

KL UNIVERISTY
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : ME C203
Course Title : Manufacturing Processes-I
Course Structure : 3-0-2
Course coordinator : Dr K Rama Kotaiah
Instructors : AVS Ramprasad

1. Course Description:

Mechanical Engineers apply principles of physical science and mathematics to conceive, design, produce and operate the moving parts, components and machinery used in every aspect of modern life. From rockets, robots and automobiles to power plants, engines, air-conditioning equipment and biomechanical parts, mechanical engineers put energy and machines to work, and wherever there is motion, you will find evidence of their innovations. Today, they often use computer-aided design and computer simulation to ensure their products are reliable, efficient and economically sound. The spectrum of professional activity for the mechanical engineer runs from research through design and development to manufacturing and sales.

2. Scope and Objective of the Course:

After thorough learning of Material science and metallurgy the student:

1. Will understand the objectives of casting processes than other manufacturing processes.
2. Will understand various metal forming processes like Extrusion, Drawing, Tube making, Wire drawing, Blanking and Punching operations.
3. Will understand the working principles of Arc welding, Working principle, advantages and applications of TIG, MIG, submerged arc welding, Thermit welding, electron beam welding, laser beam welding,
4. Will analyze the Resistance welding principles, Welding defects, causes and remedies, testing of welds. Brazing, Soldering, Adhesive bonding, joining of plastics.

At the end of the course the student will be able to

1. understand the role of various casting processes in industry.
2. understand the role of various Metal forming processes.
3. understand the role of various Metal joining processes.

3. Books:

(i) Textbook:

1. a. Manufacturing Engineering & Technology by Serope Kalpakjian & Steven R schmid
2. Manufacturing science by Amitab Ghosh & Ashok Kumar Mallik

(ii) Reference Book:

1. Manufacturing Technology by P.N.Rao
2. Processes & Materials of Manufacture by Roy A Lindberg
3. Introduction to Manufacturing Process by John A Schey

4. Syllabus:

UNIT I

Metal casting process: Introduction – advantages of casting method, Pattern: types, materials and allowances, Moulding sand -- ingredients, types, Properties, and its testing, cores. Introduction to Gating system.

Melting furnaces: Cupola furnace-- operation, Zones, Electric furnaces and its types.

Special casting methods: Centrifugal casting, Investment casting, shell moulding.

Casting defects: causes, remedies. Testing of castings.

UNIT II

Metal Working Processes: Introduction, Hot and Cold working of metals.

Rolling of Metals: Introduction, Principle, operation, types of Rolling, Rolling mills, Defects in rolled plates & sheets.

Forging of Metals: Introduction, open–die forging, closed–die forging, Related forging operations, forging defects, forging machines.

UNIT III

Extrusion & Drawing of Metals

Introduction, Extrusion process, Hot extrusion, cold extrusion, Defects. Drawing process, Defects and residual stresses. Tube making, Wire drawing.

Sheet Metal Working Operations: Introduction, Sheet metal Blanking and Punching operations. Clearance and shear as applied to Punching/Blanking operations. simple related problems.

UNIT IV

Welding: Introduction, Arc welding principles, electrode types, oxy-acetylene gas welding. Working principle, advantages and applications of TIG, MIG, submerged arc welding, Thermit welding, electron beam welding, laser beam welding,

UNIT V

Resistance welding principles, Butt welding, Spot welding, Seam welding. Welding defects, causes and remedies, testing of welds. Brazing, Soldering, Adhesive bonding, joining of plastics.

5.Course Plan:

| Lecture No | Learning Objectives | Topics to be Covered | Text/Reference Book | Chapters/Page No. |
|------------|---|--|---------------------|-------------------|
| 1. | To know about advantages of casting method, Pattern: types, materials and allowances, | Introduction – advantages of casting method, Pattern: types, materials and allowances, | T ₁ | 262 |

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|-----|--|--|----------------------------------|---------------|
| 2. | To know about Moulding sand -- ingredients, types, Properties, and its testing, cores. | Moulding sand -- ingredients, types, Properties, and its testing, cores. | T ₁ T ₂ | 265-266 39 |
| 3. | To know about Introduction to Gating system. | Introduction to Gating system. | T ₁ T ₂ | 246 46-47 |
| 4. | To know about Cupola furnace-- operation, Zones, | Cupola furnace-- operation, Zones, | T ₁ | 293 |
| 5. | To know about Electric furnaces and its types. | Electric furnaces and its types. | T ₁ | 193,292 |
| | To know about Centrifugal casting, | Centrifugal casting, | T ₂ | 96 |
| 6. | To know about Investment casting, | Investment casting, | T ₁ | 278 |
| 7. | To know about shell moulding. | shell moulding. | T ₂ | 93 |
| 8. | To know about Casting defects: causes, remedies. Testing of castings. | Casting defects: causes, remedies. Testing of castings. | T ₂ | 90 |
| 9. | To know about Metal Working Processes: Introduction, | Metal Working Processes: Introduction, | T ₁ | 320 |
| 10. | To know about Hot and Cold working of metals. | Hot and Cold working of metals. | T ₁ | 322 |
| 11. | To know about Rolling of Metals: Introduction, Principle, operation, | Rolling of Metals: Introduction, Principle, operation, | T ₂ | 110 |
| 12. | To know about types of Rolling, | types of Rolling, | T ₂ | 110 |
| 13. | To know about Rolling mills, | Rolling mills, | T ₂ | 156 |
| 14. | To know about Defects in rolled plates & sheets. | Defects in rolled plates & sheets. | T ₁ | 327 |
| 15. | To know about Introduction, open– die forging | Introduction, open– die forging | T ₁ | 342 |
| 16. | To know about closed–die forging | closed–die forging | T ₁ | 343 |
| 17. | To know about Related forging operations,. | Related forging operations,. | T ₁ | 348 |

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| 18. | To know about forging defects, forging machines | forging defects, forging machines | T ₁ | 361 |
| 19. | To know about Introduction, Extrusion process, | Introduction, Extrusion process, | T ₁ T ₂ | 369 166 |
| 20. | To know about Hot extrusion, cold extrusion, | Hot extrusion, cold extrusion, | T ₁ | 374-377 |
| 21. | To know about Defects. Drawing process. | Defects. Drawing process. | T ₁ T ₂ | 386 162 |
| 22. | To know about Defects and residual stresses | Defects and residual stresses | T ₁ | 385 |
| 23. | To know about Tube making, Wire drawing. | Tube making, Wire drawing. | T ₂ | 127 |
| 24. | To know about Introduction, Sheet metal Blanking and Punching operations. | Introduction, Sheet metal Blanking and Punching operations. | T ₁ T ₂ | 392 169 |
| 25. | To know about Clearance and shear as applied to Punching/Blanking operations. | Clearance and shear as applied to Punching/Blanking operations. | T ₁ | 392 |
| 26. | To know about simple related problems. | simple related problems. | T ₁ | 434 |
| 27. | To know about Introduction, Arc welding principles, electrode types, | Introduction, Arc welding principles, electrode types, | T ₁ | 779 |
| 28. | To know about oxy-acetylene gas welding. | oxy-acetylene gas welding. | T ₂ | 323 |
| 29. | To know about Working principle, advantages and applications of, TIG, MIG | Working principle, advantages and applications of, TIG, MIG | T ₁ | 787 |
| 30. | To know about submerged arc welding, | submerged arc welding, | T ₁ | 790 |
| 31. | To know about Thermit welding, , | Thermit welding, , | T ₂ | 323 |
| 32. | To know about electron beam welding | electron beam welding | T ₂ | 325 |
| 33. | To know about electron beam welding, | electron beam welding, | T ₁ | 790 |

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|-----|--|--|----------------|-----|
| 34. | To know about laser beam welding, | laser beam welding, | T ₂ | 325 |
| 35. | To know about Resistance welding principles, | Resistance welding principles, | T ₂ | 320 |
| 36. | To know about Butt welding, | Butt welding, | T ₁ | 812 |
| 37. | To know about Spot welding | Spot welding | T ₁ | 815 |
| 38. | To know about Seam welding. | Seam welding. | T ₁ | 813 |
| 39. | To know about Welding defects, | Welding defects, | T ₂ | 326 |
| 40. | To know about causes and remedies, | causes and remedies, | T ₁ | 860 |
| 41. | Testing of welds. | Testing of welds. | T ₁ | 830 |
| 42. | Brazing, Soldering, | Brazing, Soldering, | T ₁ | 840 |
| 45 | Adhesive bonding, Joining of plastics. | Adhesive bonding, Joining of plastics. | T ₁ | 850 |

6.Self learning material:

| Unit | Topic | Source |
|-------------|------------------------------|--|
| I | Testing of Castings | www.alcoa.com |
| I | Electric Induction Furnace | en.wikipedia.org |
| I I | Forging Machines | en.wikipedia.org/wiki/Forge, www.machine-tools-manufacturers.com |
| I I | Defects in rolled sheets | en.wikipedia.org/wiki/Rolling, www.tech.plym.ac.uk |
| I I I | Defects in Drawing Processes | www.ucl.louisiana.edu, wiki.answers.com |
| I I I | Blanking operation | www.toolingu.com, en.wikipedia.org |
| I V | Electro slag welding | worldwidescience.org, www.eng-tips.com |
| I V | Types of Electrodes | www.hobartwelders.com, wikieducator.org |
| V | Brazing operation | www.hobartwelders.com, wikieducator.org |
| V | Adhesion bonding | en.wikipedia.org, www.pokayokeweld.com |

7.Evaluation Scheme:

| Component | Duration (minutes) | % Weightage | Marks | Date & Time | Venue |
|----------------------------------|--------------------|-------------|-------|------------------------------------|--|
| Test-1 | 50 Min | 7.5 | 10 | 10.08.2010 09.30 to 10.20 AM | CSE005,101, 104,105,106, 201,202,204, 205,209,301, 309,502,509 |
| Test-2 | 50 Min | 7.5 | 10 | 14.09.2010 09.30 to 10.20 AM | CSE005,101, 104,105,106, 201,202,204, 205,209,301, 309,502,509 |
| Assignment submission | | 3.75 | 5 | Continuous | |
| Assignment Test | 50 Min | 3.75 | 5 | 26.10.2010 09.00 to 10.20 AM | CSE005,101, 104,105,106, 201,202,204, 205,209,301, 309,502,509 |
| Quiz | 30 Min | 3.75 | 5 | 26.10.2010 09.00 to 10.20 AM | CSE005,101, 104,105,106, 201,202,204, 205,209,301, 309,502,509 |
| Regular Lab Evaluation | Continuous | 12.5 | 50 | | |
| Comprehensive Lab Exam | 3 Hrs | 10 | 40 | | |
| Comprehensive Exam | 3 Hrs | 45 | 60 | | |
| Attendance for Theory & Tutorial | | 3.75 | 5 | Continuous | |
| Attendance for Lab | | 2.5 | 10 | Continuous | |

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

Course Coordinator