SHIVAJI UNIVERSITY KOLHAPUR

COMMUNITY COLLEGE

Syllabus

For

Diploma in Foundry Technology

To be implemented from Academic Year 2014-2015 onwards

Ad-hoc Board in Foundry Technology:
STRUCTURE OF SYLLABUS:

To be implemented from the academic year 2014-2015

1. Title of the course: DIPLOMA (FOUNDRY TECHNOLOGY)

2. Preamble of the syllabus:

The proposed curriculum is with the view to make it more contextual, industry affable and suitable to cater the needs of society and nation in present day context. The committee examined the nature of the existing syllabus of various courses in foundry technology and after analysing other curricula of existing universities in respective subjects in terms of content, relevance, quality and pattern of teaching and examination, has synthesized the present proposal. After guidance from industry professionals, consultants and senior faculty, feedbacks from the core faculty and intensive discussions the syllabus is suitably finalized.

The syllabus needs revision in terms of preparing the student for the professional scenario with relevance to practical needs and requirements. A holistic approach includes providing industry training via on job training/internships, handling live projects, visits to foundry units. Regular expert’s interaction will help to build a bridge between students and industry.

Technical advancement is the key to a substantial teaching system in today’s world and thus a great responsibility lies on the curriculum to prepare students to rise to meet global standards and align seamlessly to changing trends.

3. Objectives:

To enable the students-

• To promote understanding of basic facts and concepts in foundry process while retaining the excitement of foundry industry.
• To make students capable of studying foundry technology in academic and Industrial courses.
• To expose the students to various emerging new areas of foundry technology and apprise them with their prevalent in their future studies and their applications in various spheres of manufacturing technology.
• To develop problem solving skills in students.
• To expose the students to different processes used in Foundry Industries and their applications.
• To develop ability and to acquire the skill and knowledge of terms, facts, concepts, processes, techniques and principles of foundry industries.
• To develop ability to apply the skill and knowledge of contents of principles of foundry technology.
• To inquire of new skill and knowledge of foundry technology and developments therein.
• To expose and to develop interest in the fields of foundry technology.
4. Duration:

The duration of the Diploma Course will be of one year. The final Diploma certificate will be awarded only after completion of one year course.

The suggested credits for each of the award are as follows:

<table>
<thead>
<tr>
<th>Awards</th>
<th>Normal calendar duration</th>
<th>Skill Component Credits</th>
<th>General Education Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate in Foundry Technology.</td>
<td>Three Months</td>
<td>09</td>
<td>06</td>
</tr>
<tr>
<td>Advanced Certificate in Foundry Technology.</td>
<td>Six Months (One Semester)</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Diploma in Foundry Technology.</td>
<td>One Year (Two Semesters)</td>
<td>36</td>
<td>24</td>
</tr>
</tbody>
</table>

As per UGC guidelines General Education Component should not exceed 40% of the total curriculum.

Credits can be defined as the workload of a student in
1. Lectures
2. Practicals
3. Seminars
4. Private work in the Library/home
5. Examination
6. Other assessment activities.

The following formula should be used for conversion of time into credit hours.

a) One Credit would mean equivalent of 15 periods of 60 minutes each, for theory, workshops / labs and tutorials;

b) For internship /field work, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;

c) For self-learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

5. Eligibility:

The eligibility condition for admission to Diploma programme shall be 10+2 or equivalent, in any stream from any recognized board or university.

6. Medium of Instruction:

The medium of instruction of the course will be English/Marathi.


8. University Term: As per academic calendar of the university.
9. List of equipment and instruments:

1. Universal sand testing machine.  2. Sieve analyser.
7. Electric Muffle (1000°c).  8. Muller (Sand mixing)
9. Metallurgical Microscope.  10. Metallurgical Microscope with image analysis

10. Examination:

A. Scheme of examination:

• The semester examination will be conducted at the end of each term (both theory and practical examination)

• Theory paper will be of 50 marks for semester examination. The practical examination will be of 150 marks and industrial practical training/project work of 50 marks in the practical.

• Question papers will be set in the view of the entire syllabus and preferably covering each unit of the syllabus.

For each award the scheme of examination will be as below.

I. Theory Examination:

<table>
<thead>
<tr>
<th>Paper Number</th>
<th>Title of Paper (For Semester I)</th>
<th>Certificate Course Marks.</th>
<th>Advance Certificate Course Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Business Communication-I</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>II</td>
<td>Engineering Graphics-I.</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>III</td>
<td>Engineering Materials.</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>IV</td>
<td>Pattern Construction Technology.</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>V</td>
<td>Moulding Technology.</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>125</td>
<td>250</td>
</tr>
</tbody>
</table>

II. Practical Examination:

i) The practical examination for Certificate Course will be of 100 marks.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Practical examination</th>
<th>Marks</th>
<th>Internal Assessment</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Practical</td>
<td>60</td>
<td>Projects/ Industry Visit</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>Journal</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Oral</td>
<td>05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>75</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>
ii) The practical examination for Advance Certificate Course/ Semester-I will be of 200 marks.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Practical examination</th>
<th>Marks</th>
<th>Internal Assessment</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Practical</td>
<td>120</td>
<td>Projects/ Industry Visit</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Journal</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Oral</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>150</td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

The total weightage of first term i.e. semester- I is of 450 marks, the details of which are-

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Theory Examination 50 X 5</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>Practical Examination.</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>Internal Assessment</td>
<td>50</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>450</strong></td>
</tr>
</tbody>
</table>

• For the Certificate course of three months duration the examination will be conducted by the college. The certificate will be awarded by the college.

• For the Advance Certificate course of six months duration the examination will be conducted by Shivaji University as Semester-I Examination and the certificate will be awarded by the college.

• For the Diploma course of one year duration the examination will be conducted by Shivaji University as Semester-I and Semester-II and the Diploma will be awarded by the college.

For the Diploma in Foundry Technology, practical examination and theory paper assessment will be done at college level.

B. Nature of question paper:

A. The nature of the question paper for certificate course will be designed by College Examination Board for Community College.

B. The question paper setting work for the certificate course will be done by College Examination Board for Community College.

B. For the advance certificate course, the nature and setting of the question paper will be similar to that of Semester -I of B.Voc. Part-I Diploma in Foundry Technology which is as below;

Nature of the question paper:

For the papers II to V there will be in all SEVEN questions in each paper of which any FIVE should be solved. All questions will carry equal marks i.e. each question will be of 10 marks.
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Type</th>
<th>Any two out of three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1</td>
<td>Short answer</td>
<td>Any two out of three</td>
</tr>
<tr>
<td>Q.2,3,4,5,6</td>
<td>Long answer</td>
<td>No internal options.</td>
</tr>
<tr>
<td>Q.7</td>
<td>Short notes</td>
<td>Any two out of three</td>
</tr>
</tbody>
</table>

**C. Standard of Passing:**

To pass the examination a candidate must obtain at least 35% (i.e 9/18 marks out of 25/50) marks in individual subjects, in internal assessment and University examination each in all theory and practical subjects.

**D. External Students:** Not applicable as this is a practical oriented course.

**11. Workload:**

Each skill based paper will have **three theory** periods per week. There are **four practical** per week. Each practical will be based on skill based papers i.e. paper no. II, III, IV and V. The practical batch will have 20 students.

The total workload for one batch will be:

1. **One Paper** on General Education: = 06 Theory Periods.
2. **Four Papers** on skill based Education: 4 X 3 = 12 Theory Periods.
3. **Four Practical** work per week: 4 X 4 = 16 Practical periods.
4. **Project Work** per batch per week: = 02 Periods

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TOTAL    36 Periods.

Working hours will be 5 hours (300 minutes) per day i.e. six periods each of 50 minutes.

**12. Laboratory Safety Equipments:**

**Part I:** Personal Precautions:

1. All persons must wear safety Goggles at the time of Practicals/Training times.
2. Must wear Lab Aprons / Lab Jacket and proper shoes.
3. Except in emergency, over – hurried activities is forbidden.
4. Fume cupboard must be used whenever necessary.
5. Eating, Drinking and Smoking in the laboratories strictly forbidden.

**Part II:** Use of Safety and Emergency Equipments:

1. First aid Kits
2. Sand bucket
3. Fire extinguishers (dry chemical and carbon dioxide extinguishers)
4. Material Storage cabinet with proper ventilation
5. Material Safety Date sheets.
6. Management of Local exhaust systems and fume hoods.
7. Sign in register if using instruments.
13. MEMORANDUM OF UNDERSTANDING (MOU):

The purpose of this MOU is to clearly identify the roles and responsibilities of each party (i.e. college and industry partner) as they relate to the implementation of the Diploma in Foundry Technology at the college.

It is recommended to sign at least TWO MOU with the industry partners in the related field.

**Diploma in Foundry Technology: Course structure**

**General Structure:**

The diploma course has two semesters; each one is of 450 marks. There will be five theory papers for each semester having 50 marks each.

**SEMMESTER – I**


**SEMMESTER – II**


There will be practical examination for each semester. The duration of practical examination will be of six hours and it will be of 150 marks of which 30 marks are reserved for oral and journal. The internal assessment includes industry training via internships, handling live projects, visits to foundry units etc.

**SYLLABUS**

N. B.

i) Figures shown in bracket indicate the total lectures required for the respective units.
ii) The question paper should cover the entire syllabus. Marks allotted to questions should be in proportion to the lectures allotted to respective to units.
iii) All units should be dealt with S.I. units.
iv) **Industrial training / tour / visit per semester is compulsory.**
v) Use of recent editions of reference books is essential.
v) Use of Scientific calculator is allowed.
SEMESTER – I

GENERAL EDUCATION:

Paper – I: Business Communication-I
Total Workload: 06 lectures per week of 60 mins.

Distribution of Workload:
Theory: 04 lectures per week
Practical: 02 lectures per week per batch of 20 students

Units Prescribed for Theory: 40 Marks.
Unit 1: Use of English in Business Environment
   Topics:
   Business Vocabulary: Vocabulary for banking, marketing and for maintaining public relations
   What is a sentence?
   Elements of a sentence
   Types of sentence: Simple, compound, complex

Unit 2: Writing a Letter of Application and CV/ Resume
   Topics:
   Structure of a letter of application for various posts
   CV/ Resume and its essentials

Unit 3: Presenting Information/Data
   Topics:
   Presenting information/data using graphics like tables, pie charts, tree diagrams, bar diagrams, graphs, flow charts

Unit 4: Interview Technique
   Topics:
   Dos and don’ts of an interview
   Preparing for an interview
   Presenting documents
   Language used in an interview

Practical: Based on the theory units 10 Marks.

Reference Books:
Pattern of a Question Paper
B. Voc. Part-I
Business Communication-I
Semester –I   Paper: I

Time: 2 hours                  Total Marks: 40

Q. 1  Do as directed. Question items on Unit 1 to be asked.  (10 out 12) 10

Q. 2  Write a letter of application.  OR

Draft a CV/ Resume for a particular post.  10

Q. 3  Present a given information or data using a table/ chart/ pie diagram, etc (Any one diagram to be drawn.) 10

Q. 4  Fill in the blanks in the given interview.  10

Practical Evaluation:  10 Marks

Oral and Presentation based on the units prescribed.

SKILL BASED PAPERS:

Paper –II: ENGINEERING GRAPHICS-I

1.0. Drawing office practice  10Hrs.

1.1. Importance of engineering drawing - drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets etc., - layout of drawing sheets.

1.2. Importance of legible lettering and numbering - single stroke letters - upper case and lower case letters- general procedures for lettering and numbering - height of letters - guidelines.

1.3. Dimensioning - Need for dimensioning - terms and notations as per BIS - Dimension line, Extension line and Leader line - Methods of dimensioning – Importance of dimensioning rules - Exercises.

1.4. Scales - Study of scales - full size scale, reduced scale and enlarged scale.

2.0. Constructions of conics.  15Hrs.

2.1. Conics: Different types – Definition of locus, focus and directrix - Applications of ellipse, parabola and hyperbola.

2.2. Ellipse: Construction of ellipse by concentric circle method, rectangular method and Eccentricity method when focus and directrix are given – Practical applications.

2.3. Parabola: Construction of parabola by rectangular method, parallelogram method and eccentricity method when focus and directrix are given– Practical applications.

2.4. Hyperbola: Construction of hyperbola by rectangular method and eccentricity method when focus and directrix are given– Practical applications.

2.5. Scales: Construction of Diagonal and Vernier scales.

3.0. Constructions of special curves. 10Hrs.

3.2. Involute of a circle - Archimedean spiral – helix – exercises.

4.0. Projection of points. 5Hrs.

4.1. Projection of points – points in different quadrants.

5.0. Projection of straight lines. 10Hrs.

5.1. Projection of straight lines – parallel to one plane and perpendicular to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes – inclined to both the planes (simple problems only).

Text Books


Reference Books


Publication of Bureau of Indian Standards:

Paper –III: ENGINEERING MATERIALS

1.0. **Ferrous metals:**  
10Hrs.

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.

2.0. **Non-ferrous metals:**  
8Hrs.

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

3.0. **Engineering plastics and fiber:**  
10Hrs.


4.0. **Insulating material**  
8Hrs.

Various heat insulating material and their usage like asbestos, glass wool, cork, puf, china 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.

5.0. **Fuels:**  
4Hrs.

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

6.0. **Refractories:**  
10Hrs.

6.1. Definition, classification and properties of Refractories.


6.3. Testing of refractories
   - Specific gravity
   - Bulk density
   - Porosity
   - Refractoriness
   - Slag attack
   - Cold crushing strength

6.4. Refractory failures due to slagging, abrasion, fusion, spalling.
**Recommended Books:**

**Text**
1. Material science  
   RK Rajput, SK Kataria and sons, Ludhiana

**Reference**
1. Material science and engineering  
   Raghavan Prentice Hall of India, Delhi
2. Material science and engineering  
   Srivastava New age international (P) Ltd.
3. Materials and metallurgy  
   OP Khanna Dhanpatrai
4. Manufacturing processes  
   V. Raghvan Prentice Hall
5. Introduction to physical metallurgy  
   Sidney H Avner Tata McGraw-Hill

**Paper –IV: PATTERN CONSTRUCTION TECHNOLOGY:**

1.0 Pattern materials. Pattern making tools, different pattern materials their merits and Demerits.  
   10Hrs.

2.0 Different types of patterns such as single piece, Cope and Drag, Followboard, Match plate pattern etc.  
   10Hrs.

3.0 Tools for making Wood patterns and Metal patterns.  
   6Hrs.

4.0. Patterns for special processes such as foam moulding, shell moulding.  
   6Hrs.

   10Hrs.

6.0. Finishing of patterns, colour codes for pattern and importance.  
   4Hrs.

7.0. Pattern allowances.  
   4Hrs.

**Reference Books:**

1. Principles of Metal casting - R. Heine &Rosenthall, TMH
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
11. Introduction to foundry technology by Ekay Winter
12. Foundry technology - O.P. Khanna S. Chand & Co
14. Workshop Practice II – HazraChaudharyKhanna Publisher.
Paper – V: MOULDING TECHNOLOGY

1.1 Conventional Sand moulding: 6Hrs.

Hand moulding with green sand using natural binders like clay, use of mechanical ramming aids & mould manipulation dry sand process, loam sand moulding, use of cow dung, Bentonites dextrin core oils & molasses as binder, mould washers Skin drying of moulds.

1.2 Moulding Machine: 7Hrs.

Use of moulding machines, jolt squeeze, jolt squeeze & slinger, insertion of cores, power computation, type of flask equipment, preparation of sand cycle, mulling of the sand, flow charting special moulding/core making process, Use of plaster of Paris & cement as a moulding material carbon dioxide process, shell moulding & metal moulds, gravity & pressure die casting, V moulding processes.

1.3 Mould Quality: 6Hrs.

Role of quality & packaging of sand. Mould hardness variation, Strength of mould & core enforcement, core floatation, use of chaplets for supporting cores, use of chills, mass hardness & hard spots. Defects like scabs & rat tails, storage of mould & moisture pick up.

1.4 Functions& design of mould: 6Hrs.

Function of cavity, components of mould, gating system & risers, Directional solidification of metals, streamlined pouring of mould, maintenance of metal purity, Rigging and shake out, recycling of sand, reclamation of sand.

2.0. Core Making: 25Hrs.

2.1 Importance and requirement of cores, Core making materials.
2.2 Core sand, its ingredients and properties.
2.3 Binders & machines used in core making.
2.4 Types of Cores, Core making processes.
2.5 Core venting, Core baking by different methods.
2.6 Finishing of Cores. Core setting chaplets.
2.7 Core sand disposal.

Reference Books:

1. Principles of Metal casting - R. Heine & Rosenthall, TMH
6. Foundry Engineering - P. L. Jain, TMH.
8. Metal Casting Technology - P. C. Mukherjee, Oxford & IBH
9. Principal of foundry technology by P. L. Jain
SEMESTER II

GENERAL EDUCATION PAPER:

B. Voc. Part-I (Diploma)
Business Communication-II

Semester –II Paper: VI

Total Workload: 06 lectures per week of 60 mins.
Distribution of Workload:
  Theory:  04 lectures per week
  Practical:  02 lectures per week per batch of 20 students

Units Prescribed for Theory:
Unit 5: Group Discussion
  Topics:
  Preparing for a Group Discussion
  Initiating a Discussion
  Eliciting Opinions, Views, etc.
  Expressing Agreement/ Disagreement
  Making Suggestions; Accepting and Declining Suggestions
  Summing up.

Unit 6: Business Correspondence
  Topics:
  Writing Memos, e-mails, complaints, inquiries, etc.
  Inviting Quotations
  Placing Orders, Tenders, etc.

Unit 7: English for Negotiation
  Topics:
  Business Negotiations
  Agenda for Negotiation
  Stages of Negotiation

Unit 8: English for Marketing
  Topics:
  Describing/ Explaining a Product/ Service
  Promotion of a Product
  Dealing/ bargaining with Customers
  Marketing a Product/ Service: Using Pamphlets, Hoardings, Advertisement, Public Function/ Festival

Practical: Based on the theory units

Reference Books:

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**Pattern of a Question Paper**
**B. Voc. Part-I**
**Business Communication-II**

**Semester –II**
**Paper: VI**

**Time: 2 hours**
**Total Marks: 40**

Q. 1 Fill in the blanks in the following Group Discussion.
(On Unit 5) (10 out 12) .......................... 10
Q. 2 Attempt ANY ONE of the following ( A or B):
(On Unit 6) .......................... 10
Q. 3 Fill in the blanks with appropriate responses:
(On Unit 7) .......................... 10
Q. 4 Attempt ANY ONE of the following ( A or B):
(On Unit 8) (10 out 12) .......................... 10

**Practical Evaluation: 10 Marks**
Oral and Presentation based on the units prescribed.

**SKILL BASED PAPERS:**

**Paper –VII: ENGINEERING GRAPHICS-II**

**1.0. PROJECTION OF POINTS, LINES AND PLANE SURFACES** 10Hrs.

1.1. Orthographic projection- principles-Principal planes-First angle projection-projection of points.
1.2. Projection of straight lines (only First angle projections) inclined to both the principal planes
1.3. Determination of true lengths and true inclinations by rotating line method and traces
1.4. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
2.0. PROJECTION OF SOLIDS 10Hrs.

2.1. Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

3.3. PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES. 10Hrs.

3.1. Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.
3.2. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinders and cones.
3.3. Development of lateral surfaces of solids with cut-outs and holes

4.0. ISOMETRIC AND PERSPECTIVE PROJECTIONS 10Hrs.

4.2. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method

5.0. COMPUTER AIDED DRAFTING (Demonstration Only) 10Hrs.

5.1. Introduction to drafting packages (AUTOCAD) and demonstration of their use.

Text Books


Reference Books

Publication of Bureau of Indian Standards:


Paper – VIII MELTING TECHNOLOGY

1.1 Melting of primary and secondary metals: 10Hrs.

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.

1.2 Melting technology: 10Hrs.

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.

1.3 Composition control and melt quality: 10Hrs.

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.

1.4 Efficient Operation: 10Hrs.

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.

1.5 Handling of liquid metal: 10Hrs.

Different methods to consume liquid metal, ingot, pigging, power production, casting etc. economical 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.
Paper – IX GATING SYSTEM AND RISERING:

1.0 GATING SYSTEM: 25Hrs.

1.1: Components of gating system- Pouring basin, down sprue, sprue well, runner bar, skimbob and ingates : Significance and function.
1.2: Types of gating: Top gate, bottom gate and parting gates.
1.3: Steps in design of gating area, calculations of pouring time, Runners andingates for ferrous and non-ferrous alloys.
1.4: Importance and determination of dimensions of passages i.e gating ratio.

2.0 RISERING SYSTEM: 25Hrs.

2.1 Function of risers/ feeders in compensating shrinkage in metals and alloys during solidification.
2.2 Riser types, shapes, sizes and locations.
2.3 Designing of risers using Cain’s method, modulus method, Inscribedcircle method.
2.4 Directional solidification: Use of padding, exothermic material, use of chills. Riser neck.

Paper –X CASTING PROCESSES:

1.0 CASTING 35Hrs.

1.1 Sand Casting,
1.2 Advantages of special casting techniques over sand casting method.
1.3 Plaster mold casting,
1.4 Permanent mold casting,
1.5 Die casting - Gravity and pressure die casting, Hot chamber and cold chamber.
1.6 Centrifugal casting,
1.7 Shell mold casting,
1.8 Investment casting,
1.9 CO₂ process of casting,
1.10 Continuous process.

2.0 CASTINGS DEFECTS: 15Hrs.

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

Reference Books:
1. Principles of Metal casting - R. Heine & Rosenthall, TMH
8. Metal Casting Technology - P.C. Mukherjee, Oxford & IBH
9. Principal of foundry technology by P. L. Jain

**SUGGESTED LIST OF PRACTICALS:**

For each semester, at least 15 practicals related with the theory subjects should be conducted. Some of the practicals are suggested below.

1. Study of different foundry tools & their functions.
2. Study of different melting units (furnace) present in the laboratory/industry.
4. Preparation of moulding sand. Making a green sand mould. One mould each on pit. Moulding & split pattern. At least two for different type of components with core and without core to be made.
5. Preparation of different moulds using different types of patterns.
6. Testing of moulding and core sand. Sand testing experiments to determine:
   - Grain Fineness Number
   - Green Strength
   - Permeability Test
   - Moisture content test
8. Demonstration of die casting, centrifugal casting process.
9. Study, understanding and working of simple destructive & non-destructive testing Procedures used for castings.
11. Study of Medium Frequency Induction Furnace (Coreless) detailing regarding lining material and crucibles.
13. Study of Holding Furnace (Indirect Heating)
14. Study of various types of gates.
15. Study of various types of risers.
16. Case study of design of gating system and riser
18. Crucible Melting of Al
20. Foundry practice for Aluminum alloys.
21. Production of Cu and Cu alloy castings
22. Production of Mg & Zn base casting alloys.

**INDUSTRIAL TRAINING:**

The purpose of industrial training is to offer wide range of practical exposures to latest practices, equipment and techniques used in the field. This training programme will help the student in acquiring hands on experiences of various practices and events required to perform in different job situations. Through the industrial training the students are given an opportunity to develop psychomotor skills and problem solving ability.

The industrial Training has basically the following three components:

1. Orientation Programme
2. Industrial Training in the Industry
3. Report Writing and Evaluation

**General Objectives:** The student will be able to,

- Read and Interpret Drawing
- Observe different types of processes in ferrous / non-ferrous foundry.
- Study and develop methoding of casting.
- Identify casting defects and provides remedies.
- Study the available manuals.
- Develop history sheet for various processes/product.

**Activities to be carried out during training:**

1. Student should visit each section of the foundry/foundry department
2. Observe the processes, tools, machinery and equipment used
3. Observe testing of castings at each stage
4. Study drawings and interprete the drawings
5. Study the organisational structure of the company
6. Study the product development from raw material to finished goods
7. Observe safety norms adopted
8. Prepare a report on a case study which includes all the components referred above.

Training Report:
The students will have to go for industrial training in all the sections of foundry. After training the student is required to prepare a report on the following points:
• Details of the industry
• Layout of the foundry- different sections
• List of equipments in each section
• Organizational structure of the industry
• Description of major processes
• Quality measures adopted in the industry
• Safety norms and there implementation
• One detailed case study- from component drawing to finished casting.