

| UTKALMANI GOPABANDHU INSTITUTE OF ENGINEERING, ROURKELA<br>Session: 2025-26 |                                               |                                                                                        |                                                                                            |
|-----------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Discipline:<br><b>Metallurgical Engineering</b>                             | Semester:<br><b>5<sup>th</sup></b>            | Name of the Teaching Faculty: <b>Goutam Kumar Majhi</b>                                |                                                                                            |
| Subject:<br><b>Ferrous Metallurgy-II (TH-04)</b>                            | No. of days/per week class allotted: <b>4</b> | Semester from Date: <b>14. 07. 2025</b> to Date: <b>15.11.2025</b><br>No. of weeks: 15 |                                                                                            |
| Week                                                                        | Class Day                                     | Module                                                                                 | Lecture Topics                                                                             |
| 1                                                                           | 1                                             | Chapter -1:<br>Steel Making Processes                                                  | Introduction about steel making                                                            |
|                                                                             | 2                                             |                                                                                        | Brief history of principles of steel making & processes of steel making                    |
|                                                                             | 3                                             |                                                                                        | Bistre steel making & Shear steel making                                                   |
|                                                                             | 4                                             |                                                                                        | Crucible steel making                                                                      |
| 2                                                                           | 5                                             | Chapter -2 Principles of steel making                                                  | Bessemer steel making.                                                                     |
|                                                                             | 6                                             |                                                                                        | Open hearth steel making                                                                   |
|                                                                             | 7                                             |                                                                                        | Reactions involved in steel making                                                         |
|                                                                             | 8                                             |                                                                                        | acid process & basic process of steel making                                               |
| 3                                                                           | 9                                             | Chapter-3: Raw Materials for Steel Making                                              | principles and conditions required in removal of P, S, Si, Mn and C in steel making        |
|                                                                             | 10                                            |                                                                                        | -do-                                                                                       |
|                                                                             | 11                                            |                                                                                        | -do-                                                                                       |
|                                                                             | 12                                            |                                                                                        | Raw materials required for steel making                                                    |
| 4                                                                           | 13                                            | Chapter-4: Steel Making by LD Converter                                                | -do-                                                                                       |
|                                                                             | 14                                            |                                                                                        | important raw materials available in India                                                 |
|                                                                             | 15                                            |                                                                                        | different raw materials of LD process                                                      |
|                                                                             | 16                                            |                                                                                        | construction and operation of LD converter                                                 |
|                                                                             | 17                                            |                                                                                        | -do-                                                                                       |
|                                                                             | 18                                            |                                                                                        | Refining reaction in LD converter with reference to decarburization and dephosphorisation. |
|                                                                             | 19                                            |                                                                                        | -do-                                                                                       |
|                                                                             | 20                                            |                                                                                        | -do-                                                                                       |

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|----|----|------------------------------------------------------------------|---------------------------------------------------------|
| 6  | 21 |                                                                  | Quality of steel and composition of slag in LD process  |
|    | 22 |                                                                  | advantages and limitations of LD process                |
|    | 23 |                                                                  | Bottom, top and combined blowing                        |
|    | 24 |                                                                  | Multi nozzle converter                                  |
| 7  | 25 | Chapter-5: Blast furnace Operation                               | OLP process                                             |
|    | 26 |                                                                  | Tutorial Class                                          |
|    | 27 |                                                                  | Principle of electric arc furnace                       |
|    | 28 |                                                                  | Types of slags prepared by electric arc furnace         |
| 8  | 29 |                                                                  | steps of electric arc furnace heating to produce steel  |
|    | 30 |                                                                  | advantages of electric arc furnace process              |
|    | 31 |                                                                  | steel making induction furnace                          |
|    | 32 |                                                                  | advantages and limitations of induction furnace process |
| 9  | 33 | Chapter-6: Brief Study of Other Recent Processes of Steel Making | Ajax Process                                            |
|    | 34 |                                                                  | OBM Process                                             |
|    | 35 |                                                                  | -do-                                                    |
|    | 36 |                                                                  | Spray Steel Making Process                              |
| 10 | 37 | Chapter-7: De-Oxidation Practice                                 | Different De-Oxidisers and their use                    |
|    | 38 |                                                                  | killed steel, semi killed steel and rimming steel       |
|    | 39 |                                                                  | -do-                                                    |
|    | 40 |                                                                  | Teeming methods                                         |
| 11 | 41 | Chapter-8: Pit Side Practice                                     | Direct pouring, Tundish teeming and Bottom teeming      |
|    | 42 |                                                                  | -do-                                                    |
|    | 43 |                                                                  | Ingot defects, their causes and remedies                |
|    | 44 |                                                                  | -do-                                                    |
| 12 | 45 | Chapter- 9: Continuous Casting of Steel                          | Principle and operation of continuous casting           |
|    | 46 |                                                                  | -do-                                                    |
|    | 47 |                                                                  | Different types of casters                              |
|    | 48 |                                                                  | -do-                                                    |
| 13 | 49 |                                                                  | Moulds and mould maintenance in continuous casting.     |
|    | 50 |                                                                  | Advantages of continuous casting                        |
|    | 51 |                                                                  | Continuous casting of Billets, Blooms and Slabs.        |
|    | 52 | Chapter- 10: Secondary Steel Making Processes                    | Importance of Secondary Steel Making                    |

|    |    |  |                               |
|----|----|--|-------------------------------|
| 14 | 53 |  | VAD Process                   |
|    | 54 |  | VOD Process                   |
|    | 55 |  | AOD Process                   |
|    | 56 |  | -do-                          |
| 15 | 57 |  | Stream degassing process.     |
|    | 58 |  | Revision Class-I              |
|    | 59 |  | Revision Class-II             |
|    | 60 |  | Important question discussion |

### Learning Resources:

| Sl.No | Title of the Book                  | Name of Authors | Name of Publisher               |
|-------|------------------------------------|-----------------|---------------------------------|
| 1.    | . Steel Making                     | R.H.Tupkary     | Khanna                          |
| 2.    | . Steel Making                     | A.K.biswas      | Cootha                          |
| 3.    | Manufacture of iron & Steel Vol II | Bashforth       | Chapman and Hall                |
| 4.    | Elementary Metallurgy (Steel)      | Frier           | Mc Graw Hill                    |
| 5.    | Metal Process engineering          | P.Polukrint     | University Press of the Pacific |
| 6.    | Chemistry of Steel                 | Bodsworth       | CBS                             |
| 7.    | Steel Making                       | V. A. Kudrin    | VRSS Publishing Group           |