

## Welding and Foundry

### 211103

**Teaching Scheme**

Lectures: 4 hours / week

**Examination Scheme**

In-Sem (Online): 50 Marks

End-Sem (paper): 50 Marks

Credits: 4

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**Prerequisites:** Basic Mechanical Engineering, Physics**Course objectives:**

- To study on different types of welding processes practiced in industry
- To understand the weld joint design, physics of welding and Symbols
- To provide basic understanding of foundry practices and processes

**Course Outcomes:**

On successful completion of the course students should be able to-

- Classify and describe welding processes.
- Predict safety measures, inspection and testing of welding of welding.
- Describe and classify metal casting process and casting defects.
- Justify the pattern material, allowances, and effect of mould ingredients on mould strength.
- Design the gating system and risers.

**Unit I****(8)**

Introduction & classification of welding processes, Basic electrical – Electrodes – coding of electrodes – Electrode efficiency, Welding symbol. Physics of welding – arc structure, characteristics and power – chemical heat source- contact resistance heat source- heat flow characteristics- cooling of weld.

Arc welding processes- carbon arc, submerged arc, Tungsten inert gas (TIG), Metal Inert gas (MIG), Plasma arc, stud welding- Theory, comparison on merits, limitations and applications. Fluxes used in arc welding.

**Unit II****(8)**

GAS welding: - processes and equipment used, type of flames, adjustment of flames, oxyacetylene welding, gas cutting –merits, limitations and applications.

Electric resistance welding- processes and equipment used, spot, seam, projection, butt, percussion welding, resistance tube welding, - merits, limitations and applications.

**Unit III****(8)**

Pressure welding, diffusion welding, ultrasonic, friction, explosive, forge, thermit welding, laser, electron beam welding- equipment used- merits, limitations and applications of above processes.

Brazing, braze welding and soldering processes.

Inspection and testing of welding: - visual inspection, destructive & non-destructive testing. Estimation of welding cost. Protection and safety in welding.

#### **Unit IV**

**(8)**

Sand casting processes , Principles of casting, steps involved in casting, Introduction of sand casting. Patterns, Pattern materials, pattern allowances and design. Core prints and core seats. Mould strength, Ingredients of moulding materials and their effect on mould strength-testing of mould strength, testing of moulding sand.

Melting and pouring of metals:- melting furnace- types, Cupola, electric arc furnace, Induction furnace- Construction, operations and zones, cleaning, finishing of casting.

#### **Unit V**

**(8)**

Special casting processes Pressure and gravity die casting (hot and cold chamber), shell moulding, centrifugal casting, continuous casting, investment casting, - their typical applications, merits and limitations.

Casting defects- defects, Inspection- analysis of casting defects- Quality control. Foundry mechanization and automation.

#### **Unit VI**

**(8)**

Casting Design, Metal pouring, Gating system- design of gating system, solidification time, riser design, Principles of gating, risering and their design methods. Progressive and directional solidification, casting design consideration, Chvorinov's rule, numerical on casting, defects in casting. Fluidity- method of measuring fluidity of metal by spiral technique. Computer applications in casting design and software.

#### **Text Books**

1. Rao P.N., "Manufacturing Technology, Foundry, Forming and welding", 2ed., Tata McGraw-hill publishing, 2006, ISBN 0-07-463180-2.
2. Khanna O.P., "Welding Technology", Dhanpat Rai& sons, 1996.
3. Khanna O.P., "Foundry Technology", Dhanpat Rai& sons, 1999.
4. Parmar R.S., "Welding Process and Technology", 2ed., Khanna Publishers, 1997.

#### **Reference Books**

1. Kalpakjian Serope and Schmid Steven, "Manufacturing Engineering & Technology", 2004.
2. Degarmo E.P. and Black J.T., "Materials & Processes in Manufacturing", 9ed., Prentice hall of India Pvt.Ltd., 2002.
3. Little Richard., "Welding & Welding Technology", Tata Mc-graw hill Publishing, 1992, ISBN 0-07-099409-9.