Mechanical Engineering

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA131</td>
<td>3</td>
</tr>
<tr>
<td>CE202</td>
<td>3</td>
</tr>
<tr>
<td>LE203</td>
<td>1</td>
</tr>
<tr>
<td>LE209</td>
<td>3</td>
</tr>
<tr>
<td>IE251</td>
<td>3</td>
</tr>
<tr>
<td>IE252</td>
<td>1</td>
</tr>
<tr>
<td>IE261</td>
<td>3</td>
</tr>
</tbody>
</table>

2.2.2 Technical Elective Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM3ADM</td>
<td>3</td>
</tr>
<tr>
<td>MM2DM2</td>
<td>6</td>
</tr>
<tr>
<td>MM3CAI</td>
<td>3</td>
</tr>
<tr>
<td>MM3SV2</td>
<td>3</td>
</tr>
<tr>
<td>MM2TF2</td>
<td>6</td>
</tr>
<tr>
<td>MM3CAE</td>
<td>3</td>
</tr>
<tr>
<td>MM3EM2</td>
<td>3</td>
</tr>
<tr>
<td>MM4ICE</td>
<td>3</td>
</tr>
<tr>
<td>MM4SET</td>
<td>3</td>
</tr>
<tr>
<td>MM3MEC</td>
<td>3</td>
</tr>
<tr>
<td>HG2M13</td>
<td>3</td>
</tr>
<tr>
<td>MM2MID</td>
<td>3</td>
</tr>
<tr>
<td>MM2DYN</td>
<td>3</td>
</tr>
<tr>
<td>MM2MS2</td>
<td>3</td>
</tr>
<tr>
<td>MM2MS3</td>
<td>3</td>
</tr>
<tr>
<td>MM3PR</td>
<td>9</td>
</tr>
<tr>
<td>MM3CMT</td>
<td>3</td>
</tr>
<tr>
<td>MM3DES</td>
<td>3</td>
</tr>
<tr>
<td>MM3HTR</td>
<td>3</td>
</tr>
</tbody>
</table>
List of courses from UNSW

- MM3SAT 3 credits
- MMAN2300 4 credits
- MECH3110 4 credits
- MECH3540 4 credits
- MECH3610 4 credits
- MMAN3200 4 credits
- MMAN3210 4 credits
- MMAN3400 4 credits
- MECH4100 4 credits
- MECH4320 4 credits
- MMAN4000 4 credits
- MMAN4010 4 credits
- MMAN4020 4 credits
- MTRN3020 4 credits
- MTRN3100 4 credits
- MTRN3200 4 credits
- MTRN3500 4 credits
- MTRN4010 4 credits
- MTRN4230 4 credits
- AERO3110 4 credits
- AERO3200 4 credits
- AERO3410 4 credits
- AERO3630 4 credits
- AERO3650 4 credits
- AERO4110 4 credits
- AERO4120 4 credits

List of courses from KU LEUVEN

- T2EMEN 3 credits
- T2STAE 2 credits
- T2SSYE 3 credits
- T2EE30 3 credits
- T2OGDE 3 credits
- T2THEE 3 credits
- T2STLE 2 credits
- T2MATE 3 credits
- T2ERWO 2 credits
- T2EE4M 2 credits
- T2ELTE 3 credits
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2DYNE</td>
<td>3</td>
</tr>
<tr>
<td>T31MPE</td>
<td>4</td>
</tr>
<tr>
<td>T31MTE</td>
<td>4</td>
</tr>
<tr>
<td>T31MSE</td>
<td>2</td>
</tr>
<tr>
<td>T31EIE</td>
<td>2</td>
</tr>
<tr>
<td>T31HTE</td>
<td>2</td>
</tr>
<tr>
<td>T31EMS</td>
<td>4</td>
</tr>
<tr>
<td>T31CIE</td>
<td>3</td>
</tr>
<tr>
<td>T31CTE</td>
<td>2</td>
</tr>
<tr>
<td>T31MCD</td>
<td>3</td>
</tr>
<tr>
<td>T31ELM</td>
<td>3</td>
</tr>
<tr>
<td>T31EIA</td>
<td>2</td>
</tr>
</tbody>
</table>

**List of courses from RMIT**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIET2116</td>
<td>3</td>
</tr>
<tr>
<td>MIET1071</td>
<td>3</td>
</tr>
<tr>
<td>MIET1076</td>
<td>3</td>
</tr>
<tr>
<td>MIET1081</td>
<td>3</td>
</tr>
<tr>
<td>AUTO1006</td>
<td>3</td>
</tr>
<tr>
<td>MIET1077</td>
<td>3</td>
</tr>
<tr>
<td>MIET1084</td>
<td>3</td>
</tr>
<tr>
<td>AUTO1019</td>
<td>3</td>
</tr>
<tr>
<td>AUTO1014</td>
<td>3</td>
</tr>
<tr>
<td>OENG1074</td>
<td>6</td>
</tr>
<tr>
<td>OENG1075</td>
<td>6</td>
</tr>
<tr>
<td>AUTO1018</td>
<td>3</td>
</tr>
<tr>
<td>MIET1192</td>
<td>3</td>
</tr>
<tr>
<td>MIET2011</td>
<td>3</td>
</tr>
<tr>
<td>AUTO1016</td>
<td>3</td>
</tr>
<tr>
<td>MIET1200</td>
<td>3</td>
</tr>
</tbody>
</table>

**3. Free Electives Courses**

Select 6 credits from the list of courses offered by collaborative universities.
ME Curriculum : 145 credits
Course planning for the first two and a half years (5 semesters) at Thammasat University.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Title</th>
<th>Credits (lecture-lab-self study)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semester 1</strong> (August – December)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE100</td>
<td>Ethics for Engineers</td>
<td>0 (0-0-0)</td>
</tr>
<tr>
<td>CE101</td>
<td>Introduction to Engineering Profession</td>
<td>1 (1-0-2)</td>
</tr>
<tr>
<td>MA111</td>
<td>Fundamentals of Calculus</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>ME100</td>
<td>Engineering Graphics</td>
<td>3 (2-3-4)</td>
</tr>
<tr>
<td>IE121</td>
<td>Engineering Materials I</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>SC133</td>
<td>Physics for Engineers I</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>SC183</td>
<td>Physics for Engineers Laboratory I</td>
<td>1 (0-3-0)</td>
</tr>
<tr>
<td>TU100</td>
<td>Civic Engagement</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>TU050</td>
<td>English Skill Development or</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>TU105</td>
<td>Communication Skills in English</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td><strong>Semester 2</strong> (January – May)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC123</td>
<td>Fundamental Chemistry</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>SC173</td>
<td>Fundamental Chemistry Laboratory</td>
<td>1 (0-3-0)</td>
</tr>
<tr>
<td>MA112</td>
<td>Analytic Geometry and Applied Calculus</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>SC134</td>
<td>Physics for Engineers II</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>SC184</td>
<td>Physics for Engineers Laboratory II</td>
<td>1 (0-3-0)</td>
</tr>
<tr>
<td>TU104</td>
<td>Critical Thinking, Reading and Writing</td>
<td>3 (3-0-3)</td>
</tr>
<tr>
<td>TU105</td>
<td>Communication Skills in English</td>
<td>3 (3-0-3)</td>
</tr>
<tr>
<td>CE202</td>
<td>Engineering Mechanics – Statics</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Course Number</td>
<td>Title</td>
<td>Credits (lecture-lab-self study)</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>TU107</td>
<td>Digital Skill and Problem Solving</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>TU108</td>
<td>Self-Development and Management</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>MA214</td>
<td>Differential Equations</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>EL214</td>
<td>Communicative English I</td>
<td>0 (3-0-6)</td>
</tr>
<tr>
<td>IE261</td>
<td>Engineering Statistics</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>LE209</td>
<td>Introduction to Electrical Engineering</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>LE203</td>
<td>Introduction to Electrical Engineering</td>
<td>1 (0-3-0)</td>
</tr>
<tr>
<td>ME200</td>
<td>Mechanical Drawing</td>
<td>2 (1-3-2)</td>
</tr>
<tr>
<td>IE252</td>
<td>Engineering Tools and Operations Laboratory</td>
<td>1 (0-3-0)</td>
</tr>
<tr>
<td>ME230</td>
<td>Fundamental of Thermodynamics</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>22</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Title</th>
<th>Credits (lecture-lab-self study)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN101</td>
<td>Introduction to Computers Programming</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>TU109</td>
<td>Innovation and Entrepreneurial Mindset</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>ME220</td>
<td>Engineering Mechanics – Dynamics</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>ME240</td>
<td>Mechanics of Fluids</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>MA131</td>
<td>Applied Linear Algebra</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>IE251</td>
<td>Manufacturing Processes for Mechanical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering</td>
<td>3 (2-3-4)</td>
</tr>
<tr>
<td>ME210</td>
<td>Mechanics of Materials</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>EL215</td>
<td>Communicative English II</td>
<td>0 (3-0-6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>21</strong></td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Credits (lecture-lab-self study)</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>TU106</td>
<td>Creativity and Communication</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>ME310</td>
<td>Mechanical Design</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td>ME322</td>
<td>Mechanical Vibrations</td>
<td>3 (3-0-6)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>
Course planning for the last two years (4 semesters) at University of Nottingham or University of New South Wales or KU Leuven or RMIT University

After completing the course work at Thammasat University, students shall proceed to University of Nottingham or University of New South Wales or KU Leuven or RMIT University to complete the rest of their course work.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Third Year</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Semester 6</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXXXXXX General Education</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>XXXXXXX Technical Electives</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td><strong>Semester 7</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXXXXXX Technical Electives</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Forth Year</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Semester 8</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXXXXXX Technical Electives</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Semester 9</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XXXXXXX Technical Electives</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>XXXXXXX Free Electives</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>
Course Descriptions
TU Courses

1. General Basic Courses
Part I
Social Science
TU100 Civic Engagement 3(3-0-6)
Instillation of social conscience and awareness of one’s role and duties as a good global citizen. This is done through a variety of methods such as lectures, discussion of various case studies and field study outings. Students are required to organise a campaign to raise awareness or bring about change in an area of their interest.

TU109 Innovation and Entrepreneurial Mindset 3(3-0-6)
Risk assessment and creating new opportunities. Thinking and planning as an entrepreneur. Decision making and entrepreneurial venture development. Business communication for delivering concept or initiative in an efficient, effective and compelling manner. Social shared value creation.

Humanities
TU108 Self-Development and Management 3(3-0-6)

Sciences and Mathematics
TU107 Digital Skill and Problem Solving 3(3-0-6)
Basic computational thinking skill for solving problems and developing new social and economic opportunities. Efficient access and search for information. Information reliability evaluation. Filtering and managing information systematically. Ethical digital usage and professional online communication.

Languages
TU050 English Skill Development 3(3-0-6)
*Credits are not counted
Practice basic skills for listening, speaking, reading, and writing in English through an integrated method. Students will acquire a basis to continue to study English at a higher level.
TU104  Critical Thinking, Reading, and Writing  3(3-0-6)

Development of critical thinking through questioning, analytical, synthetic and evaluation skills. Students learn how to read without necessarily accepting all the information presented in the text, but rather consider the content in depth, taking into account the objectives, perspectives, assumptions, bias and supporting evidence, as well as logic or strategies leading to the author’s conclusion. The purpose is to apply these methods to students’ own persuasive writing based on information researched from various sources, using effective presentation techniques.

TU105  Communication Skills in English  3(3-0-6)

Prerequisite: Have earned credits of TU050

Development of English listening, speaking, reading and writing skills, focusing on the ability to hold a conversation in exchanging opinions, as well as reading comprehension of academic texts from various disciplines related to students’ field of study.

TU106  Creativity and Communication  3(3-0-6)

Creative thought processes, with critical thinking as an important part, as well as communication of these thoughts that lead to suitable results in social, cultural and environmental contexts, at personal, organisational and social levels.

EL214  Communicative English 1  0(3-0-6)

Prerequisite: Have earned credits of TU105

Practising four skills through academic activities such as discussions and group work; communicating with and contributing to discussions with native English speakers effectively.

- Speaking: to improve pronunciation skills based on phonetic charts and to practice pronouncing common problematic sounds in English.
- Writing: to study essay writing such as how to write introduction, body and conclusion
- Listening: to study problematic sounds and become familiar with common listening problems
- Reading: to study vocabulary and practice different reading strategies such as reading for the main idea and critical reading

Assessment criteria: S(Satisfactory) and U(Unsatisfactory)

EL215  Communicative English 2  0(3-0-6)

Prerequisite: Have earned credits of EL214 or taking EL214 in the same semester

Participating in classroom discussions and effectively communicating with English native speakers; performing communicative activities in class using English.

- Speaking: to practice academic speaking skills such as oral presentations and speeches
- Writing: to practice sentence and paragraph writing and summary writing
• Listening: to study problematic sounds and become familiar with common listening problems
• Reading: to study reading strategies, such as speed reading, critical reading, reading extended text and doing exercises

Assessment criteria: S (Satisfactory) and U (Unsatisfactory)

Part II
TU Courses

SC123  Fundamental Chemistry 3(3-0-6)
Atomic structure, Stoichiometry, Chemical Bonds, Properties of representative and Transition elements, Gases, Liquids and solutions, Solids, Thermochemistry, Chemical kinetics, Chemical equilibrium, Acids and bases and Electrochemistry

SC173  Fundamental Chemistry Laboratory 1(0-3-0)
Prerequisite: Have taken SC123 or taking SC123 in the same semester
Experiments related to the contents in SC 123

CN101  Introduction to Computer Programming 3(3-0-6)

NU Courses

H61RES  Introduction to Renewable and Sustainable Energy Sources 3
This module provides an introduction to renewable and sustainable energy sources. It covers the various types of renewable energy and the resources available. It explains the physical principles of various types of energy conversion and storage, in relation to electrical power generation. It includes; wind power, solar power including PV cell characteristics, hydro power, electrical energy storage including batteries, thermal power sources – e.g. geothermal, biomass. It also cover environmental issues such as energy balance and life-cycle analysis and gives an overview of the limitations and potential contribution of the various technologies to the electrical supply network.

H63BPE  Business Planning for Engineers 3
This module introduces a diverse set of topics that a graduate engineer is likely to encounter upon entering employment. This will equip them with the knowledge to be able to write and assess rudimentary business plans and make informed decisions about product and business development. It includes various models, tools and concepts that are common within the business community including: Belbin’s model of team formation, the appropriate use of PEST and SWOT analysis, the basics of marketing, the product life cycle, technology audits, sources of finance,
intellectual property, ethics and product design. The generation of an idea for a new product and its development into a Business Plan serves as both the primary means of assessment and a way of discussing the above topics in a meaningful context.

**MM2MN1 Management Studies 1**

This module introduces students to modern management methods relevant to the running of a company. Topics include an introduction to basic economics, the essential requirements and aims of a business, preparing a business plan, accounting, the interpretation of accounts, programme management, the essentials of “lean” manufacture and the management of innovation.

**MM3MN2 Management Studies 2**

This is a compulsory module for Mechanical Engineering students. Students from other courses and faculties, seeking a good understanding of a wide range of management topics, will find this module to be useful.

**N11440 Entrepreneurship and Business**

The course presents a formal analysis of entrepreneurship in theory and practice leading on to a consideration of creativity and business concept generation. The course concludes with the practical application of these theories and concepts in business planning and business concept presentation.

**N12105 Introduction to Marketing A**

Lecture topics include: What is Marketing?, Strategic Marketing Planning, Buyer Behaviour, Marketing Research, Segmentation, Targeting and Positioning, Managing Products, Pricing, Marketing Channels, Marketing Communications, Services Marketing

**N12814 Introduction to Business Operations**

The scope and importance of operations management in both service and manufacturing businesses. IT and Knowledge management to support operations. Competitive operations; strategies for success in manufacturing operations, the links with other business functions. Planning the provision; forecasting and planning, including location and layout of facilities, in the context of the globalised economy, and infrastructure development. Managing the supply chain; competitive advantage through the supply chain, models of the extended and virtual enterprise. Logistics and distribution issues. Timely provision of products and services; methods and techniques used to schedule and control business and manufacturing operations, including inventory and materials management. Achieving quality and freedom from waste; quality management, improvement techniques, cultural issues, measurement of quality performance, service quality. The content will be explored using a variety of management games.
N12412 Marketing Management

This module is designed to focus on the strategic and operational aspects of marketing management. It will examine: understanding the marketing concept; the role of marketing within business and its contribution to business performance and enhancing value; developing marketing strategy; segmentation, targeting and positioning; managing the marketing mix; and planning and implementation.

N11413 Introduction to Management Accounting

This module will introduce students to the use of accounting information for managerial planning, decision-making, and control within an organisation.

N12403 Financial Management

The module will introduce students to the corporate investment and financing decision as well as the interaction between the investment and financing decision.

UNSW Courses

GENC6007 Marketing in Today's Society

Marketing plays an important role in today’s society. Yet most people are only vaguely aware of just what marketing is. This course sets out to give you a better understanding of the basic concepts of marketing, how consumers such as yourself make decisions, how organisations make sense of their markets and what choices organizations make about the delivery of products and services in order to meet the needs of their customers.

The course is designed to give you a contemporary view of marketing by exploring current issues such as marketing to children and the impact of the internet, and by drawing on examples from a range of different organisations; Fast Moving Consumer Goods (FMCG), government through to charities i.e. Not for Profit Organisations (NFP).

GENL0230 Law in the Information Age

This course will give students an overview of the operation of new media and communications services under Australian law, examining both the legal requirements and the policy reasoning behind the way in which media and communications are regulated. It will cover five broad areas:

1. How laws are made, changed, interpreted and enforced, with cybercrime among the examples
2. Laws governing licensing, ownership and control of telecommunications, radiocommunications and broadcasting enterprises, and whether these laws are appropriate and effective to deal with new technologies and services;
3. Electronic commerce and what it means for business, consumers and the community;
4. Restrictions on media and online content, including classification and censorship, and regulation of content; and
5. Protecting intellectual property and reputation, covering copyright, trademarks, and defamation.

GENC7003 Managing Your Business

Business management is the science of managing scarce resources, change and competitive forces in deregulated environment. Within this context the law has emerged as a key player in helping, guiding and prohibiting the behaviour of managers in small to medium businesses. The course examines the regime of laws and regulations, institutions and authorities that govern the function and performance of management in small and large business entities in Australia and internationally. The topics covered include: rights and obligations attached to property; dealing with suppliers, employees and subcontractors; developing legal financial models and business plans and undertaking legal and compliance audits and continuing governance reviews that provide focus to the business entities. The course will provide a substantial range of analytical research and practical skills to empower students to undertake the responsibilities of the contemporary manager.

GENT0708 International Governance in the Twenty-First Century

Examines key global issues confronting us as world citizens today, such as managing or eliminating nuclear weapons, restricting greenhouse gas emissions, and combating international terrorism. Explores the mechanisms of global governance through which such issues may be addressed. We skim through the history of international governance, and the growth of international law and international organizations up to the present, with particular attention to the European Union. We then look forward to future developments in the coming century, including possible regional organizations in the Asia-Pacific, and the slow evolution of a world federation.

GENC7002 Getting Into Business

This course examines how to set up, manage and develop a business within the limits of the law. The law regulates and provides protection and value to every aspect of the business and its activities. In a step by step method, using case studies, students will be exposed to the ideas and concepts which make up the ingredients of a successful business. Identifying the business opportunity; developing the concept; setting up the vehicle to conduct the business, securing premises; equipment and employees; dealing with creditors, suppliers customers and the government; and protecting the assets of the business are all covered in this course.
GENC6004 Introduction to Corporate Risk Management

This course provides students with an overview of corporate risk management that includes classifying, measuring and managing various types of risks. Topics include financial risk, operational risk, technological risk, sovereign risk, environmental risk, legal risk.

KU LEUVEN Courses

T2MANE Management II: Marketing and Financial Management / Management Game  2

Learning outcomes
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I5: Entrepreneurship
P1: To operationalize
G1: Information gathering and processing
G2: Communication with engineers and non-engineers

Lecture "Marketing and Financial Management" A lot of freshly graduated engineers get a job in enterprises or consulting companies. Marketing plays an essential role here. As a consequence, it is of primary importance that engineers have a good insight into the basics of Marketing Management. The main objective of the Financial Management part is to give the student the necessary insights into the most important topics of financial management, and this to such an extent that he/she can understand and interpret financial information and make the appropriate decisions and management reports in his/her function as an engineer. Learning experience "Management Game" The Management Game tries to give the students on the one hand an insight into the different functional domains of a company and on the other hand how these are linked to each other. Soon there will be an English version of the course goals. A lot of freshly graduated engineers get a job in enterprises or consulting companies. Marketing plays an essential role here. As a consequence, it is of primary importance that engineers have a good insight into the basics of Marketing Management. The main objective of the Financial Management part is to give the student the necessary insights into the most important topics of financial management, and this to such an extent that he/she can understand and interpret financial information and make the appropriate decisions and management reports in his/her function as an engineer.

T3MGME Management III: Operations and Project Management  2

Learning outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I3: Application-oriented research
I4: Ethical behavior
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical thinking
G4: Working in a team in different roles
G5: Professionalism

Explanation: At the end of the course, the aim is to enable the students, to reflect a critical attitude towards the knowledge and the importance of operations management in solving both business and engineering related problems. (K1,G1,G2, G3,G4), to develop knowledge on construction and improvement layout methods, to apply different layout techniques in designing a new layout, to develop research oriented thinking on the kinds of layouts necessary in different scenarios of production and service businesses. (K1,I3,G1,G2,G3,G4), to develop insights into the methodological and theoretical foundations on operations scheduling problems, the ability to apply different operations scheduling techniques in solving different kinds of scheduling related problems. To apply line balancing techniques in balancing a production line. (K1, I1, I3, G1,G2,G3,G4),

to identify and define different investment analysis methods for different investment situations both in manufacturing and in general. To apply the investment analysis techniques for any investment proposal and assess their operational and financial viability. (K1, I1, G1,G2,G3,G4), to identify and apply necessary analytical techniques such as CPM and PERT that help to design, manage and control any project in terms of completion time and the associated costs. (K1, I1, G1,G2,G3,G4), to identify the research importance of supply chain management and its application in the management of materials such as raw materials, work in process inventory and finished good with respect to their costs and service to the customers. (K1, I1, G1,G2,G3,G4),
to acquire knowledge on theories behind managing inventory problems, to apply inventory management techniques both for goods having certain demand and uncertain demand. (K1, I1, G1,G2,G3,G4), to develop and design different production planning techniques such as MRP and JIT for different materials, given their demand characteristics. To reflect on MRP and JIT developments in software packages such as ERP and their inventory management principles in managing materials in real life. (K1, I1, I3, G1,G2,G3,G4)

T2COME Communication II: Scientific Writing / Intercultural Communication

Learning outcomes:
(G2) Communication with engineers and non-engineers
(G3) Critical thinking
(G5) Professionalism
(I1) Problem analysis and solving
(I4) Ethical behavior

Explanation: Communication II is comprised of two subcourses (OLA’s)

The premise behind the first course is that a first-rate engineer should be able to make his scientific insights and technological knowledge easily accessible to different sorts of audiences. Specifically, such an engineer should be able to do so in different sorts of texts, even for readers who have little or no scientific or technological background. Such a communicative
context requires that the engineer adapt the mode of expression to the expectations of his or her audience, to the sort of text that is called for, and to the circumstances in which the text (verbal or written) is produced and delivered.

In order to develop this area of competence, the course Scientific Writing aims to do the following:

1) Ensure that students understand the process of scientific writing in detail, as well as giving them experience in its undertaking; (G2, I4)

2) Enable students to pose scientific and technological problems and to propose hypotheses, methodological approaches, and designs in function of the latter (I4, G3), in a logical and well-structured format (G2, G3), in accurate and perspicuous language (G2).

3) Teach students how to communicate with regard to science and technology, with particular attention given to appropriate and well-researched references to secondary literature and related research publications (G1, G3), and the adaptation of the scientific-technological content to prospective audiences (I4, G3).

In the second course of Communication II, namely Intercultural Communication, the aims are the following:

(1) Making students sensitive to cultures and their various forms, roles, and meanings and making them aware of the sources for these different functions of culture, such that they themselves can judge how best to interact with individuals sharing various cultures and how best to institute flourishing intercultural interaction (G2, G3, I1, G4, G5).

(2) Teaching students to observe important cultural phenomena so that they are able to communicate and cooperate successfully with persons belonging to and sharing various other cultures (G2, G3, I1, G4, G5).

(3) Allowing students to gain experience in how they have to prepare for living and working in a multicultural environment. (G2, G3, I1, G4, G5)

This course will contribute to your effectiveness in personal intercultural communication as well as to your professional growth as an engineer in a diverse and globalizing environment. We aim to bring you to an Intermediate Level of intercultural competence as defined in the INCA Framework and the Global People Competency Framework. To this end, you will engage in a variety of investigative assignments and communication activities where you will be challenged to prepare and reflect as (prospective) exchange students, in line with IEREST, an ongoing EU research project on student mobility and intercultural learning objectives and preparedness. You will be expected to demonstrate English proficiency at a Strong Threshold Level (B2) in accordance with the Common European Framework of Reference (CEFR).

T3COME Communication III: Negotiation and Meeting Skills / Persuasion

Negotiation & Meeting Skills

You are able to prepare and to conduct effective, amicable and efficient negotiations. You have gained an insight into the method of ‘principled negotiation’ and you are able to apply
these principles in case analyses and in simulations. You have sufficient assertiveness to communicate adequately in a variety of negotiation situations. (I1, G1, G2, G3, G5)
You are able to apply all of the abovementioned communication techniques at the Vantage level (B2+) as defined by the Common European Framework of Reference for Languages. This means that you: "Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialization. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can formulate ideas and opinions with precision and relate his/her contribution skillfully to those of other speakers. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options." (G1, G2), Persuasion, You are able to distinguish different types of customers and to offer them corresponding products or services (K1, I1, G1, G2, G5).
You are able to approach a customer in a personal and customer-focused way in the two following sales situations, and conduct a structured sales conversation: (a) 'vente ajustée', where the customer experiences a need and takes the initiative to contact a seller; and (b) 'vente persuasive', where the seller looks for a potential customer and convinces him that the offered product or service satisfies a need of which the customer was not aware. (K1, I1, G1, G2, G5).
You can perform these activities as an 'independent user' on the Threshold level (B1 +), as it was defined in the Common European Framework of Reference for Languages. Regarding to understanding, this means the following: "Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. Can produce simple connected texts on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans. Can narrate a story or relate the plot of a book or film and describe my reactions. Can deal with most situations likely to arise whilst traveling in an area where the given language is spoken. I can enter unprepared into conversation on topics that are familiar, or that have my personal interest or that concern everyday life (e.g. family, hobbies, work, travel and current happenings)." (G1, G2)

A07M9A Religions

This course fits into the vision of Group T that engineers have a higher purpose: to develop people and to improve conditions for humankind. In order to reach this goal students need to have a holistic vision on engineering and they have to become aware of the interplay between technology and society. Moreover, the engineer of the future will be situated in a globalised world in which he/she will have to live, work and interact with people of many different cultures and religious traditions. Religions have a major impact on how people feel and behave and on what they consider important in their lives. As such, it is also an important factor in how they will respond to new technologies. Moreover, technology as such raises important religious and spiritual issues. This course on Religions wishes to help students in engineering technology understand the impact
of religions on the daily life of people and their willingness to adopt new technologies. It also wishes to confront them with a plurality of religious perspectives on science, technology and sustainability, and show them how technology challenges religion. Furthermore, the course also intends to help students clarify their own stance vis-à-vis religion and how religious traditions may inspire them in deepening and formulating their call as engineers in the society of the future.

Learning Outcomes: G2: Communication with engineers and non-engineers, G3: Critical thinking

Aims: Students are able to indicate the core elements of a number of the major religions, with a special focus on those elements that will be important for their future interaction with adherents of these religions (G3), Students are able to assess how religious views and sensibilities may impact the adoption and success of new technologies (G3), Students are able to tell about the diversity of views and perspectives on science, technology and sustainability that exist among and within the religions (G3), Students are able to identify religious and spiritual issues raised by technology, to explain how technology challenges the religions and to formulate answers to the question of what religion in dialogue with technology teach us about what it means to be human (G3) Students are able to reflect on religious and spiritual issues in the context of their field of study, they are able to take a stance on these matters in a substantiated way, and to enter into dialogue with fellow students on them (G2, G3), Students are able to explain how they are challenged by a confrontation with a number of the major religious traditions (G3), Students are able to indicate the importance of religion and world views, also in connection with their own life, and they are able to reflect critically on their own ideological prejudices and presuppositions (G3), Students are able to explain their responsibility and their call as engineers in the society of the future, and they are able to clarify in which way religious traditions inspire them when doing this (G3)

RMIT Courses

ACCT1046 Accounting in Organisations and Society 3

Accounting is a key aspect of your life. In this course you will gain insights into the meaning and role of accounting and of accountants in the larger context of a changing and interconnected world of people, organisations and the changing planet upon which we live. You will develop an understanding of key ideas or concepts which you will reflect upon and appreciate that accounting goes beyond the technical aspects to recognise its strong influence in organisations and society. The course structure, content and learning activities provide you with an understanding of accounting’s pervasive and transformative role as a social practice and organisational driver. You will learn that environments, ideas, values and so forth change; that the world is interconnected; that the planet is a key resource; and that people are affected and influenced by the information they receive and the way it is presented.

ACCT1014 Accounting, Behaviour and Organisations 3

Accounting Behaviour and Organisations provides you with an opportunity to further your understanding of the management accounting tools and techniques taught in previous
management accounting courses. In this course you will explore the use of these tools to design formal Management Accounting Systems in different organisational contexts. The course adopts the perspective of accounting as a social practice; therefore there is a strong emphasis on the behaviours that management accounting systems can encourage. The course also examines the relevance of business strategy and organisational structure to the design management accounting systems. Particular emphasis is given to the role of performance-based measures and rewards within contemporary management accounting systems, and the behaviours these factors may encourage.

**MKTG1069 Advanced Marketing Concepts and Applications**

This course builds on concepts introduced in Marketing Principles, as well as introducing additional concepts related to contemporary issues in marketing. Furthermore, it incorporates skills acquired in the first year business courses into the marketing decision making process. This course seeks to provide you with an understanding of, and experience in, the application of selected marketing concepts. In doing so, you will gain skills related to the use of analytical tools in marketing management and their application and limitations in commercial settings. Further, you will gain skills in developing marketing initiatives based on an analysis of the company and business environment. Finally, you will develop an understanding of contemporary issues in marketing.

**HUSO1081 Asian Economic Development**

At the conclusion of this subject, you should have a good understanding of:
- the nature of economic development in East Asia
- the role of various policies in the economic development of East Asia

At the conclusion of this subject, you should have a good understanding of:
- some important economic problems in East Asia and the lessons therefrom
- the problem of economic integration in the Asia-Pacific region
- the implications of the East Asian economic development and of its problems for the Australian economy.

**MKTG1065 B2B Marketing**

In this course you will develop the knowledge and skills to explore the specialized nature of business-to-business marketing, and develop an understanding of the differences between business marketing and consumer marketing. The general principles of marketing continue to apply to business and industrial marketing. However, specific theories of organizational buying behaviour, relationship marketing and purchasing and B2B networks will be examined and applied using a mix of work-based learning and academic learning to allow you to solve authentic business problems or address real issues faced in organisations. Supply chains, marketing strategies and the business marketing mix will be examined in detail. Case studies and examples will be used to illustrate the application of marketing principles in business to business environments. This course includes a
Work Integrated Learning (WIL) experience in which your knowledge and skills will be applied and assessed in a real or simulated workplace context and where feedback from industry and/or community is integral to your experience.

**MKTG1086 Business Ethics**

In this course you will explore and discuss basic ethical theory and its practical application by analyzing a wide selection of classical and contemporary approaches to applied ethics. You will also explore the relationship between ethics and our society including the implications and consequences on business practice, the media, the environment, and elsewhere in the marketplace, and its implications for customers, employees and managers.

**BAFI1008 Business Finance**

The theory of finance stems from the broad area of applied economics. Over the past thirty or so years extensive research and theoretical developments have resulted in the emergence of this discipline as a science in its own right. Today, the theory of finance is a field that equips the individual with techniques and skills that ensure the objective analysis and evaluation of alternatives, resulting in effective financial decision-making. These techniques and skills are applicable in a number of sectors of our economy, namely financial markets (including financial products such as derivative instruments), financial institutions and the financial management of companies. The theory of finance plays a significant role in the area of business, or corporate, finance. The effective financial management of firms, large or small, private or publicly listed, is paramount for the wellbeing of any economy. However, not only does its importance lie in its benefit to the economy as a whole, but it is vital that financial managers are capable of developing sound financial policies for the benefit of the firm itself and its owners, the shareholders. Financial managers must have a sound framework that will provide the analytical tools to competently evaluate alternatives and make objective decisions both in the short term and in the long term. Investment options and financing choices must be analysed and assessed using techniques that have a solid theoretical base. Business Finance provides an introduction to the fundamental concepts of finance and the key skills required for good financial management of corporations and companies, as well as for personal financial management. It introduces financial concepts and issues that provide the necessary guidelines to solve many corporate finance problems and covers some of the important theories in modern finance to provide a substantial grounding in the discipline, including in preparing students for more advanced studies in finance. Business Finance is a second year course and consequently is taught on the assumption that students have an understanding of the basic concepts, principles and analytic techniques found in the introductory courses in the fields of statistics and microeconomics.
LAW2442 Commercial Law

The course provides an introduction to commercial law fundamentals relevant to business professions. The course provides you with the knowledge and skills necessary to pursue further and more specific studies in the law discipline. The course is taught through weekly lectures and tutorials in which you will examine and apply law principles related to negligence, contract law, the Australian Consumer Law and business structures. Commercial Law is a compulsory core course in the Bachelor of Business.

BUSM4550 Creativity, Innovation and Design

This course presents contemporary views of creativity, innovation and design and their importance within organisations and business that are increasingly characterised by risk and uncertainty. You will examine the need to manage these activities through the application of theory and the introduction of practices and processes to achieve sustainable competitive advantage. You will also explore the innovation imperative, creative problem solving approaches, design thinking, innovation process management, and innovation performance measurement.

2. Engineering Major Courses

2.1 Course Courses

2.1.1 Basic Sciences and Mathematics

SC133 Physics for Engineers I

Motion, force, gravity, work and energy, collisions, rotational motion, bodies in equilibrium, elastic and fractures, fluids, vibrations and waves, sound and applications, heat and the kinetic theory, the first and the second laws of thermodynamics.

SC134 Physics for Engineers II

Prerequisite: Have taken SC 133

Electric charge and electric fields, Gauss’ law, electric potential, capacitance, dielectrics, electric current, DC circuits and devices, magnets and electromagnets, magnetic induction and Faraday’s law, inductors, AC circuits, electromagnetic theory and applications, light, lenses and optical instruments, reflection, refraction, diffraction, interference and polarization, modern physics.

SC183 Physics for Engineers Laboratory I

Laboratory practices involving measurement and errors, force and motion, energy, momentum, waves and heat.

SC184 Physics for Engineers Laboratory II

Laboratory practices involving electromagnetic fields, electric circuits and instruments, optics and modern physics.
MA111  Fundamentals of Calculus  3(3-0-6)
Mathematical induction, number systems and elementary functions, calculus of one variable functions, limit, continuity, the derivative and its applications, antiderivatives, techniques of integrations and its applications, improper integrals, series, Taylor’s Theorem for basic functions, numerical integration.

Note: There is no credit for students who are currently taking or have earned credits of MA 211 or MA216 or MA218 or AM101

MA112  Analytic Geometry and Applied Calculus  3(3-0-6)
Prerequisite: Have earned credits of MA111
Analytic geometry, polar coordinates, vector algebra in three dimensional space, line, plane and surface in three dimensional space, limit, continuity derivative and integral of vector valued functions, calculus of real-valued functions of several variables and theirs applications, introduction to line integrals, surface integrals, Gauss’s Theorem, Green’s Theorem and Stokes’ Theorem, Fourier and Laplace analysis and theirs applications.

MA214  Differential Equations  3(3-0-6)
Prerequisite: Have earned credits of MA112 or MA219

2.1.2  Basic Engineering

ME100  Engineering Graphics  3(2-3-4)

CE100  Ethics for Engineers  0(0-0-0)
Ethical issues relevant to the engineering profession. Potential impact of technology transfers and implementation with respect to society and its members. Potential problems that may arise are studied along with possible ways to prevent them from occurring and ways to deal with them once they occur. Grading is in S or U.

CE101  Introduction to Engineering Profession  1(1-0-2)
Engineering profession, Roles and responsibilities of Engineers, Engineering fields, Curriculum and courses in engineering, Basic science and engineering subjects, Responsibility and
ethics for engineers, Engineering communication, Information technology in engineering, Problem solving in engineering, Importance of testing, experimentation, and presentation, Basic law for engineers, Engineering safety, Engineering and society, Engineering and environment, Engineering and technology development, Computers in engineering, Basic knowledge and practice in tool and machine, Manufacturing process, Usage of measurement tool in industrial work.

IE121 Engineering Materials I 3 (3-0-6)

Relationship between structures, properties, production processes, and applications of main groups of engineering materials i.e., metals, polymers, ceramic and composites; phase equilibrium diagrams, mechanical properties, and materials degradation.

2.2 Major Courses

2.2.1 Compulsory Courses

Mechanical Engineering Compulsory

ME200 Mechanical Drawing 2(1-3-2)

Prerequisite: Have earned credits of ME100


ME210 Mechanics of Materials 3(3-0-6)

Prerequisite: Have earned credits of CE202 (Students in Automotive engineering program and Vehicle technology engineering program must have earned credits of ME291)

Forces and stresses, Review of engineering materials, Stresses and strains relationship, Stresses in beams, Shear force and bending moment diagrams, Deflection of beams, Torsion, Buckling of columns, Stresses in pressure vessels, Mohr’s circle and combined stresses, Statically indeterminate systems, Hooke’s law, Strain energy, Failure criterion, Introduction to finite elements, Stress measurement.

ME220 Engineering Mechanics – Dynamics 3(3-0-6)

Prerequisite: Have earned credits of CE202

Reviews of basic principles governing the laws of motion, Kinematics of particles and rigid bodies, Displacement, velocity, and acceleration, Absolute and relative motion, Kinetics of particles and rigid bodies, Newton’s second law of motion, Force mass and acceleration, Work and energy, Impulse and momentum, Centripetal motion, Introduction to vibration.
ME230  Fundamental of Thermodynamics  3(3-0-6)
Prerequisite: Have earned credits of SC133 (Students in Vehicle technology
engineering program must have earned credits of SC135)
Properties of pure substances. Equation of state for ideal and real gas. Thermodynamics

ME240  Mechanics of Fluids  3(3-0-6)
Prerequisite: Have earned credits of SC133 (Students in Vehicle technology
engineering program must have earned credits of SC135)
Angular momentum equation and its application to turbo machinery. Kinematics of incompressible
and non-viscous fluid flow. Finite control volume and differential analysis. Dimensional analysis
Introduction to boundary layer theory. Introduction to turbulent flow.

ME310  Mechanical Design  3(3-0-6)
Prerequisite: Have earned credits of ME210
Principles and significance of design. Design philosophy and methods. Factors affecting
machine elements i.e. spring, power screws, joints, shafts, keys, flywheels, couplings, etc.
Introduction to computer aided design and engineering.

ME322  Mechanical Vibrations  3(3-0-6)
Prerequisite: Have earned credits of ME220 or ME291 and MA 214
The behavior of lumped systems with single degrees of freedom. Torsional vibration. Free
and forced vibration. Method of equivalent systems. Natural frequency and damping effects.
Principles of vibration isolation and vibration measuring instruments. Lumpred systems with two
degrees of freedom: natural frequencies, modes, and mode shapes. Principle of dynamics vibration
absorbers. Lumpred systems with several degrees of freedom. Whirling of shafts. Introduction to
distributed parameter systems. Methods and techniques to reduce and control vibration.
Introduction to non-linear systems. Introduction to numerical solution of vibration problems.

Non – Mechanical Compulsory

MA131  Applied Linear Algebra  3(3-0-6)
Prerequisite: -
Theorems of matrices, Hermitian matrices and unitary matrices, LU-fractorization, vector
spaces, linear independence, dimensions, rank of matrices, applications of matrices for solving
systems of linear equations, inverse of matrices, determinant, Cramer’s Rule, linear transformations, inner product space, orthogonal complement and least square, eigenvalues and its application, diagonalization of matrices, basic concepts of tensor.

**CE202 Engineering Mechanics – Statics**

Prerequisite: Have earned credits of SC 133

Force System, Newton’s law of motion, Resultant; Equilibrium of forces and moments; Centroid, Center of mass, Center of gravity; Theorems of Pappus; Moment of inertia of an area; Application of equilibrium equations for structures and machines; Beams, Introduction to bending moment and shear; Friction; Virtual work; Introduction to dynamics.

**LE203 Introduction to Electrical Engineering Laboratory**

Prerequisite: Have earned credits or taking LE209 in the same semester

This course focuses on practicing skills in basic electrical engineering. Learn how to use equipments and some electrical elements. Connect some electrical circuits. Identify, analyze and solve some basic problems in electrical circuits and electronics. Learn how to use basic circuit and electronic software.

(This course for students in Mechanical, Chemical, and Industrial Engineering)

**LE209 Introduction to Electrical Engineering**

Prerequisite:

Basic D.C. and A.C. circuit analysis; voltage; current and power; transformers; introduction to electrical machinery; generators, motors and their uses; concepts of three-phase system; method of power transmission; introduction to some basic electrical instruments.

(This course for students in Mechanical, Chemical, and Industrial Engineering)

**IE251 Manufacturing Processes for Mechanical Engineering**

Prerequisite:


**IE252 Engineering Tools and Operations Laboratory**

Prerequisite:

Workshop in basic metal working processes such as bench work, sheet metal working, welding, shaping, turning, milling and grinding. Measurement tools such as vernier caliper, micrometer, etc. Safety principles in workshop operations. Basic maintenance of machine tools.
IE261  Engineering Statistics  
Prerequisite: -

2.2.2 Technical Electives

NU Courses
MM3ADM Advanced Dynamics of Machines  3
This module covers advanced concepts and analytical techniques used to analyse the dynamics of mechanical systems. Topics covered include:
Lagrange's equation
  - Applying Lagrange's equation to derive the governing equations of motion of dynamical systems
  - Discrete mass, spring and damper systems, including single and multi-degree of freedom systems
  - Continuous systems
  - Linearising equations of motion
  - Three-dimensional rigid body dynamics
  - Using vector mechanics to understand the dynamical behaviour of rigid body systems moving in three-dimensional spaces
  - Various engineering applications are considered, including gyroscopic sensors
  - Moving (translating and rotating) reference frames
  - Absolute velocity and acceleration of a particle
  - Angular momentum
  - Torque equations
  - Momentum equations
  - Euler dynamical equations
  - High speed rotating machinery
  - Applying methods of 3D rigid body dynamics to understand the dynamical behaviour of rotating machinery
  - Case studies considered include analysing the influence of bearing and shaft asymmetry and different damping mechanisms on the whirl motion and stability of rotating machines

MM2DM2 Design and Manufacture 2  6
This is a continuation module about Mechanical Design Principles and Methods. The methodology available for design is described and further machine elements are introduced and
analysed. Practical experience of the design process is obtained through design assignments and a group design-and-make project.

**MM3CAI Control and Instrumentation**  
3  
This module covers the basic techniques for the analysis and development of simple control systems with an emphasis on their application to mechanical and process systems. The module covers theoretical methods and hardware considerations in the analysis and design of open-loop and closed-loop systems, including: Routh-Hurwitz criteria and Root Locus methods frequency response methods, polar plots, Nichols charts, Nyquist stability criterion, stability margins PID controllers and other series compensators (1st & 2nd order) identifying systems from swept-sine test outcomes an introduction to computer control and sampled data systems, analogue/digital conversion and sensors/transducers.

**MM3SV2 Structural Vibration 2**  
3  
The module covers advanced concepts and analytical techniques used in structural vibration applications. These include: Vibration response of complex structures, modern vibration measurement methods and experimental modal analysis techniques. A number of engineering case studies are presented.

**MM2TF2 Thermodynamics & Fluid Mechanics 2**  
6  
An intermediate module in thermodynamics and fluid mechanics applicable to a wide range of engineering practice, including basic equations for thermo-fluid flows laminar and turbulent boundary layers heat exchangers thermal mixtures and combustion dimensional analysis and similarity condensable vapour cycles compressible flow pumps and compressors heat transfer refrigeration and air conditioning.

**MM3CAE Computer Aided Engineering**  
3  
This module includes further development of modelling and analysis techniques within CAE (currently Creo) introduced in MM1DM1 and MM2DM2 to enable the student to create, display and analyse complex forms and assemblies. Various elements of CAE will be covered including, solid & surface modelling, rendering and analysis. Review of the CAE software and industry.

**MM3EM2 Energy Efficiency for Sustainability 2**  
3  
Patterns of energy use in UK and globally; fossil fuel resources. Renewable energy resources and technology and applications in UK. Sources and control of pollution from combustion of fuels. Global warming: causes, impact and measures to combat it. 2nd Law of thermodynamics: - Entropy, reversibility, efficiency of energy conversion processes and application to practical machines and systems. Heat Exchangers: - Application of thermodynamics to heat exchangers for energy recovery. Heat exchanger types, heat recovery systems and analysis. Heating and Cooling in Buildings:

**MM4ICE Internal Combustion Engines**

Design features, function and layout, Performance, efficiency and energy flows, Fuel delivery and gas exchange processes, Combustion, heat release and work transfer, Coolant system and heat rejection, Lubrication system and friction, Aftertreatment system, emissions and test regulations

**MM4SET Surface Engineering Technology**

This module highlights the benefits of surface engineering before introducing the main surface engineering processes. These processes are classified into two categories, namely surface modification, and film/coating technologies. The most common processing methods are presented, along with some state-of-the-art development. These include surface treatment (e.g. induction hardening, laser surface hardening, and ion implantation, etc.), surface thermochemical processes (e.g. carburising, and nitriding, etc.), as well as surface coating processes: electrodeposition and electroless plating, thermal spraying, diffusion coatings, and vapour phase deposition (e.g. CVD and PVD). The selection criteria and applicability of each processing method are discussed. The lectures give an in-depth explanation of the process principle for each processing method. Case studies of surface engineering technology in different industrial applications are conducted.

**MM3MEC Mechatronics**

This module exploits the LabView interfacing environment and associated hardware to introduce the use of digital computers for signal acquisition from test equipment and the control of electro-mechanical systems. It includes the study of computer architecture, real-time computing issues, analogue and digital interfaces, programming techniques, sensors and electro-mechanical actuators in order to implement tasks such as data capture and analysis and motion control. Specifically the module will be in four parts: Part 1: Computer architecture; FPGAs vs. microprocessors. Digital input and output; timer-counters. Part 2: Real-time programming: the LabView programming language, concurrency, latency. Program structure – state tables. Part 3: A/D and D/A conversion, multiplexers, aliasing, settling time. Part 4: Sensors, transducers and actuators:
overview and revision of 1st year material. System integration using LabView. Motion control using NI hardware.

HG2M13 Differential Equations and Calculus for Engineers

The majority of the module is concerned with providing techniques for solving selected classes of ordinary differential equations (ODEs) relevant to the analysis of engineering topics. This module also provides the basic calculus to help analyse engineering problems in two- or three-dimensions and special solutions of partial differential equations relevant to engineering applications. The module will cover: Multiple integrals; Fourier series and Periodic Functions; Homogeneous (revision) and inhomogeneous second-order ODEs; Systems of ODEs; Application of Fourier Series; Laplace transform; Separation of Variable Technique for PDEs.

MM2MID Materials in Design

This module seeks to develop an understanding of materials in design across a wide range of engineering applications. The module is arranged in blocks covering designing with light alloys, designing with polymers, designing with composites and designing with functional materials. Each block will explore the design requirements in detail of a particular case study followed by other examples, key material properties relevant to the engineering application, manipulation of the microstructure through processing and example calculations against failure of the product/component. Consideration will be given to materials attributes, engineering context, manufacturing processes and environmental impact. Taken as a whole the blocks build up a portfolio of applications, materials properties, processing and principles that the students can draw upon when tackling new designs. Case studies are an increasingly popular form of teaching and have an important role in developing skills and knowledge. Student-centred activities are based around topics that demonstrate theoretical concepts in an applied setting.

MM2DYN Dynamics

Dynamics: Rigid body kinematics and dynamics in planar motion, planar mechanisms, velocity and acceleration diagrams. Structural vibration: Free and forced vibration of damped single degree of freedom structures, vibration isolation, free vibration of multi-degree of freedom structures, experimental modal analysis, shaft whirl and beam vibration. Control: Representation and analysis of simple control systems, PID control, stability of feedback systems.

MM2MS2 Mechanics of Solids 2

Analysis methods applicable to engineering design including: Combined loading, thermal stress and strain, yield criteria, elastic-plastic deformations including yield in beams and shafts, residual stresses, fatigue and fracture, direct stiffness method/finite element analysis. Case studies are presented to relate topics covered in the module to actual design situations. Practical application is taught through design exercises.
MM2MS3 Mechanics of Solids 3

Analysis methods applicable to engineering design including: Combined loading, thermal stress and strain, yield criteria, elastic-plastic deformations, fatigue and fracture and finite element method. Case studies are presented to relate topics covered in the module to actual design situations. Practical application is taught through laboratory and/or design exercises.

MM3BPR Individual Project

The project aims to give experience in the practice of engineering and scientific approaches at a professional level. It involves the planning, execution and reporting of a programme of work which will normally involve a mixture of experimental, and/or theoretical and and/or computational work together with a detailed review of relevant previous work in the field. The detailed content and project balance relating to the experimental/theoretical/computational work is a matter for discussion between the student and his/her supervisor, factoring in the students course.

MM3CMT Computer Modelling Techniques

Introduction to numerical methods in engineering, Finite Element analysis of structures, pin-jointed elements, Computational Fluid Dynamics (CFD) for thermo-fluids problem.

MM3DES Group Design Project

The project involves 3 or 4 students working as a team to design a product from initial concept to fully engineered drawings. Starting from a design brief prepared by the supervisor, the group will be required to devise and evaluate alternative design concepts, undertake the detailed engineering analysis and mechanical design, select suitable materials and methods of manufacture and assess costs and the marketability of the product.

MM3HTR Heat Transfer

An advanced module covering heat transfer theory and applications including:
- Conduction heat transfer - thermal conductivity, thermal resistance networks. Analytical and numerical solutions for one- and two-dimensional steady-state conduction and for one-dimensional transient and unsteady conduction.
- Convection heat transfer - general concepts and phenomena, velocity and thermal boundary layers, Reynolds analogy, use of experimental correlations for internal and external flows, enhancement techniques for convective heat transfer.
- Introduction to boiling and condensation heat transfer
- Radiation heat transfer - black body emission, emissivity, absorptivity, transmissivity, Kirchhoff's law, black body radiation heat transfer, view factors, grey body radiation exchange, radiation networks.
- Introduction to mass transfer
• Case studies including problems involving combined modes of heat transfer, use of resistance networks for steady and unsteady heat transfer calculations.

**MM3SAT Stress Analysis Techniques**


**UNSW Courses**

**MMAN2300 Engineering Mechanics 2**

This course covers the practical application of engineering mechanics and mechanical vibrations. Topics include the following: Plane kinematics and kinetics of rigid bodies; equations of motion, work and energy, impulse and momentum; Introduction to mechanical vibration; Free and forced responses of single degree-of-freedom spring-mass-damper systems, vibration isolation; Harmonic analysis; Vibration measuring instruments; Linear vibrations of multi-degree-of-freedom systems; Analysis of continuous systems, wave equation, transverse vibration of strings, longitudinal/torsional vibration of bars and rods; Gear kinematics, involute profile and involute action; Gear trains, epicyclic gears.

**MECH3110 Mechanical Design 1**

Mathematical modelling for design applications, force flow through components and assemblies. Belt and chain drive design; Rolling element bearing selection; Dynamically-loaded bolted connections and welded-joint design; shaft design.

**MECH3540 Computational Engineering**

Applications of computational techniques and commercial packages in engineering analysis, covering the following. Finite element analysis: Finite elements in one dimension; element matrices, assembly and solution for rods and beams. Application of a commercial finite element system to problems in two and three dimensions. Interfaces with CAD systems, strategies for modelling, choice of elements, interpreting the solution, accuracy and convergence. Applications will include linear and nonlinear analysis and time dependent problems including introduction to vibrations of simple beams. Computational Fluid Dynamics: Basic concepts in CFD, pre-processing and grid development, structured and unstructured grids, validation and verification, introduction to solution methods and turbulence modelling. Application of a commercial CFD package to heat and fluid flow problems.
MECH3610 Advanced Thermofluids


MMAN3200 Linear Systems and Control


MMAN3210 Engineering Experimentation

Scientific method; engineering method; experimental program; report writing; error analysis; principles of transducers; selection of instruments. Dynamic response of instruments; signal processing; digital data acquisition; interfacing transducers to computers; computer control of experiments; smart transducers.

MMAN3400 Mechanics of Solids 2


MECH4100 Mechanical Design 2

Major design projects provided by industries, involving broad engineering/cross-discipline aspects; design approaches including project-based design process, concurrent design,
management of design groups, design for manufacturing, reliability, affordability, and sustainability.
Gear drive design, brake and clutch design, hydraulic system design.

**MECH4320 Engineering Mechanics 3**

Gyroscopic torque. Static and dynamic balancing of rotating and reciprocating mass systems. Kinematics and kinetics of linkage mechanisms, Spatial manipulators, Profile cam-follower systems.

**MMAN4000 Professional Engineering**


**MMAN4010 Thesis A**

To be taken in the second last session required for the completion of all requirements for the award of the degree. This course, together with MMAN4020 Thesis B, which is to be taken in the following session, requires each student to demonstrate managerial, technical and professional skills in planning and executing an approved engineering project within a stipulated time limit. Each student is also required to report on their project work at a thesis conference which is organised under MMAN4000 Professional Engineering. Each student is guided by a supervisor, but successfully planning, executing and reporting on the project is the sole responsibility of each student. Thesis A does not require the submission of a thesis document. A satisfactory grade in this course is provisional pending successful completion of MMAN4020. A nominal 1 HPW has been allocated for student consultation with supervisor. Consultation should be arranged to allow both student and supervisor to regularly monitor the progress of the project.

**MMAN4020 Thesis B**

To be taken in the last session required for the completion of all requirements for the award of the degree, i.e. in the session immediately following that in which MMAN4010 Thesis A is taken. This course, together with MMAN4010 Thesis A, requires each student to demonstrate managerial, technical and professional skills in planning, executing and reporting on an approved engineering project within a stipulated time limit. Each student is also required to report on their project work at a thesis conference which is organised under MMAN4000 Professional Engineering. The project, on which each student works, will be a direct continuation of the project on which that student worked in MMAN4010 Thesis A. Each student is guided by a supervisor, but successfully completing the project, writing the thesis and submitting two bound copies by specified deadlines are the sole responsibility of each student. A nominal 1 HPW has been allocated for student
consultation with supervisor. Consultation should be arranged to allow both student and supervisor to regularly monitor the progress of the project.

MTRN3020 Modelling and Control of Mechatronic Systems

This subject teaches the student how to design and develop a control system in discrete-time domain to be used in motion control systems. Material covered includes; Revision of continuous-time control systems and design tools such as root locus, bode methods and Laplace transforms. Starred Laplace transforms, z-transforms. Discretising continuous-time systems. Stability, speed of response and accuracy. Controller design using; root-locus method, direct and indirect analytical methods and bode methods. Observability, controllability. State estimators and design of observers.

MTRN3100 Robot Design

The course is aimed at developing skills on how to design and build a robot from scratch. Half of the course is lecture-based and deal with the following contents: Introduction to robot design. Mechanisms and dynamics of wheeled and legged robots. Mechanical design of wheeled and legged robots. Calculation of torques and selection of motors. Selection of sensors. Integration of mechatronic systems. Motion planning and control. Design of a robot using CAD. Simulation of a robot using MATLAB/C/C++. In the other half, students will design and build an actual robot using knowledge and skills acquired in the lecture.

MTRN3200 Elements of Mechatronic Systems

Electro-mechanical devices, electro-hydraulic and electro-pneumatic devices and their interfacing, A/D conversions, D/A conversions, sensors for motion control, encoders and decoders, digital circuits for mechatronic systems: Number systems and number theory. Symbolic logic. TTL and CMOS devices. Boolean algebra and simplification of Boolean expressions. Counters, timers and decoders. Interfacing electro-mechanical systems with micro-controllers. Elements of micro-controllers. Principal features of a microprocessor based system, microprocessor architecture and programming. Instruction sets, addressing modes, instruction timing, interrupts. Dedicated and special purpose computers. This course has 50% laboratory content during which each student will receive hands on experience in interfacing and programming of electro-mechanical systems.

MTRN3500 Computing Applications in Mechatronics Systems

This course primarily teaches the student how to write custom software to deal with mechatronic systems as well as to develop user interfaces for such systems. The first part of the course covers; data acquisition systems, programming digital I/O and analogue I/O. Programming timers and developing software to communicate via serial communication and peripheral interfaces. Interfacing via CAN bus. Driving DC and stepper motors through H-bridges. The second
part of the course teaches the student to develop user interfaces with C++. It covers object classes, encapsulation, inheritance, operator and function overloading and virtual functions.

**MTRN4010 Advanced Autonomous Systems**

The course is aimed at learning basic and advanced techniques necessary for sensing and control of autonomous mechatronic systems. Contents covered in this course include stochastic processes, state estimation, Sensor data fusion, nonlinear control, optimal control, stochastic control, behavior-based control, machine learning techniques (genetic algorithms, neural networks, fuzzy logic and reinforcement learning). Half of the course is lecture-based. In the other half, students will program and control autonomous indoor robots.

**MTRN4230 Robotics**

This course is designed to give the student an in depth understanding of manipulative robotics and its uses. It covers the following course material. Automation types, introduction to industrial robotics, end effectors, robot history, populations and main uses, Profitability of robot usage. Robotics simulation. WORKSPACE 5.04 software and its uses. Kinematics of multi-degree-of-freedom systems. Jacobean matrices, Further kinematics and dynamics. Robot trajectories. Anatomy of an industrial robot systems. Biped robotics. Mobile robotics. The Stewart platform and its uses. The Australian Standard. Application in the workplace. Design of installations. The workcell — concepts and design. This course requires the students to take part in site visits and case study presentation. Students are also required to complete a major project on a system integrating WORKSPACE robotic simulation software, an ABB robot and a vision system.

**AERO3110 Aerospace Design**

Aerospace vehicle type; characteristics size and performance. Special constraints in the design of aerospace vehicles. Aerospace regulations; regulating bodies, regulation interpretation and application. Design data sources and quality management and control. Stress sheets. Detail design of typical aircraft structure; thin walled metal, composites and fasteners. Introduction to a typical high level computer aided design tool (CATIA). Vehicle loads; balance, gust and manoeuvre. Semi-monocoque and frame structures; torque boxes and fuselage cut-outs. Spacecraft; structure, power and thermal balance and communications. Aircraft and spacecraft system detail design. Design for manufacture and maintenance.

**AERO3200 Aerospace Systems and Avionics**

AERO3410 Aerospace Structures

Aircraft layout and loads; open and closed thin walled beams; analysis of fuselage and wing structures. Energy methods including unit load method for deflections. Finite elements; element matrices, assembly and solution for rods and beams; application of a commercial finite element system to problems in two and three dimensions. Fibre reinforced composite materials including analysis of uni-directional and multi-directional laminates. Buckling including buckling of columns, flat and curved plates and stiffened panels; buckling under multi-axial loads. Vibration of single-degree of freedom spring-mass-damper systems, free and forced vibration. Thermal stresses.

AERO3630 Aerodynamics


AERO3650 Aerospace Propulsion and Experimentation

Introduction to propulsion systems; history, types, basic thrust, efficiency equations, propellers, rotors and fans. Engine intakes.; subsonic, supersonic, scramjets, ramjets, gas turbines, piston engines, design performance. Rockets, noise, pollution. Future propulsion systems. Further wind tunnel testing and numerical experimentation with computational fluid dynamics.

AERO4110 Aerospace Design Project A Faculty

Self managing project teams are formed to carry out an initial design study within a simulated industrial environment. The teams utilize the resources of the school including computer aided design and manufacturing, wind tunnels, simulation and test facilities. The work is supported by team meetings with the staff involved attending and lectures on advanced project design. Other lectures are provided by experts within the school and externally in specific areas such as aerodynamic, structural design, engine integration and system design. The students must achieve a satisfactory grade in the current year of this course to continue to Aerospace Project Design B.

AERO4120 Aerospace Design Project B

Only students that have satisfactorily completed the current Aerospace Design Project A are eligible for this course. The same teams continue with their design study and produce a team report, they also give a presentation to leading engineer from the industry representing design organizations, manufacturing, maintenance the airlines and regulators. Each student also produces a portfolio of individual work at the end of the course along with an appraisal of the design, team and individual team members. The expert lectures continue during this course.
Electromagnetism as a part of physics is the base of many technical applications, ranging from motors, lighting to telecommunication. A first step in the translation of the physical principles to practical applications is made in this course. The course consists of 2 main parts. In the first part, alternating current/voltage is studied. Subjects, such as the effective value of voltage/current, phase shift, power, three phase networks are treated. Also the behavior of AC networks is discussed. In the second part, electromagnetic waves are considered. Not only the properties of such waves (propagation, interference, refraction, ...) are treated, also practical implementations are widely discussed.

Learning outcomes:
- K1: Basic scientific-disciplinary knowledge and comprehension
- I1: Problem analysis and solving
- G1: Information gathering and processing
- G3: Critical thinking

Goals: The student can read and understand simple electric circuit diagrams. He/She's also able to do appropriate calculations, based on necessary insight and basic laws and to interpret the results. (K1, I1, G3), The student can design, simulate, build and test simple electric circuits with AC-sources, both one phase and three phase (K1, I1, G1, G3), The student knows ac power and is able to calculate it for single phase and three phase circuits. (K1), The student can explain the operation of typical applications using basic laws of electromagnetism. (K1), The student masters the necessary mathematical techniques to formulate problems mathematically, solve them and explain the solution physically. (K1, I1, G1, G3), The student is able to solve problems by finding necessary information and applying acquired knowledge. (G1), The student can take a critical look at multiple solutions of a problem and choose the optimal solution based on relevant criteria. (G1, G3)

Statistics Learning outcomes
(K1) Basic scientific-disciplinary knowledge and comprehension in the field of statistics
(I1) Problem analysis and solving
(P1) Practical skills
(G2) Communication with engineers and non-engineers
(G3) Critical thinking

Aims:
The student has basic scientific-disciplinary knowledge of, and insight into statistics (K1). The student can think analytically in order to solve practical and technical statistical problems (I1). The student can execute basic, practical, statistical acts and manages processes related to statistics.
The student can document statistical results orally and in writing (G2). The student can critically reflect and motivate on the choices made in statistical analysis. (G3)

T2SSYE Signals and Systems

Learning outcomes:
- K1: Basic scientific-disciplinary knowledge and comprehension
- I1: Problem analysis and solving
- I2: Design and / or development
- G3: Critical thinking
- G5: Professionalism

Explanation: The student has knowledge on the analog linear time-frequency transforms of Fourier and Laplace, and their use as a mathematical tool. He knows their properties and is able to translate them from between the time domain and the frequency domain and back. He is able to select the most appropriate properties to perform signal transforms between the two domains. The student is also able to use these time-frequency transforms to solve linear differential equations or systems of these equations, and to assess the different parts of the solution. (K1 ; I1). The students knows the basic signals used in engineering applications and the operations that may be performed on these signals, and is able to apply them. He also knows the basic principles of linear system theory, and the various methods to characterize a system. He is able to apply these methods to real systems and to transform these methods one into the other. ( K1 ; I1). The student is able to translate a concrete mechanism and/or electronic linear system into a appropriate mathematical model, starting from the physics of the system, and is able to find the system function(s). He is able the describe the properties of the model in time- and in frequency domain using the relevant concepts of system theory, and is able to link these properties to the physical behavior of the real system. ( K1 ; I1 ; I2). The student is able to calculate the responses of such systems starting from typical excitations, eventually using mathematical software. He is able to compute additional properties of the system in time and in frequency domain and is able to link these properties to the physical behavior of the real system. (I1 ; G5). The student is able to reflect in a critical way on the computed results: what results (form, orders of magnitude) may be expected under normal conditions. He is able to use this attitude to detect errors if possible. He is able to propose realistic parameter values when dimensioning a system starting from technical specifications. He is able to communicate the results in an efficient way using the correct physical units and using correct graphs. (G3). The student has a basic knowledge of the mathematical software package Maple to calculate the behavior of linear systems of higher order.(K1)
**T2EE30 Engineering Experience 3: Computer-Based Control**

Learning outcomes:
- G1: Information gathering and processing
- G2: Communication with engineers and non-engineers
- G3: Critical thinking
- G4: Working in a team in different roles
- G5: Professionalism
- I1: Problem analysis and solving
- I2: Design and / or development
- I5: Entrepreneurship

Explanation: Engineering: At the end of this module the student is able to use his technological knowledge to apply in such exercises and labs and to integrate at a higher level in a project. (I1, I2, G1, G2, G3)

Educating: At the end of this module the student is able to study self-knowledge, commitment and skills and to work together in a group. (G4, G5)

Enterprising: At the end of this module the student is able to calculate the cost of his project. (I5)

**T2OGDE Object-Oriented Programming and Databases**

Learning outcomes:
- K1: Basic scientific-disciplinary knowledge and comprehension
- I1: Problem analysis and solving
- I2: Design and / or development
- P1: To make operational
- G1: Information gathering and processing
- G2: Communication with engineers and non-engineers
- G3: Critical thinking

Explanation: Students are able to translate the requirements of a (small) problem into a correct working object oriented solution. (I1, I2). Students are able to use UML and the correct jargon to represent this solution in a class diagram. (G2).
They have the skills to transfer this class diagram into correct and clean code, using JAVA syntax and an iterative and incremental process. (K1, P1)
They understand the role of a compiler and are familiar with method calls in the BlueJ environment (P1).
They understand error messages from the compiler and have strategies to work towards a solution. (G3).
They can use classes and methods of some of the JAVA libraries (G1).
They are critical towards the obtained results and define correct testing strategies (G3).

For the Database part:

Learning outcomes:
- MK1: Wetenschappelijk-disciplinaire kennis en inzicht bezitten in het domein van de industriële ingenieurswetenschappen
- I1: Problem analysis and solving
I2: Design and / or development
P1: To make operational
G2: Communication with engineers and non-engineers

Explanation: Each program that uses a large amount of data needs an efficient way to process and to store this data and to retrieve it again. Understanding the structure of data and its processing with databases are essential skills for a modern engineer. After successfully completing this course these goals should be achieved: the student knows when the data-need of a program requires the use of a database (MK1), the student is able to describe the data needs of a problem, he can depict it with a diagram and is able to discuss about this data model with user and IT specialist (G2, I1, I2); the students is able to create a new relational database, and retrieve data in all possible ways using a query language (SQL) (I2, P1);

T2THEE Thermodynamics

Learning outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical thinking

Explanation: Thermodynamics is the basic science course that deals with energy under all its engineering aspects. At the end of the course the students should be able to: explain the basic principles of thermodynamics and heat transfer. (K1) define and describe zeroth law, first law, entropy, exergy and thermodynamic cycles. (K1) apply and analyze balance equations in the area of zeroth law, first law, entropy, enthalpy, exergy and cycles (I1) explain and describe heat transfer process through conduction, convection and radiation (K1+G1) analyze heat transfer problems related to conduction, convection and radiation (I1) present many engineering applications in the four domains of matter-energy-information and life technologies; (G2) develop an intuitive understanding of the subject matter by emphasizing physics rather than the mathematics. (G3)

T2STLE Strength of Materials

The content of this course is related to the basic knowledge of the strength of a certain structure, given a certain (structural loading). In this framework, the relation between the material properties, static/dynamic) loading and geometrical properties of various structural components is highlighted.

Learning outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
I3: Application-oriented research
G3: Critical thinking

The general learning goals of this course can be summarized as:

• Gaining general scientific knowledge in the domain regarding the strength of materials (K1).
• Understanding the relation between material and geometrical properties and structural loading and the according stresses/deformations inside a structure (K1).
• Analyzing and, critically, evaluating if a certain structure satisfies the requirements with respect of maximal tolerable stress and deformation (I1, G3).
• Designing structural components to ensure that a maximum stress level or deformation is not reached (I2, I3)

T2MATE Technology of Materials

Learning outcomes:

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I4: Ethical conduct
P1: Operationalisation
G3: Critical reflection

Explanation: The student has gained scientific-disciplinary knowledge and understanding (K1) and ethical conduct (I4). The student knows the basic structure, properties, production, behaviour and applicability of the major material categories. The student understands the relationship between the manufacturing process, the material microstructure and the material behaviour. The student has notions of environment-related aspects of materials, such as energy production, resource depletion, and recycling. Analysing and solving problems (I1), Operationalizing (P1) and Critical reflection (G3). The student is able to set up, perform and interpret basic material tests for determining material properties. The student can apply his knowledge of materials technology for calculating or assessing the behaviour of materials in elementary situations.

T2ERW0 Society, Technology and Engineering

This course is related to the vision that engineers have a higher purpose: to develop people and to improve conditions for mankind. In order to reach this goal students need to have a holistic vision on engineering, and become aware of the interplay between technology and society. The course “Society, Technology and Engineering” confronts students with cases that illustrate the mutual impact of technology and society. In addition, students will learn and apply theories and models on the evolution of technology, and which factors - technological and non-technological - they have to take into account to develop a successful technological solution. In this course, with ‘successful’ we do not hint at technological superiority, but rather we point to a solution that is adopted by society and has the capability of inducing positive change.

Learning outcomes

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
I3: Application-oriented research
I4: Ethical behavior
G2: Communication with engineers and non-engineers
G3: Critical thinking
G4: Working in a team in different roles

Explanation: Students understand the role and responsibility of engineering with respect to its impact on society (I4). Students acquire an understanding of the complex interaction between society and technology and in particular the social shaping of technology (I4). Students can apply models such as the ‘Social Construction of Technology’ to historical accounts of specific technologies (K1). Students can find and process scientific research articles related to the evolution and adoption of technology and society and they can interpret, evaluate and refer to the results of their scientific research exploration (I1 & I3). Students can approach engineering from a system perspective and identify the different places to intervene in a system (K1 & I1). Students know and can apply a soft systems methodology and can identify the different stakeholders according to this methodology (K1 & I1). Students know different drivers for adoption of technology and behavioral change and can apply these drivers to specific cases (K1 & I1). Students can conceive, design and critically reflect on technological solutions, bearing in mind the different (soft) system approaches and drivers for adoption of technology and behavioral change (I2 & G3). Students can communicate their efforts in a clear manner, both written and orally (G2). Students can work in team (G4).

T2EE4M Engineering Experience 4 - Electromechanical Engineering

Learning outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
I3: Application-oriented research
I5: Enterprising
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical thinking
G4: Working in a team in different roles
G5: Professionalism

Explanation: Contribution to general acquisition of competences

- Engineering: the EE4 project allows the students to apply their technological knowledge and, more important, to integrate it at a higher level by using it creatively during the project.
Educating: composing reports and documentation about a design with the purpose to inform colleagues, superiors and outsiders, is a necessary part of the design cycle. Individual knowledge, commitment, and skills are not enough. Working as a team is a necessity to end this project successfully.

Specific learning goals
At the end of this course, the student is able to:
- apply technological knowledge in a practical project (K1, I1, I3, I5)
- design in a model based way (I2, G3)
- interpret and use the characteristics of a solar panel and a DC motor (G1, G3, I1)
- analyse the power flow through a solar vehicle and compose a Sankey diagram (I1, I3, G3)
- compose technical drawings and dimension them according to the ISO-norm (I2, G2)
- autonomously identify missing information, and search for, interpret and absorb this information (G1)
- work in a team, divide tasks, compose and follow a project planning (G4)
- communicate results in a report and on a wiki (G2)

Research related skills:
- Students develop a critical attitude towards knowledge and knowledge creation (G3)
- Students develop the skill to link research results to practice (I3)

T2ELTE Electrical Engineering

Learning Outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I4: Ethical Behavior
G3: Critical Thinking

Goals: Students understand the configuration of the three-phase power grid and the different kinds of power. On electrical schematics, students can correctly connect three-phase and one-phase loads and explain their effect on the power grid. (K1, I1, G3). Students are able to explain the working principles and characteristics of the discussed electric machines. Students understand the effect of the use of such machines on the power grid. Students understand and can explain the behavior of mechanical loads connected to DC motors. (K1). Students know the different kinds of power stations and know how power is distributed. They understand the impact of choosing certain types of power generation on the power grid, but also on society (now and future) (K1, I4). Students possess the necessary mathematical skills to formulate and solve exercises related to the discussed electric machines. They are able to interpret and reflect critically upon the results taking into account the given context (K1, I1, G3)
Learning outcomes:

K1 Basic scientific-disciplinary knowledge and comprehension
I1 Problem analysis and solving
G3 Critical thinking
G2 Communication

The general learning goals of this course can be summarized as: The student learns to analyse and solve mechanical problems from the industrial and reality. This encompasses to analyse mechanical problems (I1), especially regarding the planar motion of a rigid body, to develop a solution strategy (K1), to solve the problem mathematically (I1), to judge the solution in a critical way (G3) and to give a report of the solution (G2).

Learning outcomes

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical reflection

Explanation: Mechanical design requires knowledge extending over many areas (kinematics, dynamics, strength of materials, material science, heat transfer, fluid dynamics etc.) and sound analytical skills in order to recognise the phenomena involved and to synthesise an integrated solution. This course aims to introduce the students to the basic components of machinery and how to select and dimension these components in order to achieve design requirements in the construction of mechanical systems. At the end of this course, students must be able to: Identify and describe the characteristics and functions of the most common machine parts (K1). Identify appropriate analytical models to describe and predict the behaviour of common machine parts (K1, I1). Decompose complex machines into sub-assemblies and simple parts and analyse their functioning (K1, I1). Apply stress analysis theory, fatigue theory and appropriate criteria of failure to the design of simple machine parts (I1, I2). Perform tolerance analysis and specify appropriate tolerances and fits for machine parts (I1, I2). Design simple power transmission systems i.e. gear box (I1, I2, G1, G3); Select appropriate mechanical components from manufacturers' catalogues (G1, G3); Apply codes and standards to machine part design (I2, G1, G3); Communicate the results of a design assignment (gear box) by means of drawings and a design report (G2)
T31MTE Manufacturing Technology

Learning outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
P1: Operationalisation
G3: Critical thinking

Explanation: Basic scientific-disciplinary knowledge and comprehension (K1). The student has gained scientific-disciplinary knowledge and understanding (K1). The student has gained knowledge and understanding of the basic technologies (casting, forming, cutting, joining, coating) used for manufacturing discrete products from various materials. The student has gained knowledge and understanding of the machine tools used for manufacturing, including basic knowledge of numerical control. The student has gained insight into the relationship between product geometry and design, material, manufacturing technology, and the related economic aspects. Analysing and solving problems (I1), Operationalising (P1) and Critical reflection (G3). The student is able to assess the product quality, in particular with respect to the geometric quality. He is acquainted with basic manual dimensional measurement instruments. The student is able to make a process plan for a set of representative manufacturing technologies, in particular for simple machining tasks. In addition, (s)he is able to analyse and execute this manufacturing process.

T31MSE Material Selection

The number of available technical materials is such increased in recent decades, it has become impossible to know them all, or to remember their properties and availability. Databases and material selection maps provide product designers the ability to choose the most suitable material for their product or redesign. Hereby they take note of the mechanical, physical and chemical properties of materials classes and handle them within the selection of the material requirements. The importance of the scarcity of materials and energy optimization for the entire life cycle of the product is continuously growing.

Learning outcomes:
K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
I3: Application-oriented research
I4: Ethical behavior
I5: Entrepreneurship
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical thinking
G4: Working in a team in different roles

Learning goals
At the end of this course, the student is able to:

• Formulate a list of demands for a material in a technical application; (K1, I1, G1)
• Translate requirements to material entities; (K1, I2, I3, G1)
• Explain the structure, treatments and behavior of materials classes; (K1)
• Select materials from databases, taking into account functional requirements but also economic and environmental considerations; (I3, I4, I5, G1, G3)
• Written report of the research process, and a critical reflection of the obtained results. (G2, G3, G4)

T31EIE Electrical Installations 2

This course is the english version of "T31EI: Elektrische installaties", so the same aims are applicable:

LEARNING OUTCOMES
K1: Possess scientific-disciplinary basic knowledge and insight
I1: Analyze and solve problems
I2: Design and/or develop
I4: Safety and ethics
P1: Operationalization
G2: Communicate with colleagues and non-colleagues
G3: Critical reflection
G5: Professionalism

GOALS
Since electricity is the most important industrial energy, security and reliable energy is very important. This course examines the safe design of electrical installations. The student can design a safe electrical installation on low and very low voltage (K1, I1, I2, G1, G3). The student knows the dangers of electricity and methods and materials to protect against (K1, I4). The student is aware of legislation and standards regarding electrical installations (K1, I4). The student can perform calculations to select components of electrical equipment (eg cables) (K1, I1). The student is able to independently establish a wiring diagram (I1, I2). The student has different solutions for the grid connection of an installation, power factor compensation and the main power quality problems, he/she can make connections and assess impacts (K1, I1). The student can work with different kinds of capabilities, three-phase nets and star and delta circuits (K1, I1, G3). The student can explain subject-related terminology succinctly (K1, G2).

T31HTE Heat Transfer 2

Heat transfer is a basic science that deals with the rate of transfer of thermal energy. It has a broad application area ranging from biological systems to common household appliances, residential and commercial buildings, industrial processes, electronic devices, and food processing.
The fundamental modes of heat transfer are conduction or diffusion, convection, advection and radiation.

LEARNING OBJECTIVES

K1 - Basic scientific-disciplinary knowledge and comprehension
I1 - Problem analysis and solving
G1 - Information gathering and processing
G3 - Critical thinking

AIMS

- The student is familiar with the basic principles of heat transfer (K1)
- The student is able to apply his basic knowledge of heat transfer in real-world engineering problems (K1, I1)
- The student has developed an intuitive understanding of heat transfer by emphasizing the physics and physical arguments (G1, G3)

T31EM5 Engineering Experience 5 - Electromechanical Engineering

Learning outcomes:

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
I3: Application-oriented research
I5: Enterprising
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical thinking
G4: Working in a team in different roles

Contribution to general acquisition of competences:

- Engineering: the EE5 project not only inspires the student to apply his technological knowledge, such as in lab sessions, but also to integrate his knowledge, skills and experience in a creative way.
- Educating: individual knowledge, dedication and skills are not sufficient. It is absolutely necessary to be able to communicate and work together as a team to successfully complete this elaborate project.
- Enterprising: the students discover the economical aspect of their project by assessing the financial feasibility of their design.

Specific learning goals:

At the end of this course, the student is able to:

- combine and integrate knowledge, skills and experience from the domains of mechanics, electricity, automation and thermodynamics (I1, I2, I3, I5, G1, G3);
- analyse a project assignment, split it into smaller subtasks, and create a task distribution (I1, G3);
- develop a conceptual design for an electromechanical problem (I1, I2, I3);
- make a detailed design comprising technical drawings, calculations, electrical and control circuits (I2, I3, G2, G3);
- search for, compare and absorb the necessary information (G1, G3);
- function autonomously as a team for a project (G4);
- premise and develop individual project skills during the execution of the project assignments (G2, G4, G3);
- communicate the results with a report and a presentation (G2).

T31CIE Components of Industrial Automation

Learning outcomes:

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and/or development
I3: Application-oriented research
P1: Operationalisation
G3: Critical thinking

Explanation: The student is aware of the working principles and the way to drive current industrial drive technologies: pneumatic, hydraulic and electric and is able to make a motivated choice between them. [K1, I1]. The student able to design a digital pneumatic, hydraulic of electric sequential controller. [I1, I2]. The student is aware of the position of fieldbus systems within an industrial process and is aware of the different working principles. [K1]. The student is able to design an electric circuit drawing and to interpret it. [K1, I1, G3, I2]. The student is able to implement a sequential controller base on a given problem within a PLC environment. [K1, I1, G3, I2, P1]. The student is able to setup an PID-control within an automated system. [P1]. The student is aware of recent developments (research topics) within the field. [G3]. The student gains instrumental research skills to build up an automated system. [I3]

T31CTE Control Theory

Learning outcomes:

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I3: Application-oriented research
G3: Critical thinking

Explanation: The student knows the different subsystems a control loop consists of and understands the concept of feedback to control a process (K1, I1). The student is able to analyse the static and dynamic behavior of control loops by means of static characteristics, closed loop
transfer functions and Bode plots (K1, I1, I3). The student is able to simulate feedback loops and interpret the results (I1, I3, G3).

**T31MCD Mechanical Design**

Learning Outcomes

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
G2: Communication with engineers and non-engineers
G3: Critical thinking

Explanation: An engineer must be able to apply the acquired basic knowledge in the solution of technological problems. This basic knowledge concerns kinematics, dynamics, strength of materials, material science, heat transfer, fluidodynamics. (K1, I1). The design of an integrated construction is more complex than the design of machine elements. The designer must work iteratively starting from a coarse concept to a more organic global design. Two case studies will illustrate this: the design of a statically loaded construction and a dynamically loaded one. (I2, G3). Finally an important competence of a mechanical engineer is to communicate by technical and conceptual drawings, and moreover to give an oral synthesis of the analyses elaborated in the course. (G2)

**T31ELM Electrical Machines**

This course is the English version of "T31EM0: Elektrische machines", so the same aims are applicable:

LEARNING OUTCOMES

Definitions:

K1: Basic scientific-disciplinary knowledge and comprehension
I1: Problem analysis and solving
I2: Design and / or development
I3: Application-oriented research
I4: Ethical behavior
I5: Entrepreneurship
P1: Operationalisation
G1: Information gathering and processing
G2: Communication with engineers and non-engineers
G3: Critical thinking
G4: Working in a team in different roles
G5: Professionalism

AIMS

An electromechanical engineer needs thorough comprehension of the electrical machines: threephase induction and synchronous machine, single phase motors, transformers and
DC machines. Concerning those machines, the student is able to: understand and explain the operation principle of the studied electrical machines (K1), to derive and interpret the characteristics (K1, G3) to set up and explain the equivalent circuit and power balance, both theoretically and from measurements (K1, I1, P1), to perform calculations related to the machines, their characteristics and operation and interpret the results (I1, G3), to select start, stop and control circuits, draw them and justify the selection (K1, I1, P1, G3), explain the interaction with the electricity grid and select appropriate compensation (K1, I1), to use the different powers, three-phase grids and wye and delta circuits (K1, I1, G3). explain course related terminology (K1, G2).

T31EIA Aspects of Industrial Automation

Learning outcomes:
- K1: Scientific-disciplinary knowledge and comprehension
- I1: Problem analysis and solving
- I2: Design and / or development
- G3: Critical thinking

Explanation: At the end of this course the student: is able to apply sensors for electro-mechanical use (K1, I1, I2, G3); is able to apply measuring methods for electro-mechanical use (K1, I1, I2, G3); has insight in and knowledge of concepts and terminology in the field of industrial field busses (K1, I1, I2, G3); has insight in and knowledge of the function and position of ERP/MES systems within an automated system (K1, I1, I2, G3).

RMIT Courses

MIET2116 Engineering and Enterprise

The key topics you will study in this course are: Organisational Behaviour and Problem Solving; Accounting and Product Costing; Sustainable Engineering Practices; and Project Management. Skills developed in the study of these topics are applicable to wide range of engineering practices including research.

MIET1071 Solid Mechanics

This course is designed to expand your knowledge in the field of non-linear mechanics of solids and its application to structural analysis, machine design and material processing. Through this course you will be able to understand the influence of non-linearities on the behaviour of structures. The course aims to equip you with essential analytical skills which have a particular
bearing on your professional practice as mechanical engineers. On completion of this course you should have sufficient knowledge of the mechanics of solids to enable you to solve advanced practical problems.

**MIET1076 Mechanical Vibrations**

This course deals with the study of vibration in mechanical systems which is concerned with the oscillatory motions of bodies and the forces associated with them. This course aims to provide you with an understanding of the nature and behaviour of dynamic engineering systems and the capability of applying the knowledge of mathematics, science, and engineering to solve engineering vibration problems.

**MIET1081 Advanced Thermo-Fluid Mechanics**

This is the third part of a three-part series of core courses (Applied Thermodynamics, Fluid Mechanics of Mechanical Systems, and Advanced Thermo-fluid Mechanics) designed to provide core knowledge of the fundamental principles and engineering applications of thermodynamics, heat transfer and fluid mechanics. These three areas collectively make up the field of Thermo-Fluid Mechanics or Thermal Fluid Sciences but are traditionally taught as separate courses. However, in this course, the three areas are presented in a more integrated manner, emphasising the connectivity between these areas in theoretical treatment and through the use of practical or real-world examples of thermal fluid systems. The fundamentals and principles of thermal fluid mechanics will be reviewed through the use of the real-world examples and be advanced to analyse the practical thermo-fluid systems for engineering design applications. Collectively, they should provide you with a sound fundamental as well as a practical knowledge of this area of engineering.

**AUTO1006 Vehicle Power Systems**

This course builds on your studies in thermodynamics and fluid mechanics to give you fundamental knowledge and skills required of practicing engineers in the discipline of Vehicle Power Systems. This course provides you with the understanding of the fundamentals of piston engine performance analysis, dynamics of the two and four stoke engine, and elements of its design. Under these major headings, the course will cover the following general topics: Piston engine classification, Engine indicated work, pressure and indicated power. Mean effective pressure, brake effective power Combustion and efficiencies; knock and its detection, consequences and elimination, effect of fuels, additives and octane ratings Engine performance characteristic and engine operating regimes: Steady, transient and unsteady; Continuous and intermittent regimes. Engine load and speed characteristics. Fuel air ratios: Lambda/equivalency ratio influence on engine performance Super- and turbo-charging the engine: Impact of super and turbo-charging the engine. Arrangement of supercharger and turbo-chargers. Fuel injection in spark ignition and compression ignition engines. Principles of operation ignition systems: ignition timing. Properties of exhaust gases: pollution and
emission control treatments. Engine dynamics, design analysis, principal dimensional analysis and specific parameters.

**MIET1077 Mechanics of Machines** 3

In this course you will study advanced concepts of kinematic and dynamic modelling and analysis of mechanisms and machines, including linkage mechanisms and cam mechanisms, reciprocating and rotating machinery. The course enables you to explore in depth core mechanical engineering concepts by integrating and applying contemporary analytical, computational and experimental methods. It relates kinematics and dynamics of mechanisms and machines to their design and allows you to relate theory and practice using a problem-based approach in which you develop project management skills.

**MIET1084 Finite Element Analysis** 3

The course introduces you to theoretical basics and practical application of the finite element method as well as to related numerical modelling techniques. It is designed to enable you to solve practical problems related to solid mechanics, machines and structures. This course, which is also a pre-requisite for an elective in applied computational engineering, provides a necessary tool for the analysis and solution of practical structures and processes.

**AUTO1019 Management of Vehicle Design & Research** 3

This course is centred on a series of lectures and associated tutorials based on contemporary vehicle research, design and development practices. The lectures will concentrate on the theory attached to the design and development of motor vehicles. The tutorials in turn will convert the theory to practice. You will research, design and develop a typical vehicle in this course. You will take part in the design and development of your nominated component(s) depending on your group responsibilities (e.g. chassis, body, etc.) throughout the course. The designs will be developed from concept to scale production model as the course progresses. The various stages of your designs and documentation will be brought together to form an integrated whole.

**AUTO1014 Vehicle Handling and Control** 3

The course objective is to provide fundamental knowledge of the dynamics of ground vehicles. Through a basic analysis of vehicle dynamics in performance, handling and ride modes, this course aims to train you to critically analyse vehicle modelling in order to have a better comprehension of dynamic and static behaviours of a vehicle and its subsystems. This course will develop your understanding of the application of engineering analytical techniques as they apply to fundamental subsystems and components of the vehicle. After this course, you will be able to reconcile competing demands inherent in the design of vehicles.
This course is the first part of a research project that is conducted over two courses. In this first course, "Professional Research Project 1", you will plan your research project, conduct a critical review of relevant published material and do sufficient work to produce some initial findings. This project is completed in the companion course "Professional Research Project 2". This is a work-integrated project done either in conjunction with industry or in a simulated engineering work environment. You will receive supervision from an internal RMIT supervisor and you may also have an external supervisor (such as an industry-based practitioner). As appropriate to the level of professionalism that is required in this course, you are expected to perform your project work with a high degree of independence and with only limited guidance from staff and/or external industry supervisors.

The course is the second part of a research project that is conducted over two courses. In this second course, "Professional Research Project 2", you will complete your research project, evaluate information and report your findings. This is a work-integrated project done either in conjunction with industry or in a simulated engineering work environment. You will receive supervision from an internal RMIT supervisor and you may also have an external supervisor (such as an industry-based practitioner). As appropriate to the level of professionalism that is required in this course, you are expected to perform your project work with a high degree of independence and with only limited guidance from staff and/or external industry supervisors.

In this course you will study the impact of aerodynamics on the design of motor vehicles. You will study the analytical, experimental and computational techniques that are integrated within the motor vehicle design process. You will also learn to design and implement experimental and computational simulations to support vehicle development.

Noise and vibration of motor vehicles is gaining increasing importance in the automotive industry involving both vehicle manufacturers and component suppliers. While noise pollution legislation is driving down vehicle exterior noise, customers are becoming more discerning regarding noise and vibration inside the vehicle. In fact, noise and vibration levels are now considered as important quality parameters in vehicle design. This course aims to develop your appreciation for the sources and mechanisms of noise and vibration generation and transmission in motor vehicles. In addition, it aims to introduce you to design principles and palliative treatments to help meet noise and vibration targets. In general, the course aims to introduce you to the noise and vibration of motor vehicles and the application of noise and vibration control principles to the design of quality automotive vehicles. You will develop an understanding of structure borne and airborne
noise transmission and the physical mechanisms involved. More specifically, upon completion of this course you will be able to describe and identify the main sources of noise and vibration in vehicles, such as the engine, transmission, tyre/road interface and intake and exhaust systems. You will describe these sources individually and their respective contributions to overall interior/exterior design of the vehicle, resulting in better understanding of the role of trim, isolating mounts and structural/acoustic design in the reduction of noise and vibrations in the passenger compartment. You will use contemporary computational and experimental techniques to achieve these outcomes.

MIET2011 Computational Engineering 1  
3
The course develops your skills in the finite element method so that you can solve advanced engineering problems in solid mechanics, machines and structures. You will study theoretical basics and practical applications of the finite element method in advanced applications including linear and non-linear modelling of engineering problems using numerical methods. This course prepares you for the analysis and solution of practical problems related to modern design and manufacturing technology and familiarises you with up-to-date commercial engineering software widely used in industry both in Australia and overseas.

AUTO1016 Sustainable Automotive Manufacturing  
3
In this course you will study the concepts and principles of process analysis and quality improvement in the manufacturing systems, with particular reference to vehicle manufacturing. Topics include: Process capability and control; FMEA; Six Sigma; Process problem solving; Inventory and material flow systems; Just-in-time, Lean Manufacturing and Quality Principles. At the end of this course, you will have developed an appreciation of the environment of automotive manufacturing, and through class activities you will develop skills to solve real life automotive problems step by step.

MIET1200 Advanced Materials  
3
In this course you will consider materials requirements for the automotive industry with a particular emphasis on cost, performance, recyclability, ease of processing and manufacturing. You will systematically examine the advantages and limitations of advanced materials. You will learn about the different material types used in current automobiles.