The University of British Columbia
Faculty of Applied Science
Department of Mechanical Engineering

MECH 491 – "Computer-Aided Manufacturing"

3 Credits / [2-2*-0]

OBJECTIVES: This course focuses on the introduction of modern computer-aided manufacturing technologies as well as the related computer-aided geometric modeling methods. Students will develop practical knowledge and understanding of the applications, underlying mathematical principles, and limitations of these technologies through lectures and laboratory tutorials/projects.

PREREQUISITE: MECH 392

TOPICS:
1. CNC Machine Tool Basics and Milling Operations
2. NC Part Programming
3. Parametric Representation of Curves and Surfaces
4. Sculptured Surface Machining: Three-Axis and Five-Axis

LECTURES: 2 lecture hours per week – Tuesdays, 4:00-6:00 pm, MacMillan 158

LABS: 10 laboratory sessions – Thursdays, 5:00-7:00 pm, PACE Lab (ICICS X060)

REFERENCE TEXTS:
1. Zeid, I., *Mastering CAD/CAM*, McGraw-Hill, 2005
2. Lee, K., *Principles of CAD/CAM/CAE Systems*, Addison-Wesley, 1999

EVALUATION: The course grade will be determined according to the following:

Assignments	8%
Laboratory Tutorials	2%
Project #1 – Individual	15%
Project #2 – Group	15%
Quiz (closed book)	10%
Final Examination (closed book)	50%

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NOTE: The items listed above are subject to adjustments and changes as needed.

MECH 491 Lecture & Laboratory Schedule

<table>
<tr><th>Week</th><th>Lecture[1]</th><th>Date</th><th>Topic</th><th>Lab[2]</th><th>Date</th><th>Topic</th></tr>
<tr><td rowspan="2">1</td><td>1</td><td>Jan. 5</td><td>Course overview</td><td rowspan="2">1</td><td rowspan="2">Jan. 7</td><td rowspan="2">Basic Concepts in NX</td></tr>
<tr><td>2</td><td>Jan. 5</td><td>CAM/NC/CNC</td></tr>
<tr><td rowspan="2">2</td><td>3</td><td>Jan. 12</td><td>Machine tool basics</td><td rowspan="2">2</td><td rowspan="2">Jan. 14</td><td rowspan="2">Sketch Essentials & Feature Modeling</td></tr>
<tr><td>4</td><td>Jan. 12</td><td>Milling operations</td></tr>
<tr><td rowspan="2">3</td><td>5</td><td>Jan. 19</td><td>NC part programming – 1</td><td rowspan="2">3</td><td rowspan="2">Jan. 21</td><td rowspan="2">Curves</td></tr>
<tr><td>6</td><td>Jan. 19</td><td>NC part programming – 2</td></tr>
<tr><td rowspan="2">4</td><td>7</td><td>Jan. 26</td><td>3D modeling schemes – 1</td><td rowspan="2">4</td><td rowspan="2">Jan. 28</td><td rowspan="2">Free Form Modeling – 1</td></tr>
<tr><td>8</td><td>Jan. 26</td><td>3D modeling schemes – 2</td></tr>
<tr><td rowspan="2">5</td><td>9</td><td>Feb. 2</td><td>Parametric curves – 1</td><td rowspan="2">5</td><td rowspan="2">Feb. 4</td><td rowspan="2">Free Form Modeling – 2</td></tr>
<tr><td>10</td><td>Feb. 2</td><td>Parametric curves – 2</td></tr>
<tr><td rowspan="2">6</td><td>11</td><td>Feb. 9</td><td>Parametric curves – 3</td><td rowspan="2">6</td><td rowspan="2">Feb. 11</td><td rowspan="2">Free Form Modeling – 3</td></tr>
<tr><td>12</td><td>Feb. 9</td><td>Parametric curves – 4</td></tr>
<tr><td></td><td colspan="6">Midterm Break: February 15 – 19</td></tr>
<tr><td rowspan="2">7</td><td>13</td><td>Feb. 23</td><td>Parametric curves – 5</td><td colspan="3" rowspan="2">Project #1</td></tr>
<tr><td>14</td><td>Feb. 23</td><td>Parametric curves – 6</td></tr>
<tr><td rowspan="2">8</td><td>15</td><td>Mar. 1</td><td>Parametric curves – 7</td><td colspan="3" rowspan="2">Project #1</td></tr>
<tr><td colspan="3">Quiz: March 1</td></tr>
<tr><td rowspan="2">9</td><td>16</td><td>Mar. 8</td><td>Parametric surfaces – 1</td><td rowspan="2">7</td><td rowspan="2">Mar. 10</td><td rowspan="2">Cavity Milling</td></tr>
<tr><td>17</td><td>Mar. 8</td><td>Parametric surfaces – 2</td></tr>
<tr><td rowspan="2">10</td><td>18</td><td>Mar. 15</td><td>Machine tool control basics</td><td rowspan="2">8</td><td rowspan="2">Mar. 17</td><td rowspan="2">Surface Contouring</td></tr>
<tr><td>19</td><td>Mar. 15</td><td>Accuracy and repeatability</td></tr>
<tr><td rowspan="2">11</td><td>20</td><td>Mar. 22</td><td>Milling operation setup</td><td colspan="3" rowspan="2">Project #2 & Drop-in Sessions</td></tr>
<tr><td>21</td><td>Mar. 22</td><td>CAD/CAM part programming</td></tr>
<tr><td rowspan="2">12</td><td>22</td><td>Mar. 29</td><td>Tool path generation – 1</td><td colspan="3" rowspan="4">Shop Machining Sessions
March 29 – April 8</td></tr>
<tr><td>23</td><td>Mar. 29</td><td>Tool path generation – 2</td></tr>
<tr><td rowspan="2">13</td><td>24</td><td>Apr. 5</td><td>Tool path generation – 3</td></tr>
<tr><td>25</td><td>Apr. 5</td><td>Review</td></tr>
<tr><td colspan="7">Final Exam: April 12 – 27</td></tr>
</table>

[1] Tuesdays, 4:00-6:00 pm, MacMillan 158
[2] Thursdays, 5:00-7:00 pm, PACE Computer Laboratory (ICICS X060)