VIVEKANAND COLLEGE, KOLHAPUR
(AUTONOMOUS COLLEGE)

Board of Studies in Foundry Technology

Choice Based Credit System Pattern

Syllabus

For

B. Voc. Part-II (Advance Diploma)

Advance Diploma in Foundry Technology

(To be implemented from Academic Year 2019-2020 onwards)

STRUCTURE OF SYLLABUS:

To be implemented from the academic year 2019-2020

1. Title of the course: ADVANCED DIPLOMA IN 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 B.Voc. Course will be of **three years.**

•B.Voc. Part I - Diploma in Foundry Technology

•B.Voc. Part II - Advanced Diploma in Foundry Technology

•B.Voc. Part III - Bachelor of Vocation in Foundry Technology

The final B.Voc degree will be awarded only after completion of three years course. The suggested credits for each of the years are as follows:

Awards		**Normal calendar duration**	**Skill Component Credits**	**General Education Credits**
Year 1	Diploma in Foundry Technology	Two Semesters	36	24
Year 2	**Advanced Diploma in Foundry Technology**	**Four Semesters**	**36**	**24**
Year 3	B.Voc in Foundry Technology	Six Semesters	36	24
		TOTAL	108	72

General Education Component (i.e. the work in classroom) 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 50 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. Medium of Instruction:

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

6. Pattern:. Choice Based Credit System with Course Outcomes

7. Eligibility:

1. Candidate should be passed Diploma in **'Foundry Technology**'

2. Candidates having Diploma in '**Cast Iron Foundry Technology**' are also eligible.
3. Candidates with Diploma in '**Casting Development and Quality Assurance**' are also eligible for the advanced diploma course.

8. 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 each. 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 semester there will be five theory papers. **Practical Examination will be conducted at the end of every semester.**

For Semester I

Paper Number	Title of Paper (For Semester III)	Internal Marks	Theory Exam Marks	Total Marks
I	Fundamentals of Financial Accounting-I	10	40	50
II	Physical Metallurgy-I	10	40	50
III	Machine Drawing	10	40	50
IV	Fuels, Furnaces and Refractories	10	40	50
V	Iron Casting Production	10	40	50
TOTAL		**50**	**200**	**250**

For Semester II

Paper Number	Title of Paper	Internal Marks	Theory Exam Marks	Total Marks
VI	Fundamentals of Financial Accounting-II	10	40	50
VII	Physical Metallurgy-II	10	40	50
VIII	Steel Casting Production	10	40	50
IX	Non-Ferrous Casting Production	10	40	50
X	Testing and Inspection Techniques	10	40	50
TOTAL		**40**	**200**	**250**

The practical examination will be of 200 marks for **each semester**.

Sr. No.	Practical examination	Marks	Internal Assessment	Marks
1	Practical	120	Projects/ Industry Training.	50

2	Journal	15		
3	Oral	15		
Total		150		50

The total weightage of each semester is of 450 marks, the details of which are-

Sr. No.	Title	Marks
1	Theory Examination 40 X 5	200
2	Practical Examination.	200
3	Internal Assessment	50
	TOTAL	**450**

B. Nature of question paper:

For each paper there will be **THREE** compulsory questions.

General nature of the question paper will be:

Question Number	Type		Marks
Q.1	Multiple choice question	No internal options.	8
Q.2	Short answer	Any four out of six	16
Q.3	Long answer	Any two out of three	16

C. Standard of Passing:
To pass the examination a candidate must obtain at least 35% (i.e 14 marks out of 40) 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**.**

9. University Term: As per academic calendar of the university

For the second year i.e. Advanced Diploma in Foundry Technology practical examination and theory paper assessment will be done at university level.

10. List of equipment and instruments:

1. Universal sand testing machine
2. Sieve analyser.
3. Mold hardness teller.
4. Molding meter.
5. Demonstrative Cupola
6. Rapid moisture teller.
7. Electric Muffle (1000^{oc}**)**
8. Muller (Sand mixing)
9. Metallurgical Microscope = 5/6
10. Metallurgical Microscope with image analysis software = 1
11. Belt abrasive grinder.

12. Bend saw.
12. Cut- off wheel.
13. Lapping wheel for metallography.
14. Coal fired /Gas fired Furnace.
15. Micro Vickers Hardness Tester.
16. Impact testing Machine (with ASTM specimens – set of low & high energies)
17. Manual Broaching Machine.
18. Sub Zero Treatment bath with Digital calibrated temperature indicator.
19. Optical Brinell Hardness Testing Machine.
20. Dynamic Hardness Tester.
21. Digital Hardness Testing Machine.
22. Double Disc Polisher.
23. Medium Abrasive Cutting machine.
24. Hyd. Spec. Mounting Press -Water cooled

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.

	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 Practical/Training times.
2. Must wear **Lab Aprons / Lab Jacket** and proper shoes.
3. Except in emergency, over – hurried activities are forbidden.
4. Fume cupboard must be used whenever necessary.
5. Eating, Drinking and Smoking in the laboratories is 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 **B.Voc. Programme in Foundry Technology** at the college.

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

14. PROGRAM OUTCOMES (PO's)

1. B. Voc. Graduates in Foundry Technology will demonstrate knowledge of Machine Drawing, Material Science, Gating System Design & Metallurgy to solve actual casting products/processes related problems in Foundries.
2. Graduates will become Innovators & Entrepreneurs to address social, technical and business challenges.
3. B. Voc. Graduates in Foundry Technology will select and apply relevant modern technique and IT Tools to solve complex problems in design and manufacturing of casting components.
4. B. Voc. Graduates in Foundry Technology will able to understand and solve social, health, legal issues related to foundry.
5. B. Voc. Graduates in Foundry Technology will able to use appropriate environmental friendly processes for foundry to achieve sustainable growth.
6. B. Voc. Graduates in Foundry Technology will be able apply ethical business practices in Industry.
7. B. Voc. Graduates in Foundry Technology will able to work in Industry/Foundry as a team player as well as a team leader.
8. B. Voc. Graduates in Foundry Technology will be able to communicate effectively and professionally at Local to Global level.
9. B. Voc. Graduates in Foundry Technology will be able to apply Project Management Techniques and Financial Management Techniques in foundry.

Program Educational Outcomes:

1. The graduates will apply knowledge gained in course to improve lives and livelihoods through a successful career in Foundry based Companies.
2. The Graduates will engage in lifelong learning such as higher studies & association with professional bodies.

Program Specific Outcomes:

1. B. Voc. Graduates in Foundry Technology will collect and analyze data for solving the problems related with casting by using modeling, analysis & design tools.
2. Make Use of Material Testing Techniques, Sand Testing Techniques & Appropriate Gating Design Techniques for improving quality of product.

B.Voc. Part-II (Advanced Diploma in Foundry Technology)
Course structure

General Structure:

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

SEMESTER – I

1) Paper-I: Fundamentals of Financial Accounting-I - 50 Marks.
2) Paper-II: Physical Metallurgy-I - 50 Marks.
3) Paper-III: Machine Drawing - 50 Marks.
4) Paper-IV: Fuels, Furnaces and Refractories - 50 Marks.
5) Paper-V: Iron Casting Production - 50 Marks.

SEMESTER – II

1) Paper-VI: Fundamentals of Financial Accounting-II - 50 Marks.
2) Paper-VII: Physical Metallurgy-II - 50 Marks.
3) Paper-VIII: Steel Casting Production - 50 Marks.
3) Paper-IX: Non-Ferrous Casting Production - 50 Marks.
4) Paper-X: Testing and Inspection Techniques - 50 Marks.

There will be practical examination for each semester. The practical examination will be conducted in **two days** each of six hours. It will be of 150 marks of which 30 marks are reserved for oral and journal. The internal assessment of 50 marks 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.

(vi) Use of Scientific calculator is allowed.

ADVANCE DIPLOMA IN FOUNDRY TECHNOLOGY

SEMESTER III

GENERAL EDUCATION:

Paper I: FUNDAMENTALS OF FINANCIAL ACCOUNTING-I

Work Load - 6 | Total Marks – 50

Theory – 4 Lectures / Week | Theory- 40

Practical- 2 Lectures / Week | Practical- 10

Course Objectives:

1. To impart basic accounting knowledge as applicable to business.
2. To help students understand fundamental accounting concepts and principles.
3. To introduce students to accounting, stressing its importance in today's business world
4. To provide students with a theoretical basis upon which they will develop their knowledge in other areas of accounting

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF201.1	Perform the basic accounting functions.	6,9
CF201.2	Perform the journal entries and leaguer accounts.	6,9
CF201.3	Use various meaning methods effectively.	6,9
CF201.4	Prepare Final Accounts of Sole Traders and partnership firms.	6,9

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF210.1	-	-	-	-	-	1	-	-	2	-	-
CF210.2	-	-	-	-	-	1	-	-	2	-	-
CF210.3	-	-	-	-	-	1	-	-	2	-	-
CF210.4	-	-	-	-	-	1	-	-	2	-	-

Course contents:

Unit I : Introduction to Accounting

Meaning, Nature and Advantages of Accounting, Branches of Accounting, Accounting Concepts and Conventions, Types of Accounts, Rules of journalizing, Source Documents – Cash Voucher, Petty Cash Voucher, Cash Memo – Receipts, Debit Notes, Credit Note, Paying Slips, Withdrawals, Cheque

Unit II : **Journal and Ledger**

Preparation of Journal entries and Ledger accounts – Subsidiary Books - Purchase Book, Purchase Return Book, Sales Book, Sales Return Book, Cash Book, Bills Receivable Book, Bills Payable Book, Journal Proper

Unit III : **Depreciation**

Meaning, Methods – Straight Line Method – Reducing Balance Method, Change in Depreciation Method.

Unit IV: **Final Accounts**

Preparation of Trial Balance, Preparation of Final Accounts of Sole Traders and partnership firms

Practical:

1) Preparation of Journal entries and Ledger accounts
2) Preparation of subsidiary books
3) Preparation of Trial Balance
4) Practical problems on Final Accounts of sole traders and partnership firms
5) Practical problems on methods of depreciation

Scheme of Internal Practical Evaluation **10 Marks**

1) Submission of Record Book 5 Marks
2) Viva – Voce 5 Marks

Text Books/Reference Books/ Other Books/E-material/Paper

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Advanced Accountancy	M.C. Shukla and T.S. Garewal			
2	Advanced Accountancy	S.C. Jain and K. L. Narang			
3	Advanced Accountancy	S.M. Shukla.			
4	Advanced Accountancy	S. N. Maheshwari.			
5	Advanced Accountancy	R. L. Gupta.			

SKILL BASED PAPERS:

Paper –II: Physical Metallurgy-I

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Information about different materials.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours

Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To learn the fundamental science and engineering principles relevant to materials.
2. To help students understand the concept of structure property relationship using characterization and testing techniques for the material.
3. To have the experimental and computational skills for a professional carries.
4. To understand the significance of research.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF202.1	Understand crystallography completely.	1
CF202.2	Draw equilibrium diagram using cooling curves.	1
CF202.3	Identifying types of Phases	1
CF202.4	Study effect of alloying elements on Iron- Iron Carbide Diagram	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF202.1	2	-	-	-	-	-	-	-	-	-	1
CF202.2	2	-	-	-	-	-	-	-	-	-	1
CF202.3	2	-	-	-	-	-	-	-	-	-	1
CF202.4	2	-	-	-	-		-	-	-	-	1

Course contents:

1.0 **Crystallography** **10 Hrs.**
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;

2.0 **Crystallization** **10 Hrs.**
Process of solidification- nucleation and growth- critical nucleus size; Cooling curves for metals and alloys, Gibbs phase rule; Equilibrium diagrams-

3.0 **Equilibrium Diagrams** **10 Hrs.**

To draw equilibrium diagrams using cooling curves, Equilibrium diagram types-Eutectic, peritectic systems, etc; Types of phases- so0lid solutions, types and properties , intermetallic compounds and intermediate phases; long range and short range freezing alloys- coring and dendritic structures.

4.0 **Iron-Iron carbon equilibrium diagram** **10 Hrs.**

Phases, compositions, temperatures; study of effect of alloying elements on iron-iron carbon diagram;

5.0 **Non ferrous equilibrium diagrams** **10 Hrs.**

Equilibrium diagrams of Aluminum alloys, copper alloys, magnesium alloys, tin alloys.

Text Books/Reference Books/ Other Books/E-material/Paper

Sr. No	Title	Author	Publisher	Edition	Year of Edition
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			

Paper –III: Machine Drawing

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Information about basics of engineering drawing.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To learn the fundamentals of Drawing, Details.
2. Have and ability to apply knowledge of modeling.
3. To communicate the drawing information clearly to the user.

4. To understand and apply national and international standards while drawing machine components.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF203.1	Know conventional representation of engineering materials, components.	1
CF203.2	Methods of dimensioning, symbolic representation of welds and surface finish.	1
CF203.3	Sketch various machine components like thread, nuts, bolts, washers, flange, gear drives etc.	1
CF203.4	Understand the concept of various tolerances and fits used for component design.	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF203.1	2	-	-	-	-	-	-	-	-	1	-
CF203.2	2	-	-	-	-	-	-	-	-	1	-
CF203.3	2	-	-	-	-	-	-	-	-	1	-
CF203.4	2	-	-	-	-		-	-	-	1	-

Course contents:

1.0 Principles of drawings : 15 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

2.0 Sketching of machine components: **15 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

3.0 Gear drives : 10 Hrs.

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

4.0 Elements of Production Drawings: **10 Hrs.**

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

Drawing Sheets: 6 drawing Sheets based on above topics

Text Books/Reference Books/ Other Books/E-material/Paper

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Engineering drawing	Gill P.S	S.K.Kataria & Sons		
2	Engineering Drawing	Bhatt N.D. and Panchal V.M	Charotar Publishing House	50th Edition	2010
3	Engineering Drawing	Basant Agarwal and Agarwal C.M	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.

Paper –IV: Fuels, Furnaces and Refractories

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Information about Remelting furnaces and different materials.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To study the origin, classification and analysis of industrial fuels.
2. To study characteristic features of various furnaces.
3. To study different types of Fuels, Furnaces and Refractories.
4. To understand how to use fuels, furnaces and Refractories for various manufacturing techniques

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF204.1	Solve calorific value, speed and combustion problems	1
CF204.2	Select type of furnace required based on heating method and Refractories used.	1
CF204.3	Select type of fuel according to furnace and Refractories used.	1
CF204.4	Know uses of Refractories according to their need in foundry industries.	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF204.1	1	-	-	-	-	-	-	-	-	-	-
CF204.2	1	-	-	-	-	-	-	-	-	-	-
CF204.3	1	-	-	-	-	-	-	-	-	-	-
CF204.4	1	-	-	-	-		-	-	-	-	-

Course contents:

1.0 Classification of fuels **8 Hrs.**
Solid liquid and gaseous, natural and synthetic liquid fuels, their advantages and limitations.

2.0 Principles of combustion **7 Hrs.**
Calorific value, speed and combustion, requirements of air, or oxygen, properties of flames, combustion problems, non conventional energy.

3.0 Furnaces **20 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.

4.0 Refractories **15 Hrs.**
Classification of refractories, their properties and uses in foundry industries.

Sr. No	Title	Author	Publisher	Edition	Year of Edition
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		

Paper –V: Iron Casting Production

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Basic information about Cast iron.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To study the importance of cast iron as a material in various application.
2. To study types and properties of cast iron.
3. To develop simplified manufacturing process with the aim of reduction of cost and man power.
4. To manufacture the product optimally.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF205.1	Identify type of cast iron.	1
CF205.2	Select Charges, melting units for manufacturing various grades and types of cast iron.	1
CF205.3	Recommend the appropriate design of gating systems.	1
CF205.4	Identify/Control possible defects of manufacturing process, so as to remove them.	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF205.1	1	-	-	-	-	-	-	-	-	1	-
CF205.2	1	-	-	-	-	-	-	-	-	1	-
CF205.3	1	-	-	-	-	-	-	-	-	1	-
CF205.4	1	-	-	-	-		-	-	-	1	-

Course contents:

1.0 Introduction of Cast Iron **10 Hrs.**

Significance of carbon equivalent, solidification of grey and S.G. Iron, states of graphitization, effect of alloying elements;

2.0 Classification of Cast Iron **10 Hrs.**

Properties and applications of grey and S.G. Iron; Melting units for production of cast iron and melt quality control test;

3.0 Treatments of Cast Iron **10 Hrs.**

Inoculation, desulphurization and Mg treatment methods for production of S.G. Iron production; Production of compacted graphite iron;

4.0 Methoding of Cast Iron **10 Hrs.**

Molding and core making processes for cast iron; gating and feeding practices for cast iron

5.0 Defects of Cast Iron **10 Hrs.**

Casting defects and analysis of defects of different grades of cast iron.

Text Books/Reference Books/ Other Books/E-material/Paper

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Metal Casting Principles and Practice	T.V. RamanaRao	New Age International Publishers		
2	Principles of Foundry Technology	P.L. Jain	Tata McGraw Hill		
3	Principles of Metal casting	R. Heine & Rosenthall	TMH		
4	Modern Iron Making	V.R. Tuppari			
5	Principles of Blast Furnace Iron Making: Theory and Practice-	A.K. Biswas	SBA Publication		
6	Castings	John Campbell	Elsevier		2004
7	Principal of foundry technology	P. L. Jain	Tata McGraw Hill		
8	ASM Metal Handbook-Vol.-4, Casting				
9	Foseco Ferrous Foundryman's Handbook	John R. Brown	Butterworth Heinemann Pub		
10	Foundry Technology	Peter Beeley	Butterworth Heinemann Pub		

SEMESTER IV

Paper - VI- FUNDAMENTALS OF FIANACIAL ACCOUNTING- II

Work Load - 6
Theory – 4 Lectures / Week
Practical- 2 Lectures / Week

Total Marks – 50
Theory- 40
Practical- 10

Course Objectives:

1. To study in depth the rules for compiling the financial information reflected in financial statements.
2. To Provide students with the detailed knowledge of the various assets and liabities of companies.
3. To provide students with a broad knowledge of accounting standards
4. To provide students with a theoretical basis upon which they will develop their knowledge in other areas of accounting

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF206.1	Know imporantance and utilization of computerized accounting system.	6,9
CF206.2	Create company group, ledger accounts, feeding of accounting, data receipts.	6,9
CF206.3	Prepare income and expenditure account and balance sheets	6,9
CF206.4	Convert single entry system into double entry system.	6,9

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF206.1	-	-	-	-	-	1	-	-	2	-	-
CF206.2	-	-	-	-	-	1	-	-	2	-	-
CF206.3	-	-	-	-	-	1	-	-	2	-	-
CF206.4	-	-	-	-	-	1	-	-	2	-	-

Course contents:

Unit I **Computerized Accounting System**

Introduction – Concept – Components –Features - Importance and Utilization of Computerized Accounting System.

Unit II **Computer Application through Accounting Package Tally**

Creation of Company, Group, Ledger Accounts, Feeding of Accounting Data Receipts, Payments, Purchase, Sale, Contra, Journal, Credit Note and Debit Note Inventory Information – Groups, Items and Valuation.
Generation of various Accounting Reports.

Unit III **Accounts of Professionals**

Preparation of Receipts and Payment Account – Income and Expenditure Account and Balance Sheets of Non Profit Organization.

Unit IV **Single Entry System**

Conversion of Single Entry System into Double Entry System.

Practical:

1. Understanding computerized accounting practices applied in different retail malls in and around Kolhapur city
2. Practical problems based on computerized accounting using Tally
3. Practical problems on preparation of Receipts and Payment Account
4. Preparation of Income and Expenditure account and Balance Sheet of Non-profit making organizations
5. Solving the problems on conversion of Single Entry system into Double entry system.
6. Oral / Seminar

Text Books/Reference Books/ Other Books/E-material/Paper

Sr.No	Title	Author	Publisher	Edition	Year of Edition
1	Advanced Accountancy	M. C. Shukla and T. S. Garewal.			
2	Advanced Accountancy	S.C. Jain and K. L. Narang			
3	Advanced Accountancy	S. N. Aheshwari			
4	Theory and practice of Computer Accounting	Rajan Chougule and Dhaval Chougule.			
6	www.nos.org www.wiki.answers.com Chow.com				

Scheme of External Practical Examination **10 marks**

1) Submission of Record book 5 marks
2) Viva – Voce 5 marks

Paper –VII: Physical Metallurgy-II

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Information about microstructures of different material.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To acquirement of a sound background in physical metallurgy.
2. To understand the fundamental principles of physical metallurgy.
3. To have the experimental and computational skills for a professional carries.
4. To understand the significance of research.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF207.1	Acquire the skills of selecting and designing appropriate heat treatments for microstructure control and property optimization.	1
CF207.2	Understand/ Predict the behavior of metallic material and their effect on their properties	1
CF207.3	Behavior of a metallic material to a certain application.	1
CF207.4	Select heat treatment furnaces according to their required operations	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF207.1	2	-	-	-	-	-	-	-		-	1
CF207.2	2	-	-	-	-	-	-	-		-	1
CF207.3	2	-	-	-	-	-	-	-		-	1
CF207.4	2	-	-	-	-	-	-	-		-	1

Course contents:

1.0 Principles of heat treatment **05 Hrs.**

Definition and basic requirements for alloys to be heat treated, heat treatability; advantages and purposes of heat treatment

2.0 Transformations of pearlite and austenite **05 Hrs.**

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;

3.0 TTT diagrams **05 Hrs.**

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;

4.0 Annealing and Normalizing **05 Hrs.**

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

5.0 Quenching **05 Hrs.**

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

6.0 Surface hardening **05 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;

7.0 Heat treatment for Cast Iron **05 Hrs.**

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

8.0. Heat treatment for non ferrous alloys **05 Hrs.**

Homogenization annealing, stress relief annealing, recrystallization annealing;

9.0 Precipitation Hardening **05 Hrs.**

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

10 Heat treatment furnaces **05 Hrs.**

Classification based on fuel used, furnace atmospheres, Batch type, continuous type; Heat treatment defects-oxidation, decarburization, low strength and hardness, cracks and distortion-causes and remedies; Energy economy- Need and significance- methods of energy economy.

Text Books/Reference Books/ Other Books/E-material/Paper

Sr. No	Title	Author	Publisher	Edition	Year of Edition
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			
8	ASM Metal Handbook	Vol.-4, Heat Treating			
9	Steel Heat Treatment Handbook	George E. Totten	Taylor and Francis Pub		

Paper –VIII: Steel Casting Production

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Basic information about steel.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To study the importance of Steel as a material in various application.
2. To study types and properties of Steel

3. To develop simplified manufacturing process with the aim of reduction of cost and man power.
4. To manufacture the product optimally.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF208.1	Identify type of Steel.	1
CF208.2	Select Charges, melting units for manufacturing various grades and types of Steel.	1
CF208.3	Recommend the appropriate design of gating systems.	1
CF208.4	Identify/Control possible defects of manufacturing process, so as to remove them.	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF208.1	1	-	-	-	-	-	-	-	-	-	1
CF208.2	1	-	-	-	-	-	-	-	-	-	1
CF208.3	1	-	-	-	-	-	-	-	-	-	1
CF208.4	1	-	-	-	-	-	-	-	-	-	1

Course contents:

1.0 Introduction to Steels **10 Hrs.**

Classification, properties and applications of carbon and alloy steels,

2.0 Melting and Solidification of steel **10 Hrs.**

Solidification mechanism, melting of carbon and alloy steels in electric arc and induction furnaces,

3.0 Basic Practices and Reactions of Steel **10 Hrs.**

Acid and basic practices, oxidation and refining, fluxing; Sulphur and phosphorous removal, de-oxidation, methods of degassing, tapping and pouring,

4.0 Methoding for Steel **10 Hrs.**

Gating and feeding practices; mould and core making practice for steel, fettling and salvaging for steel castings,

5.0 Heat treatment for steel castings. **10 Hrs.**

Text Books/Reference Books/ Other Books/E-material/Paper

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Modern Steel Making	V.R. Tuppari			
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 & Rosenthall	Tata McGraw Hill		
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		

Paper –IX: Non-Ferrous Casting Production

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Information about Different types of Materials and their properties.
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To study the basics of forming and casting of non ferrous metals and their alloys.
2. To study properties and applications of non ferrous metals and their alloys
3. To develop simplified manufacturing difference between ferrous and non ferrous casting production.
4. To manufacture the product optimally.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF209.1	Identify the difference between ferrous and non ferrous metals	1
CF209.2	Identify uses of aluminum, magnesium, copper and zinc.	1
CF209.3	Calculate charge calculations, hardeners; oxidation and gas absorption in non ferrous alloys	1
CF209.4	Design gating and feeding practices for non ferrous alloys.	1
CF209.5	Defect analysis, salvaging of non ferrous alloy castings.	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF208.1	1	-	-	-	-	-	-	-	-	-	1
CF208.2	1	-	-	-	-	-	-	-	-	-	1
CF208.3	1	-	-	-	-	-	-	-	-	-	1
CF208.4	1	-	-	-	-	-	-	-	-	-	2
CF208.5	1	-	-	-	-	-	-	-	-	-	1

Course contents:

1.0 Introduction to Non Ferrous Alloys **10 Hrs.**

Composition, solidification, structure, properties and applications of aluminum, magnesium, copper and zinc based alloys;

2.0 Melting and Solidification of Non Ferrous alloys **10 Hrs.**

Charge calculations, hardeners; oxidation and gas absorption in non ferrous alloys, detection of gasses;

3.0 Basic Practices and Reactions of Non Ferrous alloys **10 Hrs.**

Melting, fluxing, degassing and pouring practices, filtration of non ferrous melt; melt treatment for alloying modification and grain refinement;

4.0 Methoding For Non Ferrous alloys **10 Hrs.**

Mould and core practices, metal mould reaction, gating and feeding practices for non ferrous alloy castings;

5.0 Defects and defect analysis of Non Ferrous Alloys **10 Hrs.**

Defect analysis, salvaging of non ferrous alloy castings.

Text Books/Reference Books/ Other Books/E-material/Paper

Sr.No	Title	Author	Publisher	Edition	Year of Edition
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 & Rosenthall	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	ASM			
7	Foseco Non-Ferrous Foundryman's Handbook	John R. Brown	Butterworth Heinemann Pub		
8	Foundry Technology	Peter Beeley	Butterworth Heinemann Pub		

Paper –X: Testing and Inspection Techniques

Course Type: Theory / Practical	Theory
Required/Elective	Required
Prerequisite	Information about Material properties and alloying elements
Teaching Scheme (Lecture/Practical/Tutorial/Drawing)	03/00/00/00 Hours
Total contact Hours (Lecture/Practical/Tutorial/Drawing)	50/00/00/00 Hours
Evaluation Scheme: Theory Theory Paper /Term Work/Oral/Practical	40/10/--/--

Course Objectives:

1. To identify the defects and ensure that the product is defect free in order to produce quality product.
2. To learn major concepts of testing methodologies
3. To understand type of testing

4. To enhances the reputation of the product during operation
5. To enables design of new products.

Course Outcomes (COs):

Course Outcomes(COs): Upon completion of this course, students will be able to		Mapping with PO's
CF210.1	Conduct tests like tensile, compression, hardness and impact	1
CF210.2	Choose appropriate non-destructive test for testing of material	1
CF210.3	Perform Optical metallographic techniques	1
CF210.4	Perform Scanning Electron Microscopy, Transmission Electron Microscopy	1
CF210.5	Perform Optical emission spectrometer, Atomic absorption spectroscopy, Infrared Spectroscopy, X-Ray Spectroscopy	1

Correlation matrix of Course outcomes with Programmed outcomes (CO-PO)
1=Low correlation, 2=Medium correlation, 3=High correlation

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
CF210.1	1	-	-	-	-	-	-	-	-	-	1
CF210.2	1	-	-	-	-	-	-	-	-	-	1
CF210.3	1	-	-	-	-	-	-	-	-	-	1
CF210.4	1	-	-	-	-	-	-	-	-	-	1
CF210.5	2	-	-	-	-	-	-	-	-	-	1

Course contents:

1.0 Introduction to Foundry Testing **10 Hrs.**

Classification of various tests on the basis of type and rate of loading; Principles of different tests- tensile, compression, hardness, impact;

2.0 Non Destructive Testing **10 Hrs.**

Principles, classification of testing techniques, merits, demerits and field of applications of various non destructive tests- visual inspection, radiography, ultrasonic, magnetic particle, eddy current, dye penetrant;

3.0 Optical Metallography techniques **10 Hrs.**

Principles, methoding, applications;

4.0 Electron Microscopy **10 Hrs.**

Scanning Electron Microscopy, Transmission Electron Microscopy;

5.0 Spectroscopy Techniques **10 Hrs.**

Optical emission spectrometer, Atomic absorption spectroscopy, Infrared Spectroscopy, X-Ray Spectroscopy

Text Books/Reference Books/ Other Books/E-material/Paper

Sr.No	Title	Author	Publisher	Edition	Year of Edition
1	Characterization of Materials	Kauffmann	John Wiley Publications	-	-
2	Materials Characterization	ASM Metal Handbook	ASM Int	Vol. 10	2004
3	Non Destructive Testing and Quality Control	ASM Metals Handbook-	ASM Int.	Vol.-17	-
4	Non destructive Testing Hand Book	P. McIntire	American Society for non destructive Society	(Ed.)-Vol.-4	1986.
5	Nondestructive Evaluation: Theory, Techniques and Applications	Peter J. Shull	Marcel Dekkar	-	2002
6	Physical Methods for Metal Characterization	PejFlewitt	Institute of Physicas Publications	-	-
7	Testing and Inspection of Engineering Materials	Davis, Troxell and Wiskonell	McGraw Hill	-	-

ADVANCED DIPLOMA IN FOUNDRY TECHNOLOGY

LIST OF EXPERIMENTS

SEMESTER-III

Sr. No.	Name of Experiment
1	Sample cutting: Cast iron
2	Sample cutting: S.G. iron
3	Sample cutting: Steel
4	Sample cutting: Stainless Steel
5	Mold preparation technique
6	Polishing of Cast iron sample
7	Polishing of S. G. Iron sample
8	Polishing of Steel and Stainless steel sample
9	Study of Fe-Fe_3C Diagram
10	Study of microstructure of Cast iron
11	Study of microstructure of (Ductile) S.G. iron
12	Study of microstructure of Steel
13	Study of microstructure of Stainless Steel
14	Study of Study of Non-Ferrous Alloys
15	Study of Study of Different types of Furnaces

SEMESTER-IV

Sr. No.	Name of Experiment
1	To study the Heat treatment process
2	To study the CCT and TTT diagram
3	To study the Rockwell Hardness (Scale A) Tester
4	To study the Rockwell Hardness (Scale B) Tester
5	To study the Rockwell Hardness (Scale c) Tester
6	To study the Brinell Hardness Tester (Sample A)
7	To study the Brinell Hardness Tester (Sample B)
8	To study the Brinell Hardness Tester (Sample C)
9	To study the Vicker Hardness Tester
10	To study the of Portable Hardness Tester
11	To cut notch on standard specimen
12	To inspect notch size
13	To conduct the Tensile Strength test
14	To conduct chemical analysis of steel using optical emission spectrometer
15	To conduct chemical analysis of Cast iron using optical emission spectrometer.