# Savitribai Phule Pune University
## Faculty of Science & Technology

# Curriculum

# For
# Bachelor of Vocational (Engineering)
## FOUNDRY TECHNOLOGY
## (Choice Based Credit System)

**(With Effect from Academic Year 2024-25)**

## 1. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant appropriate and adequate technical knowledge together with the professional skills and competencies in the field of Foundry Technology so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired: -

**A. Understanding of**

(a) The relevant basic concepts and principles in foundry so that the students are able to understand the different vocational subjects.

(b) The basic concepts in engineering drawing.

(c) The concepts, principles of working of basic manufacturing processes.

(d) The knowledge of testing procedure of components and circuits by making use of different test instruments.

(e) Different types of furnaces.

(f) The concepts and principles used in casting processes

**B. Adequate Professional Skills and Competencies in**

(a) Testing different foundry components.

(b) Testing the performance of foundry.

(c) Locating the fault at component level and at the stage level.

**C. A Healthy and Professional Attitude so that the student has**

(a) An analytical approach while working on a job.

(b) An open mind while locating/rectifying faults.

(c) Respect for working with their own hands.

(d) Respect for honesty, punctuality and truthfulness

**D.** NSQF compliant skills in Qualification developed by sector skill council in Automobile sector

## 3. Course Structure:

The course will consist of combination of practice, theory and hands on skills in the Automobile sector.

**Curriculum:**

The curriculum in each of the years of the programme would be a suitable mix of general education and skill components.

**Skill Development Components:**

- The focus of skill development components shall be to equip students with appropriate knowledge, practice and attitude, to become work ready. The skill development components will be relevant to the industry as per its requirements.
- The curriculum will necessarily embed within itself, National

Occupational Standards (NOSs) of specific job roles within the industry. This would enable the students to meet the learning outcomes specified in the NOSs.

- The overall design of the skill development component along with the job roles selected will be such that it leads to a comprehensive specialization in few domains.
- The curriculum will focus on work-readiness skills in each of the year of training.
- Adequate attention will be given in curriculum design to practical work, on the job training, development of student portfolios and project work.

**General Education Component**:

- The general education component adheres to the normal senior secondary and university standards. It will emphasize and offer courses which provide holistic development. However, it will not exceed 40% of the total curriculum.
- Adequate emphasis is given to language and communication skills.

# B. Voc. Foundry Technology Syllabus for First Year

**Structure for Semester-I**

| Course Code | Course Name | Teaching Scheme (Hours/Week) | | Examination Scheme and Marks | | | | | | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | ISE | ESE | TW | PR | OR | Total | TH | PR | Total |
| 101 | Communication Skills | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 102 | Engineering Graphics | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 103 | Engineering Materials | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 104 | Engineering Graphics -Lab | | 02 | | | | 50 | -- | 50 | -- | 01 | 01 |
| 105 | On Job Training | | 24 | | | 200 | | | 200 | | 12 | 12 |
| | Total | 09 | 26 | 150 | 150 | 200 | 50 | -- | 550 | 09 | 13 | 22 |

**Structure for Semester-II**

| Course Code | Course Name | Teaching Scheme (Hours/Week) | | Examination Scheme and Marks | | | | | | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | ISE | ESE | TW | PR | OR | Total | TH | PR | Total |
| 201 | Casting Processes | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 202 | Melting Technology | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 203 | Measurement Metrology | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 204 | Casting Processes - Lab | | 02 | | | | 50 | -- | 50 | | 01 | 01 |
| 205 | Melting Technology - Lab | | 02 | | | | 50 | | 50 | | 01 | 01 |
| 206 | On Job Training | | 24 | | | 200 | | | 200 | | 12 | 12 |
| | Total | 09 | 28 | 150 | 150 | 200 | 100 | -- | 600 | 09 | 14 | 23 |

*On Job Training should be carried out in any one subject per semester as per NSDC Guide lines for following Skill Sets:

1. **Casting Line Supervisor (ASC/Q/3206)**
2. **Heat Treatment Supervisor (ASC/Q3902)**
3. **Machine Shop Supervisor (ASC/Q3505)**

| Structure for Semester-III | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **Teaching Scheme (Hours/Week)** | | **Examination Scheme and Marks** | | | | | | **Credits** | | |
| | | **Theory** | **Practical** | **ISE** | **ESE** | **TW** | **PR** | **OR** | **Total** | **TH** | **PR** | **Total** |
| 301 | Physical Metallurgy-I | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 302 | Machine Drawing | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 303 | Fuels, Furnaces and refractories | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 304 | Moulding Technology-Lab | | 02 | | | | 50 | -- | 50 | | 01 | 01 |
| 305 | Machine Drawing Lab | | 02 | | | | 50 | -- | 50 | -- | 01 | 01 |
| 306 | On Job Training | | 24 | | | 200 | | | 200 | | 12 | 12 |
| | Total | 09 | 28 | 150 | 150 | 200 | 100 | -- | 600 | 09 | 14 | 23 |

| Structure for Semester-IV | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **Teaching Scheme (Hours/Week)** | | **Examination Scheme and Marks** | | | | | | **Credits** | | |
| | | **Theory** | **Practical** | **ISE** | **ESE** | **TW** | **PR** | **OR** | **Total** | **TH** | **PR** | **Total** |
| 401 | Physical Metallurgy-II | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 402 | Steel Casting Production | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 403 | Non-Ferrous Casting Production | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 404 | Foundry Technology Lab Practice-1 | | 02 | | | | 50 | | 50 | | 01 | 01 |
| 405 | Iron Casting Production Lab | | 02 | | | | 50 | | 50 | | 01 | 01 |
| 406 | On Job Training | | 24 | | | 200 | | | 200 | | 12 | 12 |
| | Total | 09 | 28 | 150 | 150 | 200 | 100 | -- | 600 | 09 | 14 | 23 |

**Structure for Semester-V**

| Course Code | Course Name | Teaching Scheme (Hours/Week) | | Examination Scheme and Marks | | | | | | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | ISE | ESE | TW | PR | OR | Total | TH | PR | Total |
| 501 | Secondary Steel Making | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 502 | Process Modeling and Computer Applications in Foundry | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 503 | Fundamentals of Industrial Management | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 504 | Project Work-Stage I | | 04 | | | 100 | | | 100 | | 02 | 02 |
| 505 | On Job Training | | 24 | | | 200 | | | 200 | | 12 | 12 |
| | Total | 09 | 28 | 150 | 150 | 300 | -- | -- | 600 | 09 | 14 | 23 |

**Structure for Semester-VI**

| Course Code | Course Name | Teaching Scheme (Hours/Week) | | Examination Scheme and Marks | | | | | | Credits | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | ISE | ESE | TW | PR | OR | Total | TH | PR | Total |
| 601 | Energy Conservation and Pollution Control | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 602 | Fracture Mechanics and analysis of Failure | 03 | | 50 | 50 | | | | 100 | 03 | | 03 |
| 603 | Project Work-Stage II | | 04 | | | 200 | | | 200 | | 02 | 02 |
| 604 | On Job Training | | 24 | | | 200 | | | 200 | | 12 | 12 |
| | Total | 06 | 28 | 100 | 100 | 400 | | | 600 | 06 | 14 | 20 |

# Semester - I
# Syllabus

**Syllabus**
Name of the Course: B. Voc (Foundry Technology)
Semester I

## Subject Name: Communication Skills

| | | |
|---|---|---|
| Course Code: **101** | Semester: **I** | |
| Weekly Teaching Hours: TH: **03** Tut: **00** | Scheme of Marking TH: 100 | ISE: 50, ESE:50 |
| Credit:**3** | Scheme of Marking PR: -- | |

**Unit – I Communication** **08 Hrs**

Meaning of Communication, Importance of Communication, Types of communication. Process of communication, Communication network in an organization, Barriers to communication, Essentials of good communication.

**Unit – II Remedial English Grammar** **07 Hrs**

Articles, agreement between verb and subject, uses of tenses, Modal and their uses, Prepositions. Understanding and applying Vocabulary: One-word substitutes, Synonyms and Antonyms. Word formation: -Prefixes, Bases and Suffixes.

**Unit – III Listening Skills** **07 Hrs**

The process of listening, Types of listening, Benefits of effective listening, Barriers to listening, listening to announcements at work place.

**Unit – IV Reading Skills** **07 Hrs**

Process and methodologies of reading, Skimming and scanning, Levels of reading, Proofreading, Summarizing, Precise writing, Unseen comprehension passage, Note taking and reviewing, convert the given information into charts and graphs.

**Unit – V Writing Skills** **07 Hrs**

Main Forms of Written Communication: Notices, Drafting an E-mail. Correspondence: Personal and Official, Notices, Technical Report Writing, Preparing agenda and minutes of meetings.

**Books**


| Name of Authors | Title of the Book | Publisher |
|---|---|---|
| 1) Sethi, J & et al | A Practice Course in English Pronunciation | Prentice Hall of India, New Delhi |
| 2) Sen, Leena., | Communication Skills | Prentice Hall of India, New Delhi |
| 3) Prasad P. | Communication Skills | S.K. Kataria & Sons |
| 4) Bansal, R.K. and J.B.Harrison | Spoken English | Orient Language. |
| 5) McCarthy | Michael; English Vocabulary in Use | Cambridge University Press. |
| 6) Dr. Ashok Kumar Singh | One Word Substitution | Arihant Publications (India) Pvt, Ltd |
| 7) Rajinder Pal and Prem Lata | English Grammar and Composition | Sultan Chand Publication |

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology) | |
|---|---|
| **Subject Name: Engineering Graphics** | |
| Course Code: 102 | Semester: I |
| Weekly Teaching Hours: TH: 03 | Marking Scheme ISE TH: 50, ESE TH: 50 |
| Credit:3 | |

**Unit I- Introduction to drawing, lines and lettering** **07 Hrs**

- Definition and classification of drawing
- Drawing instruments such as; drawing board, drawing sheets, drafter.
- Types of pencils, sheets, eraser etc.
- Different types of lines (Straight line, inclined line and curved lines)
- Practice engineering style for letters and numbers as BIS: SP:46-2003

**Unit II - Dimensioning and scale** 0**6 Hrs**

- Importance of dimensioning
- Types (i.e. chain, parallel and progressive etc.) and methods of placing dimensioning, Principles of dimensioning and practice dimensioning technique as BIS: SP: 46-2003, Free hand sketching of straight lines, circle, square, Polygons

**Unit III -Introduction to Projection** **07 Hrs**

- Introduction to first and third angle projection,
- Introduction to projection of point, line and plane, Sectioning of solids

**Unit IV- Isometric and Orthographic projection** **09 Hrs**

- Orthographic projection of simple geometric solids
- Isometric drawing of simple geometric solids

**Unit V- Geometric and dimensioning Tolerance** **07 Hrs**

- Component Drawing and interpretation
- Geometric dimension and Tolerance
- Introduction to CAD software used in drawing

**Books:**


1. N.D. Bhatt and V.M. Panchal Enginering Drawing Plane and Solid Geometry Forty-Fourth Edition2002, Charotar Publishing House
2. Laxmi Narayan and Vaishwanar Engineering DrawingCharotar Publishing House
3. P.S. Gill Engineering Graphics and Drafting Milenium Edition S.K. Kataria and Sons
4. Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology) | |
|---|---|
| **Subject Name: Engineering Materials** | |
| Course Code: 103 | Semester: I |
| Weekly Teaching Hours: TH: 03 | Marking Scheme ISE TH: 50, ESE TH: 50 |
| Credit:3 | |

**Unit I - Ferrous metals:** **06 Hrs**

Physical and mechanical properties viz. strength, elasticity, ductility, toughness, malleability, brittleness, hardness, stiffness, fatigue, Classification of iron and steel; pig iron, cast iron, wrought iron, steel, alloy steel, stainless steel and carbon steels.

**Unit II - Non-ferrous metals:** **06 Hrs**

Non- ferrous metals, Introduction to metals aluminum, copper, zinc, lead, tin, nickel and magnesium and their alloys; physical and mechanical properties of all the above alloys.

**Unit III - Engineering plastics and fiber:** **06 Hrs**

Important sources of plastics, Classification – thermoplastic and thermosetting, Various trade names of engineering plastics, Fiber and their classification: Inorganic and organic fibers, Usage of fiber. Plastics; Introduction, types of plastics, properties, composition and their applications.

**Unit IV - Insulating material:** **06 Hrs**

Various heat insulating material and their usage like asbestos, glass wool, cork, clay, thermocole, various electrical insulating material and their use like China clay, leather, Bakelite, ebonite, glass wool, rubber felt. Composite materials: Introduction, properties and application.

**Unit V - Fuels:** **06 Hrs**

Coal, coke, liquid fuel, light diesel Oil (LDO), HSD, LPG, Natural gas, Principles of efficient combustion, liquid and gas fuel burners.

**Unit 6 - Refractories:** **06 Hrs**

Definition, classification and properties of refractories, Manufacture of Refractories, Testing of refractories Specific gravity, Bulk density, Porosity, Refractoriness, Slag attack, Cold crushing strength, Refractory failures due to slagging, abrasion, fusion, spalling.

**Books:**


1. Material science, RK Rajput, SK Kataria and sons, Ludhiana
2. Material science and engineering Raghavan Prentice Hall of India, Delhi
3. Material science and engineering Srivastava New age international (P) Ltd.
4. Materials and metallurgy OP Khanna Dhanpatrai

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester-I | |
|---|---|
| **Subject Name: Engineering Graphics Lab** | |
| Course Code: 104 | Semester: I |
| Weekly Practical's: PR: 02 | Marking Scheme PR: 50 |
| Credit:01 | |

**Practical No. 1-**

- Prepare drawing sheet by using different types of lines
- Prepare drawing sheet by Bisection of line, angle, arc.

**Practical No. 2-**

- Prepare drawing sheet

a) To divide line of length 120mm into 9equal parts

b) To divide a circle into 12 equal parts by using engineering compass

c) To divide a circle into 8 equal parts by using set square

**Practical No. 3-**

- Prepare drawing sheet of projection of point, line & plane.

**Practical No. 4-**

- Prepare drawing sheet of orthographic projection
- Prepare drawing sheet of isometric projection.

**Practical No. 5-**

Prepare drawing sheet by using any CAD software on any topic mentioned above

# Semester - II
# Syllabus

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - II | |
|---|---|
| **Subject Name: Casting Processes** | |
| Course Code: 201 | Semester: II |
| Weekly Teaching Hours: TH: 03 | Marking Scheme ISE TH: 50, ESE TH: 50 |
| Credit:3 | |

**Unit I – Intoduction to casting processes** **8 Hrs.**

Moulding materials and their requirements; Patterns: Types and various pattern materials Sand Casting, basic steps in making sand castings, Advantages of special casting techniques over sand casting method.

**Unit II – Allowances, Properties of Materials** **6 Hrs**

Pattern Allowances, Types of moulding sand, Properties of moulding sand

**Unit III -Different Casting Processes** **7 Hrs**

Plaster mold casting, Permanent mold casting, Shell mold casting

**Unit IV- Die casting** **8 Hrs**

Gravity and pressure die casting, Hot chamber and cold chamber, Centrifugal casting, Investment casting, $CO_2$ process of casting, Continuous process.

**Unit V - Castings Defects:** **7 Hrs.**

Causes and remedies of following defects
Blow holes, Gas holes, Pin holes,
Scabs, Hots tears, Cold cracks, Shrinkage cavity.

**Books:**


1. Principles of Metal casting - R. Heine &Rosenthall, TMH
2. Foundry Engineering - Howard F. Taylor, Wiley Eastern Ltd.
3. Test book of foundry technology - M.Lal& O.P. Khanna, DhanpatRai& Sons.
4. Foundry Engineering - T.R. Banga, R.L. Agrawal& T. Manghnani
5. Foundry technology - K.P. Sinha& D.B. Goel, Standard Publishers & Distributors.
6. Foundry Engineering - P.L. Jain. TMH.
7. Applied metallurgy - S. Burton.
8. Metal Casting Technology - P.C. Mukherjee, Oxford & IBH
9. Principal of foundry technology by P. L. Jain
10. Fundamental of metal casting by P.C.Mukherji.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - II | |
|---|---|
| **Subject Name: Melting Technology** | |
| Course Code: 202 | Semester: II |
| Weekly Teaching Hours: TH: 03 | Marking Scheme ISE TH: 50, ESE TH: 50 |
| Credit:3 | |

**Unit I - Melting of primary and secondary metals:** **08 Hrs.**

Basics of melting scrap and smelting, handling and characterization of scrap, cleaning and bailing charge preparation control and charge balance, general methods of charging in furnaces, changes for SG cast iron.

**Unit II - Melting technology:** **07 Hrs.**

Role of flux; Reducing agents; Air reductants and chemical additives, in the furnaces; types and, selection of furnaces suitable for specific metals; cupola, induction, rotary, pit furnaces their operation and nature/characteristics of product there from; role of temperature and superheat; acid, basic and neutral operations; post melting treatment and air furnaces; melting of various types of cast iron, steel, aluminum, brass, SG cast iron.

**Unit 3 - Composition control and melt quality:** **07 Hrs.**

Importance of metal cleanliness; endogenous and exogenous inclusions; need of formation of right quality and nature of slag; oxygen, chlorine or argon blowing to improve melt quality; role of temperature and super heat.

**Unit 4 - Efficient Operation:** **07 Hrs.**

Control of fuel consumption, quality of fuel coke in context to Sulphur and ash, use of hot blast cupola; method of producing hot blast. Use of recuperators and regenerators, regulation control of power input into the furnaces, comparison of power input into different furnaces.

**Unit 5 - Handling of liquid metal:** **07 Hrs.**

Different methods to consume liquid metal, ingot, pigging, power production, casting etc. economic output, management of liquid metal; handing devices, preheating of laddles; use of vacuum assisted equipment for degasification, killing and rimming of steels, inoculation in SG cast iron and its control.

**Books:**

1. Principles of Metal casting - R. Heine &Rosenthall, TMH
2. Foundry Engineering - Howard F. Taylor, Wiley Eastern Ltd.
3. Test book of foundry technology - M.Lal& O.P. Khanna, DhanpatRai& Sons.
4. Foundry Engineering - T.R. Banga, R.L. Agrawal& T. Manghnani
5. Foundry technology - K.P. Sinha& D.B. Goel, Standard Publishers & Distributors.
6. Foundry Engineering - P.L. Jain. TMH.
7. Applied metallurgy - S. Burton.
8. Metal Casting Technology - P.C. Mukherjee, Oxford & IBH
9. Principal of foundry technology by P. L. Jain

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester-II | |
|---|---|
| **Subject Name: Measurement Metrology** | |
| Course Code: 203 | Semester: II |
| Weekly Teaching Hours: TH: 03 | Marking Scheme ISE TH: 50, ESE TH: 50 |
| Credit:3 | |

**Unit I - Basic Concepts of Measurements (09 hrs)**

Need for measurement – Dimensional and Form tolerances – Precision and Accuracy – Errors in Measurements – Causes – Types – Handling of measuring instruments – Maintenance of Instruments – Standards and Practice – Metrology lab – Environment and conditions.

**Unit II - Types of measurement and measuring instruments (09 hrs)**

Linear measurement: Steel rule, Calipers, Vernier Calipers, Micrometers, Height gauge, Slip gauge.
Angular and taper measurement:
Protectors, Engineering square, Adjustable bevel, Bevel protectors, Dividing head, Sine bar, Sine centers, Angle gauge, Clinomometers, Autocollimators, Taper gauges.
Surface measurement: Spirit level, Straight edge, Surface gauge, Optical flat, Interferometer, Surface plate.

**Unit III - Optical Measurements (09 hrs)**

Optical microscope, Vision systems, Precision instrument based on Laser – Use of Lasers – Principle – Laser

**Unit IV - Advances in Metrology (09 hrs)**

Co-ordinate measuring machine – Constructional features – Types – Applications of CMM – CNC. CMM applications – Computer Aided Inspection – Machine Vision – Applications in Metrology.

**Books:**


1. Rajput,R.K., "Mechanical Measurement and Instrumentation (including Metrology and Control System)", S.K. Kataria and Sons.
2. Jain, R. K., "Engineering Metrology", Khanna Publishers
3. Considine, D.M., “Process Instruments and Controls Handbook”, McGraw-Hill, New York, Third Edition, 1985.
4. Wolf, S. and Smith, R.F.M., “Students Reference Manual for Electronic Instrumentation Laboratories”, Prentice Hall, Englewood Cliffs, New Jersy, 1990.
5. Gaylor, Shotbolt and Sharp, "Metrology for Engineers”, 5th Edition, O.R.Cassel, London,1993.
   Jain. R.K., "Engineering Metrology”, 19th Edition, Khanna Publishers, 2005.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - II | |
|---|---|
| **Subject Name: Casting Processes Lab** | |
| Course Code: 204 | Semester: II |
| Weekly Practical's: PR: 02 Tut: 00 | Marking Scheme PR: 50 |
| Credit:1.5 | |

1. Study of sand-casting process and its process control parameters.
2. Study of die casting process and its process control parameters.
3. Study of shell molding casting process.
4. Study of $CO_2$ process of casting.
5. Study of investment casting process.
6. Study of different types of defects.
7. Industrial visit to study any one type of casting process.

| Syllabus<br>Name of the Course: B. Voc. (Foundry Technology)<br>Semester - II | |
|---|---|
| **Subject Name: Melting Technology Lab** | |
| Course Code: 205 | Semester: I |
| Weekly Practical's: PR: 02 Tut: 00 | Scheme of Marking TH:00 |
| TH Exam Duration: | Scheme of Marking PR: 50, Total: 50 |
| Credit:1.5 | |

1. Study of different types of raw materials, scrap and ferroalloys and their effectiveness in melting process for SG iron.
2. Study of different types of raw materials, scrap and alloys and their effectiveness in melting process for aluminum melting.
3. Study of melt quality improvement in SG iron melting.
4. Study of melt quality improvement for Aluminum melting.
5. Study of charge calculations for melting S.G. Iron / Aluminum alloys. (any one)
6. Study of different types of ladles used in handling liquid metal for ferrous and non-ferrous metals.
7. Study of inoculation and control of SG iron quality in pouring.
8. Study of different methods used to improve quality of aluminum castings.

# Semester - III
# Syllabus

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - III | |
|---|---|
| **Subject Name: Physical Metallurgy-I** | |
| Course Code: 301 | Semester: III |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit I: Crystallography - 08Hrs.**
Crystal structures, Bravais lattice, crystal structures in metals and alloys-BCC, FCC, HCP; Miller indices for planes and directions, average no of atoms, co-ordination number and APF;

**Unit II: Crystallization 07 Hrs.**
Process of solidification- nucleation and growth- critical nucleus size; cooling curves for metals and alloys, Gibbs phase rule; Equilibrium diagrams-

**Unit III: Equilibrium Diagrams - 07 Hrs.**
To draw equilibrium diagrams using cooling curves, Equilibrium diagram types-Eutectic, peritectic systems, etc.; Types of phases- solid solutions, types and properties, intermetallic Compounds and intermediate phases; long range and short-range freezing alloys- coring and dendritic structures;

**Unit IV: Iron-Iron carbon equilibrium diagram - 07 Hrs.**
Phases, compositions, temperatures; study of effect of alloying elements on iron-iron carbon diagram;

**Unit V: Non-ferrous equilibrium diagrams - 07 Hrs.**
Equilibrium diagrams of Aluminum alloys, copper alloys, magnesium alloys, tin alloys.

**Books:**
1. Introduction to Physical Metallurgy- Sidney H Avner- Tata McGraw Hill
2. Applied metallurgy - S. Burton
3. Material Science and Metallurgy- V.D. Kodgire
4. Physical Metallurgy- Vijendra Singh- Standard Publishers and Distributors, New Delhi
5. Physical Metallurgy- Vol I and II
6. Metallurgy for Engineers- Clark and Varney

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - III | |
|---|---|
| **Subject Name: Machine Drawing** | |
| Course Code: 302 | Semester: III |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit I: Principles of drawings:** **09 Hrs.**

Classification of drawings, review of drawing sheet sizes & layout recommended by BIS, types of lines, scales used in engineering drawing, sections, types of sections, conventional representation of engineering materials and machine components, methods of dimensioning, symbolic representations of welds and surface finish.

**Unit II: Sketching of machine components**: 09 **Hrs.**

Screw thread terminology, forms of threads, conventional representation of threads, multiple start threads, RH & LH threads, type of nuts and bolts, washers, locking arrangements for nuts, foundation bolts, types of keys, cotter joint and knuckle joints, rigid coupling, flange coupling & flexible coupling, flat and V belt pulleys, sliding and rolling contact bearings: journal bearing, bush bearing, pedestal bearing, pivot bearing, ball & roller bearings

**Unit III: Gear drives:** **09 Hrs.**

Gear Terminology, introduction to spur gear, helical gear, bevel gear, worm & worm wheel, gear materials, forms of teeth, advantages & disadvantages

**Unit IV: Elements of Production Drawings**: **09 Hrs.**

Limits fits & tolerances- significance, types and selections, hole basis & shaft basis system, Surface roughness- terminology symbols, characteristics, representation of elements on production drawings.

**Reference Books:**

1. Gill P.S., "Engineering drawing", S.K. Kataria & Sons.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
3.0 Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing
Company Limited, New Delhi, 2008.

**Publication of Bureau of Indian Standards**:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - III | |
|---|---|
| **Subject Name: Fuels, Furnaces and refractories** | |
| Course Code: 303 | Semester: III |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit I: Classification of fuels** **09 Hrs.**

Solid liquid and gaseous, natural and synthetic liquid fuels, their advantages and limitations.

**Unit II: Principles of combustion** **09 Hrs.**

Calorific value, speed and combustion, requirements of air, or oxygen, properties of flames, combustion problems, non-conventional energy.

**Unit III: Furnaces** **09 Hrs.**

Classification of furnaces based on heating methods and refractories used basic principles of fuel fired, resistance, induction and arc furnaces, furnace lining, furnace atmospheres, furnace Efficiency.

**Unit IV: Refractories** **09 Hrs.**

Classification of refractories, their properties and uses in foundry industries.

**Reference Books:**

1. Industrial Furnaces- Trinks, Mawhinney, Shannon, Reed and Garvey- J.R. Publishers
2. Principles of Metal casting - R. Heine & Rosenthall, TMH
3. Refractories and Furnaces- Francis Thompson Havard- McGraw Hill

| Syllabus<br>Name of the Course: B. Voc. (Foundry Technology)<br>Semester - III | |
|---|---|
| **Subject Name: Moulding Technology Lab** | |
| Course Code:304 | Semester: III |
| Weekly Practical's: PR: 02 | Marking Scheme PR: 50 |
| Credit:01 | |

1. Study of different foundry tools & their functions.
2. Study of types of Patterns. Making of Pattern. Pattern making tools & equipment. Design of pattern & pattern making.
3. Study of composition and content of green sand moulding. Control of properties of green sand moulding. Typical analysis of moulding sand used in foundry. (Any one foundry)
4. Testing of moulding and core sand. Sand testing experiments to determine:
   - Grain Fineness Number
   - Compatibility Test
   - Green Strength
   - Moisture content test
5. Preparation of cores for hollow castings. Making of CO2 mould or core. Making of shell mould or core. Prepare No-bake mould and core. Demonstration of types of cores. (any 2-core making process)
6. Visit to advance foundry to study sand plant operations. Write report of visit.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - III | |
|---|---|
| **Subject Name: Machine Drawing Lab** | |
| Course Code: 305 | Semester: III |
| Weekly Practical's: PR: 02 | Scheme of Marking PR: -50 |
| Credit:01 | |

**List of Practical's/ Experiments/ Assignments (minimum six assignments should be completed)**

1. Two full imperial drawing sheets, one consisting of screw thread terminology and the other consisting of details of any one standard component such as flange coupling, components of various machine tools, pumps, joints, engine parts, etc.
2. Two assignments of AutoCAD: Orthographic Projections of any one simple machine component such as bracket, Bearing Housing or Cast component for Engineers such as connecting rod, Piston, etc.; with dimensioning and detailing of three views of components.
3. One full imperial drawing sheet consisting the drawing/sketches of representation of standard components, symbolic representations of welds, surface finish symbols and grades, limit, fit and tolerance sketches.
4. 3-D model at least one simple machine component.

# Semester - IV
# Syllabus

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - IV | |
|---|---|
| **Subject Name: Physical Metallurgy-II** | |
| Course Code: 401 | Semester: IV |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit I: Principles of heat treatment - 06 Hrs.**

Definition and basic requirements for alloys to be heat treated, heat treatability; advantages and purposes of heat treatment. Transformation of pearlite to austenite upon heating, mechanism and kinetics of transformation, austenite grain size; Transformation of austenite to pearlite, upper and lower bainite and martensite upon cooling-mechanism and kinetics of transformation;

**Unit II: Annealing, Normalizing and TTT diagrams - 06 Hrs.**

Annealing and Normalizing - Process parameters, types, effect on structure, properties and applications. Hardening-process parameters, relation of temperature and time on hardness;

Construction of TTT diagram, effect of carbon percentage and alloying element on TTT diagram, uses and significance of TTT diagrams; CCT diagrams- Construction and significance;

**Unit III: Quenching and Surface hardening - 06 Hrs.**

Quenching - Quenching media, mechanism of quenching; Hardenability, Hardenability test; Tempering - Purpose, types, transformations during tempering, applications;

**Unit IV: Surface hardening - 06 Hrs.**

Principle, purposes and types; Flame hardening, Induction hardening- Types, process control, case depth obtained, advantages, limitations and applications; Case Hardening- Carburizing, Nitriding, Carbonitriding - Process control, case depth obtained, advantages, limitations and applications;

**Unit V: Heat treatment for Cast Iron and non-ferrous alloys - 06 Hrs.**

Cast iron - Annealing, Stress relieving, Quenching, Tempering- Process parameters, advantages, limitations and applications.

non-ferrous alloys - Homogenization annealing, stress relief annealing, recrystallization annealing;

**Unit VI: Precipitation Hardening - 06 Hrs.**

Basic requirement of alloys, mechanism, structural transformations, precipitation hardenable alloys, effect of temperature, time on precipitation hardening.

**Reference Books:**

1. Principles of Heat Treatment- Rajan Sharma
2. Introduction to Physical Metallurgy- Sidney H Avner- Tata McGraw Hill
3. Applied metallurgy - S. Burton
4. Material Science and Metallurgy- V.D. Kodgire
5. Physical Metallurgy- Vijendra Singh- Standard Publishers and Distributors, New Delhi
6. Physical Metallurgy- Vol I and II
7. Metallurgy for Engineers- Clark and Varney

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - IV | |
|---|---|
| **Subject Name: Steel Casting Production** | |
| Course Code: 402 | Semester: IV |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit I: Introduction to Steels -** **08 Hrs.**
Classification, properties and applications of carbon and alloy steels,

**Unit II: Melting and Solidification of steel -** **07 Hrs.**
Solidification mechanism, melting of carbon and alloy steels in electric arc and induction furnaces. Melting and casting quality.

**Unit III: Basic Practices and Reactions of Steel –** **07 Hrs.**
Acid and basic practices. Main chemical reaction in electric arc furnace. AOD, oxidation and refining, fluxing; Sulphur and phosphorous removal, deoxidation, methods of degassing, tapping and pouring.

**Unit IV: Methoding for Steel -** **07 Hrs.**
Gating and feeding practices; mould and core making practice for steel, fettling and salvaging for steel castings.

**Unit V: Heat treatment for steel castings -** **07 Hrs.**

**Reference Books:**
1. Introduction to Modern Steel Making- V.R. Tupkari
2. Fundamentals of Steel Making- E.T. Turkdogan- The Institute of Materials, London
3. The Making, Shaping and Treating of Steel- Steel Making and Refining Vol.- AISE Steel Foundation, Pittsburg, USA.
4. Principles of Foundry Technology–P.L. Jain- Tata McGraw Hill
5. Principles of Metal casting - R. Heine &Rosenthal, TMH
6. ASM Metal Handbook- Vol.-4, Casting
7. Foseco Ferrous Foundryman's Handbook- John R. Brown- Butterworth Heinemann Pub.
8. Foundry Technology- Peter Beeley- Butterworth Heinemann Pub.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - IV | |
|---|---|
| **Subject Name: Non-Ferrous Casting Production** | |
| Course Code: 403 | Semester: IV |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit I: Introduction to Non-Ferrous Alloys - 08 Hrs.**
Composition, solidification, structure, properties and applications of aluminum, magnesium, copper and zinc-based alloys;

**Unit II: Melting and Solidification of Non-Ferrous alloys - 07 Hrs.**
Charge calculations, hardeners; oxidation and gas absorption in non-ferrous alloys, detection of gases;

**Unit III: Basic Practices and Reactions of Non-Ferrous alloys - 07 Hrs.**
Melting, fluxing, degassing and pouring practices, filtration of non-ferrous melt; melt treatment for alloying modification and grain refinement.

**Unit IV: Moulding for Non-Ferrous alloys - 07 Hrs.**
Mould and core practices, metal mould reaction, gating and feeding practices for non-ferrous alloy castings;

**Unit V: Defects and defect analysis of Non-Ferrous Alloys - 07 Hrs.**
Defect analysis, salvaging of non-ferrous alloy castings.

**Reference Books:**

1. Metal Casting Principles and Practice- T.V. Ramana Rao- New Age International Publishers
2. Principles of Foundry Technology–P.L. Jain- Tata McGraw Hill
3. Principles of Metal casting - R. Heine &Rosenthal, TMH
4. Fundamental of metal casting -P.C.Mukherji
5. Metal Casting Technology - P.C. Mukherjee, Oxford & IBH
6. ASM Metal Handbook- Vol.-4, Casting
7. Foseco Non-Ferrous Foundryman's Handbook- John R. Brown- Butterworth Heinemann Pub.
8. Foundry Technology- Peter Beeley- Butterworth Heinemann Pub.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - IV | |
|---|---|
| **Subject Name: Foundry Technology Lab practice -1** | |
| Course Code: 404 | Semester: IV |
| Weekly Practical's: PR: 02 | Scheme of Marking PR:50 |
| Credit:01 | |

1. **Mechanical Testing of Castings: It will cover following test;**
   a) Tensile Test:
      a) Preparation of test samples from the castings.
      b) Dimension of the test specimen
      c) Operation of mechanical testing equipment
      d) Data collection during testing
      e) Observation and analysis of data
   b) Hardness Test:
      - Carry out Brinell Hardness Test and record the test report.
   c) Impact test:

2. **Visit to a foundry, layout of foundry shop, report on casting quality control test and diagnosis of defects in castings components.**
      a) Resources: Literatures, industry profile, Inspection report

**3. Industrial visit report on – Detail report on Melting ferrous OR non-ferrous castings.**
      b) Raw material used
      c) Charge calculations (For specific grade)
      d) Melting operations / Furnace operation
      e) Composition adjustment
      f) Liquid Metal / Heat – Quality test for chemical analysis
      g) Tapping and pouring
         - Mg treatment / inoculation practice (For grey and SG iron)
         - Degasing / fluxing (for Aluminium / non-ferrous alloys)
      h) Pouring into mould
      i) Final sample for chemical analysis.

   Report writing for all above activities.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - IV | |
|---|---|
| **Subject Name: Iron Casting Production (Lab / Practical)** | |
| Course Code: 405 | Semester: IV |
| Weekly Practical's: PR: 02 | Scheme of Marking PR: -50 |
| Credit:01 | |

**Practical:**

1. Effect of different alloying elements in grey and S.G. Iron castings.
2. Study of inoculation practices in Grey Cast Iron production.
3. Study of inoculation practices in S.G. Iron production.
4. Study of different Mg treatment methods used in the production of S.G. Iron castings.
5. Visit to any one foundry to understand the methods used for inoculation and Mg treatment. Write a report on it.
6. Casting defects analysis for different cast iron castings.

# Semester - V
# Syllabus

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - V | |
|---|---|
| **Subject Name: Secondary Steel Making** | |
| Course Code: 501 | Semester: V |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit 1**. Introduction- Special grade steels, development of secondary steel making and their importance. **08 Hrs.**

**Unit 2.** Sources of inclusions, Sulphur, phosphorous and gasses in steels,
Secondary steel making Technologies; Inert gas purging, vacuum degassing- deoxidation; ladle furnace. **07 Hrs.**

**Unit 3**. VOD- theory and practice; Powder injection system; physical chemical and fluid dynamic aspects of powder injection and stirring processes; role of slag and powders in inclusion control, Desulphurization and dephosphorization, cored wire feeding **07 Hrs.**

**Unit 4**. Production of ultra-low S, P and inclusion free steels, ultra-low carbon steels **07 Hrs.**

**Unit 5.** Raw materials for secondary steel making, addition of Ca-Si, ferro alloys etc. **07 Hrs.**
Ladle lining, properties and selection of refractories.

**Reference Books:**

1. Introduction to Modern Steel Making- V.R. Tupkari
2. Fundamentals of Steel Making- E.T. Turkdogan- The Institute of Materials, London
3. The Making, Shaping and Treating of Steel- Steel Making and Refining Vol.- AISE Steel Foundation, Pittsburg, USA.
4. Pinciples of Foundry Technology–P.L. Jain- Tata McGraw Hill
5. Principles of Metal casting - R. Heine & Rosenthall, TMH
6. ASM Metal Handbook- Vol.-4, Casting

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester-V | |
|---|---|
| **Subject Name: Process Modeling and Computer Applications in Foundry** | |
| Course Code: 502 | Semester: V |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit 1.** Introduction to 2D drawing, 2D modeling using AutoCAD software**.** **09 Hrs**

**Unit 2**. Principles of model development, Introduction to 3D modeling; 3D modeling of molds & forging dies using solid modeler. **09 Hrs**

**Unit 3.** Simulation and analysis of close die forging of forged components such as gear blank using FEM based software packages. **09 Hrs**

**Unit 4.** Simulation of metal flow in moulds, effect of Moulding practices on solidification in castings using industry standard FEM based software packages. **09 Hrs**

**Practical:**

- 3D modelling case study of any one mould/die/pattern
- Simulation analysis of metal flow in moulds/patterns/die with any simulation software.

Furnish the report of above practical and submit to the Subject teacher.

**Reference Books:**


1. CAD-CAM Principles & Applications- Groover
2. Computer Aided Design and Manufacturing - Paperback
3. Computer Aided Graphics and Product modeling- Pande
4. CAD CAM Automation- Farandak Haidri- Nirali Publication
5. Drawing for Product Designer- Kevin Henry
6. CAD CAM Concept & Application- Allava Chankeshwara
7. Mastering CAD CAM- Ibrahim Zaidi

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - V | |
|---|---|
| **Subject Name: Fundamentals of Industrial Management** | |
| Course Code :503 | Semester: V |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit – I** **Concept of Quality** **08 Hrs**

- Quality: Definition, History, Importance
- Approaches to define Quality, Cost of Quality, Hierarchy of Quality Management
- Introduction to Quality Control.

**Unit – II** **Organizational Aspects of Quality Assurance** **7 Hrs**

- Quality Assurance (QA): Introduction, Definition, Management principles in QA, QA in different stages, Quality Planning.
- ISO: Introduction, ISO 9000 series of standard, Benefits of ISO.
- ISO 9001, Benefits of ISO 9001.
- Quality survey: Scope, Types of audits, inspection methods, Quality budget, Vendor Quality Rating

**Unit – III** **Problem solving tools and techniques** **7 Hrs**

- Definition of a problem
- Type of problems, classification of problems
- What is problem solving, barriers to problem solving
- Problem solving tools: Cause and effect diagram, Histogram, flow charts, Check sheets, Histogram, Brain-storming, Pareto charts, Control charts, Scatter Diagram

3.5 Problem solving techniques: Brain storming, Flow diagram, PDCA Cycle etc

**Unit – IV** **Total Quality Management** **7 Hrs**

- Basic concept of TQM, features of TQM
- principles of TQM
- leadership concepts
- Quality statements
- Barriers to TQM implementation
- Concept of TPM
- Quality allied concept: KAIZEN, Poke yoke, JIT, KAPA

**Unit – V** **5 S and Safety** **7 Hrs**

- Detailed concept of 5S and safety used in Industries
- Integrated Management system.

**Text books:**


1. O. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd, New Delhi.
2. L.C.Jhamb ,Savitri Jhamb , Industrial Management – I , Everest Publishing House .

**Reference Books:**

1. Dinesh Seth and Subhash C. Rastogi, “Global Management Solutions”, Cengage Learning, Second Edition, USA.
2. B. Davis and Margrethe H. Olson, "Management Information Systems", Mc-Graw-Hill International Editions.
3. AzarKazmi , “Strategic Management & Business Policy “, Tata McGraw Hill, New Delhi
4. Kenneth C. Laudon and Jane P. Laudon, “"Management Information Systems", Eighth Edition, Pearson Education
5. K. ShridharaBhat, “Materials and Logistics Management”, Himalaya Publishing House, Mumbai
6. M.Y. Khan and P. K. Jain, “Financial Management”, Tata McGraw Hill, New Delhi
7. Ravi M. Kishore, “Project Management”, Tata McGraw Hill, New Delhi.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - V | |
|---|---|
| **Project Work- Stage I** | |
| Course Code: 504 | |
| Working Hrs:PR:04 | TW: 100, Total Marks: 100 |
| Credit:2 | |

Students are allowed to select the topic of their project work subject to approval of the scope by the faculty. Maximum 4 students can work in group for a common topic. Students are expected to visit the site, shops, etc. They can discuss the topic with manufactures, owners, consultants.

# Semester - VI
# Syllabus

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - VI | |
|---|---|
| **Subject Name: Energy Conservation and Pollution Control** | |
| Course Code: 601 | Semester: VI |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit 1.** Energy Conservation- Forms of energy, energy conservation, energy sources and resources, Present and future energy demands; Review of commercial energies from solid, liquid and gaseous fuels. **07 Hrs**

**Unit 2**. Nuclear energy systems, alternate energy sources; Improving energy efficiency in extractive metallurgical processes; **07 Hrs**

**Unit 3**. Design and management of energy conservation; Recycling of energy, energy conservation techniques. **07 Hrs**

**Unit 4.** Pollution Control- Gas recovery in metal processing industries, gas cleaning and removal of particulate matter from gases; Heat exchangers and water cleaning of solids;

**07 Hrs**

**Unit 5** Pollution control in specific metal process industries- Iron and steel, Cu, Ni, Pb, Zn, Al etc; Environmental considerations in metal casting, metal forming, metal plating and heat treatment industries. **08 Hrs**

**Reference Books:**

1. Managing Industrial Pollution- S. C. Bhatia- Macmillan India Ltd.
2. Environmental Principles and Policies- Sharon Beder
3. Plant Engineers Reference Book-Dennis A. Snow- Butterworth Hienemann Pub.
4. Efficient use and Conservation of Energy Vol.1- Clark W. Gellings- Encyclopedia of Life Support Systems.
5. Energy Conservation Act, 2001- Along with Allied rules- Universal Law Publication.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - VI | |
|---|---|
| **Subject Name: Fracture Mechanics and analysis of Failure** | |
| Course Code :602 | Semester: VI |
| Weekly Teaching Hours: TH: 03 | Scheme of Marking ISE:50, ESE: 50 |
| Credit:3 | |

**Unit 1.** Aims of failure analysis, Prime factors in the premature failure of metallic components and structures, **08 Hrs**

**Unit 2.** Tools and techniques in failure analysis, Types of failures: ductile, brittle, fatigue, creep, corrosion, wear etc., fractography, mixed mode and fatigue failures,

**07 Hrs**

**Unit 3.** Failure mechanisms, Embrittlement phenomena, environmental effects, Failures due to faulty heat treatments, Failures in metal forming and welding, **07 Hrs**

**Unit 4.** Case studies in failure analysis, **07 Hrs**

**Unit 5**. Prevention of failures, case histories of component failures. **07 Hrs**

**Reference Books:**

1. Fracture Mechanics-Fundamentals and Applications-T. L. Anderson
2. Fracture Mechanics- M. Janssen- Taylor and Francis Group.
3. Metal Fatigue Analysis Handbook- Yung Li Lee, Mark Barkey- Butterworth Hienemann Pub.
4. Fatigue of Materials- S. Suresh- Cambridge University.

| Syllabus<br>Name of the Course: B. Voc (Foundry Technology)<br>Semester - VI | |
|---|---|
| **Project Work-Stage - II** | |
| Course Code: 603 | Semester: VI |
| Working Hrs, PR: 04 | TW:200, Total Marks: 200 |
| Credit:02 | |

Students are allowed to select the topic of their project work subject to approval of the scope by the faculty. Maximum 4 students can work in group for a common topic. Students are expected to visit the site, shops, etc. They can discuss the topic with manufactures, owners, consultants. The project report comprising drawing, sketches, photographs and description must be elaborate to cover the topic in its entirety. The Drawing should specify sizing followed by report writing.

The oral examination based on the project work submitted, shall be conducted in the presence of an external examiner.