1. Department, Course Number, and Course Title:

MECHANICAL ENGINEERING

ME 327 MANUFACTURING PROCESSES

2. Designation:

Required	☑	Elective	☐
Lower Division	☐	Upper Division	☑

3. Course Description: Manufacturing properties of metals, alloys, and non-metallic materials; solidification processes; material forming; material removal; joining processes; numerical control and automated processes.

4. Prerequisites: ENGR 207 Material Science and Engineering

5. Text and Materials: Manufacturing Processes for Engineering Materials, 4th., S. Kalpakjian, Addison-Wesley, 2003

6. Course Objectives: This course teaches students qualitative and quantitative approach to the solution of manufacturing problems without losing sight of the applied aspects of processing and equipment

Course Outcomes

- The ability to understand the complex nature of manufacturing and relation ship between design and manufacturing
- The ability to understand the basis for the selection of materials and manufacturing processes
- The appreciation for the global competition , world class manufacturing; lean production, agile manufacturing,
- The familiarization with the methods of testing materials: tension test compression, torsion, bending, hardness, fatigue, creep and impact, interpretation of obtained data, the limitation of tests.
- The ability to understand behavior of material in plastic region, true stress and true strain analysis and instability .
- The ability to understand origin and manifestation of residual stress
- The understand of physical meaning and use yield criteria, effective stress and strain, plane -stress and plane-strain
- The ability to understand effective stress, strain and work of deformation
- The ability to appreciate the influence of cold, warm and hot work on material properties
- Familiarization with commercially obtained metals and alloys
- The understanding of the structure and characteristic of surfaces of objects
- The understanding of basic concept of tribology: the origin and types of friction, wear and lubrication
- The familiarization of surface treatments and coatings
- The understanding of fluid flow and heat transfer in casting and different casting processes and practices
- The understanding of bulk deformation processes: forging, rolling, extrusion, drawing and swaging
- Ability to compute stresses, forces, and power consumed in forming using slab method analysis.
- Familiarization with basic cutting processes, tools life, tool wear and miscellaneous other manufacturing processes
- An ability to appreciate realistic constrain and in real life challenges in manufacturing

7. Topics Covered: (in Order of Presentation)

- Importance and Interdisciplinary Nature of Manufacturing. – Ch. 1
- Global Competitiveness and Worldwide Manufacturing, Short Quiz – Ch. 1
- Solidification and Casting Processes – Ch. 2
- Fluid Flow and Heat Transfer in Casting – Ch. 2
- Casting Processes, Project I assigned – Ch. 2
- Mechanical Properties of Engineering Materials, tensile test – Ch. 2
- Creep, Impact and Fatigue. Manufacturing Properties – Ch. 3
- EXAM I
- Three-axial Stresses and Yield criteria – Ch. 4
- Residual Stresses, Plane Stress-Plain Strain, Three-axial Stresses – Ch. 4
- Overview of Joining Processes Project II due – Ch. 5

- Structure and Manufacturing Properties, Cold and Hot Work – Ch. 5
- Surface Structure and Properties, Friction and Wear – Ch. 6
- Lubrication and Surface Treatments – Ch. 6
- Stresses in Forging and Forging Practices – Ch. 6
- EXAM II
- Rolling, Extrusion and Drawing Analytical and practical Approach – Ch. 8
- Sheet Metal Forming – Ch. 11
- Cutting of Materials – Ch. 12
- Tool Materials, Tool Wear and Machinabilty – Ch. 12

8. Class Schedule: Number of Sessions per week: 1
Duration of each session: 1 hour 40 minutes

9. Contribution of course to meeting the professional component:

This course is junior level required course for all mechanical engineering students.

Engineering Science	2 unit
Engineering Design	2 unit

10. Relationship of course to program objectives:

This course relates to the program objectives by contributing to the following measurable outcomes at the level indicated for all engineering graduates:

Knowledge outcomes:

- an ability to apply knowledge of mathematics, science, and engineering (abet a)
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (abet h)
- a knowledge of current events and societal contemporary issues -- non-engineering related. (abet j)
- a knowledge of computer aided design and simulation software
- a knowledge of measurement and manufacturing techniques
- a knowledge of how mechanical engineering integrates into inter-disciplinary systems

Skill outcomes:

- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (abet c)
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (abet k)
- an ability to select materials and manufacturing processes
- an ability to think in a logical sequential process

Attitudes Outcome:

- an understanding of responsibility and accountability
- a recognition of the need for an ability to engage in lifelong learning (abet i)
- a desire to be a flexible and adaptable team player (collaborative attitude)

11. Prepared by: Neda Fabris 05/2005