MENG 434:
Metal Forming: Design, Materials and Processes (3 credits)
Elective
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Course (catalog) description:
Mechanical and metallurgical fundamentals of materials for metal forming processes. Process parameters, forming loads, process design, tool design in different processes.

Prerequisites: MENG 339

Textbook:

References:
4. Die design Handbook

Course Outcomes:
After completing the course, students will be able to:
1. Compare and classify different forming processes.
2. Analyze the behavior of materials during forming processes.
3. Determine forming process controlling parameters.
4. Estimate the required forming loads and powers of different forming processes.
5. Determine the causes of the defects that may take place during forming processes.
6. Select the suitable equipment for every forming process.
7. Design forming tools and dies.
8. Integrate knowledge gained in this course to select and design a complete metal forming system.

Computer Usage:
Students are encouraged to use computers and ready-made packages to solve and course assignments.

Topics:

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<th>Number of classes</th>
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<td>3 hrs/week</td>
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1. Fundamentals of metal working 1
2. Forging processes (classification, equipment, loads, billet preparation, surface treatment and defects) 4
3. Rolling of metals (hot and cold rolling, rolling forces, rolling of shapes, forces and energy required, rolling mill design, rolling defects) 4
4. Extrusion (classification, equipment, extrusion force calculations, lubrication, extrusion defects) 3
5. Drawing of rods, wires and tubes (forces, lubrication, drawing die design, drawing defects) 3
6. Piercing and Blanking (shearing lines, forces, tool design) 2
7. Deep drawing and stretch drawing (materials, friction, hydro-mechanical deep drawing, lubrication, forces, drawing tools’ design) 3
8. Bending (forces and tools required) 2
9. Progressive and compound die design 3
10. Presses (classification, uses and safety) 2

Project:
Groups of 3-5 students choose one of metal forming processes. Relevant data is to be collected from industry during field visits. As the students come very close to chosen forming process they will be able to decide upon the necessary steps of operation as well as the design features of the product and tools. Each group will make a complete design of the forming process with the required calculation.
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<th>Course contribution to meeting professional component</th>
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<tr>
<td>1. Mathematics or basic science</td>
<td>30%</td>
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<tr>
<td>2. Engineering science or design</td>
<td>70% (Significant Design Component)</td>
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