**Certificate Course in Foundry Technology Course Details**

* Course Id : **MSME/CCFT**
* Candidate Eligibility : **10th PASSED**
* No. Of NOS (If QP) : **NA**
* NSQF Level : **3**
* Cost Category : **I**
* Course Duration
  + Theory duration : **280**
  + Practical duration : **420**
  + OJT duration : **80**

**Trainer Qualification Work Experience**

|  |  |
| --- | --- |
| **Trainer Qualification** | **Work Experience** |
| * Minimum - Diploma/Degree in Mechanical Engineering * Certified for Job Role: “Diploma in Foundry Technology ” with Minimum acceptance score of 65 % * Recommended that the Trainer is certified for the Job Role: “Diploma in Foundry Technology ” with Minimum accepted score of 65%. * Alternatively, must have successfully undergone a CGSC organized TOT workshop on “How to Trainer”. | * Minimum 3 to 4 years of industry experience in relevant job role and a Minimum of 3 to 4 years and Training experience in relevant job role. |

**NATIONAL SKILL QUALIFICATION FRAMEWORK QUALIFICATION FILE**

Version 6: Draft of 08 March 2016

**CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE**

**Name and address of submitting body:**

**O/o DC (MSME),**

**Ministry of Micro, Small and Medium Enterprises  
Nirman Bhawan,**

**Maulana Azad Road,**

**New Delhi - 110108**

**Name and contact details of individual dealing with the submission**

**Name :** Mr. R Panneerselvam

**Position in the organisation** : Principal Director

**Address if different from above :** MSME –TECHNOLOGY DEVELOPMENT CENTRE

(PPDC), Foundry Nagar AGRA U.P

**Tel number(s) :**08860548805

: Off: 0562-2344006/2344683;

: Fax : 0562-2344381

: Web: [www.ppdcagra.in](https://www.rediffmail.com/cgi-bin/red.cgi?red=http%3A%2F%2Fwww%2Eppdcagra%2Ein&isImage=0&BlockImage=0&rediffng=0&rogue=7c60407878ed755fc77e5584e7f046f2638bc088)

**E-mail address :** [info@ppdcagra.in](mailto:info@ppdcagra.in), [anilksagr@gmail.com](mailto:anilksagr@gmail.com), paselvam@gmail.com

**List of documents submitted in support of the Qualifications File**

1. Curriculum Document
   1. **SUMMARY**

|  |  |
| --- | --- |
| **Qualification Title** | **Certificate Course in Foundry Technology** |
| **Qualification Code** | **MSME/CCFT** |
| **Nature and purpose of the qualification** | **Nature**  **6 months Certificate Course in Foundry Technology**.  **Purpose**   * After completion of the course candidate can undertake various activities of the Foundries in technically correct & professional manner. * Develop Skill to Execute the process of :   Molding  Melting  Fettling     * To make people capable of making metallic component by using casting process. * To upgrade the skills of people which are already working in foundry sector & to learn new skills to deal with technological changes.   . |
| **Body/bodies which will award the qualification** | **MSME-Technology Centre , Ministry of Micro, Small & Medium Enterprises, New Delhi.** |
| **Body which will accredit providers to offer courses leading to the qualification** | **MSME-Technology Centre , Ministry of Micro, Small & Medium Enterprises, New Delhi.** |
| **Body/bodies which will carry out assessment of learners** | **MSME-Technology Centre , Ministry of Micro, Small & Medium Enterprises, New Delhi.** |
| **Occupation(s) to which the qualification gives access** | **Foundry Technician** |
| **Licensing requirements** | **Not Applicable** |
| **Level of the qualification in the NSQF** | **Level 3** |
| **Anticipated volume of training/learning required to complete the qualification** | **780** |
| **Entry requirements and / or recommendations** | **10th PASSED** |
| **Progression from the qualification** | **Job Progression:**  After 3-4 yrs working as a technician person can get a job at the level of Foundry Supervisor. |
| **Planned arrangements for the Recognition of Prior learning (RPL)** | RPL arrangement and polices are under development. |
| **International comparability where known** | **Not Known** |
| **Date of planned review of the qualification.** | **JUNE 2018** |

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| --- | --- | --- | --- |
| **Formal structure of the qualification** | | | |
| **Title and identification code of component.** | **Mandatory/ Optional** | **Estimated**  **size(learning hours)** | **Level** |
| Industrial Safety & Management | **Mandatory** | **100** | **3** |
| Casting process & Materials | **Mandatory** | **100** | **3** |
| Melting Technology | **Mandatory** | **150** | **4** |
| Molding Technology | **Mandatory** | **150** | **4** |
| Fettling & Inspection of Casting | **Mandatory** | **100** | **3** |
| Design and Metrology | **Mandatory** | **100** | **3** |
| Project/Inplant Training | **Mandatory** | **80** | **3** |

Please attach any document giving further detail about the structure of the qualification – e.g. a

Curriculum Document or a Qualification Pack.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

**SECTION 1**

**ASSESSMENT**

**Body/Bodies which will carry out assessment:**

Assessment Wing -

MSME-Technology Development Centre (PPDC)

Foundry Nagar, Agra-282006

**How will RPL assessment be managed and who will carry it out?**

PROCESS OF RPL ARRANGEMENT ARE UNDER DEVELOPMENT

**Assessment & Evaluation**

**(A) Assessment Guidelines:**

1. Criteria for assessment based on each learning outcomes, will be assigned marks proportional to its importance. Entire course will be covered in six month (1 semesters) and at the end of each semester examination will be conducted for both Theory & Practical.

2. Assessment of Theory & Practical part is based on the question prepared by the experience trainers and duly approved by assessment wing of MSME-TDC(PPDC), Agra.

3. Entire semesters having six theory subject having 300 marks and internal Assessments having 360 marks. for each theory and practical , internal Assessments will be conducted at the mid of training program.

Industrial training / project work of 40 marks in the will be conducted at the end of training program

4. To pass the qualification, every candidate should score a minimum of 40% marks in theory and 60% in both practical & Project work.

5. Assessment will be carried out considering the following components .

a) Job carried out in workshop/ lab.

b) Record book/ daily diary/ Log book.

c) Answer sheet of the assessment.

d) Viva-Voice

e) Presentation Skill.

f) Assessment and punctuality.

**(B) Assessors:**

1. The trainers/ Faculty of MSME-TDC(PPDC), Agra will follow the designed curriculum & assess students as per the guidelines provided by Assessment wing of MSME-TDC(PPDC), Agra.

2. The Trainers are trained time to time to upgrade their skills for imparting training as per the market/ industrial demand. The TOT conducted at specialized institute like NIFFT, Ranchi & other technology centers of the country.

**(C) Eligibility to Appear in the Exam:**

1. Minimum 85% attendance is compulsory

**5. PASSING MARKS:**

Passing criteria is based on marks obtain in attendance record, term works , assignments, practical’s performance, viva or oral exam, module test, class test, practical exam and final exam

Minimum Marks to pass practical exam – 60%

Minimum Marks to pass theory exam – 40%

Minimum Marks to pass viva / oral exam – 60%

Minimum Marks to pass Project report and presentation exam – 60%

**6. RESULTS AND CERTIFICATION:**

The assessment results are backed by evidences collected by assessors. Successful trainees are awarded the certificates by MSME-Technology Centre.

**(G) Assessment Evidence**

a) Job carried out in workshop/ lab.

b) Record book/ daily diary/ Log book. c) Answer sheet of the assessment.

d) Viva-Voice.

e) Presentation Skill.

f) Assessment and punctuality.

**Title of Component: Certificate Course in Foundry Technology**

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| **Outcomes to be assessed** | **Assessment criteria for the outcome** |
| 1. Demonstrate the use of safety equipments and tools. Apply the safety and environment guidelines and regulation. Indentify the hazards and danger in casting process. | The Candidate should able to:-  **1.1.** Identify the components needed to provide a safe and healthful work environment at melting, coating , molding process.  **1.2** Identify potential workplace safety and minimal health hazards and determine how to mitigate the hazards through engineering controls, administrative controls and personal protective equipment.  1.3. Conduct basic safety inspections based on hazard identification and job hazard analysis.  1.4. Identify and demonstrate a working knowledge of the health under high temperature condition and safety  regulations.  1.5 Apply psychological principles to individual acts of unsafe behavior and unsafe acts and the prevention. |
| **2.** Knowledge of Foundry materials: Classification, Application, & I.S.I Specification for all Raw Materials Used in Foundry. Refractory sand, Refractories, Binder, Fuels, Fluxes, Facing materials, Parting agents | **2.1** To prepare open sand mold by trammeling method  **2.2** To apply facing & backing sand for C.I casting.  **2.3** To prepare closed mold with Natural molding sand, melting of Al. |
| **3.** Knowlwdge of Engineering metals. Classification of Metals. (Ferrous, Non-Ferrous & Its Alloys. Ore to Metal Mfg. Of Ferrous Metals, Properties ,Application  I.S.I Specification. Effects Of elements normally Presents in Ferrous  Metals. Effects of alloying elements in Cast Iron alloys and Steel Alloys | **3.1** To prepare mold with different Joints (plain, Build up, Cutting, Floating).  **3.2** To prepare mold with Top Run gating system. |
| 4.. Composition, Types, Ingredients, additives.  Properties of sand. Sand reclamation and Sand Preparation | **4.1** To prepare Different types of Core by using different types of Core Boxes, and making of core by different types of Core Binder and also baking then in Oven and other Methods. |
| 5. Design of casting Introduction Sand casting , Pattern:  Types, materials, Allowance, Color coding, Care & maintenance. Core  Boxes:  Types, Materials, coloring. Core:  Classification of core. Venting & Reinforcing, Backing & Baking of  core. | **5.1** To prepare mold with core; by using of self cored  pattern and split pattern having Horizontal & Vertical  Core print.  **5.2** To Prepare core sand, preparation of core,  Reinforcement and Venting of core. Backing & Baking of  core, trimming of core & dressing of core. |
| 6. Furnace operation, basic maintenance of induction furnace.  Various preventive maintenance activities of induction furnace. | 6.1 To operate Furnace operation, basic maintenance of induction furnace. Like Reeling of Furnace. Relining and Patching of Tilting / Pit furnace  6.2 To conduct various preventive maintenance activities of induction furnace To Prepare Ladle lining by Fire clay mixture and C02 sand. |
| 7. Instrumented  Impact Testing, Hardness, test .Thermal Inspection, X-Ray Diffraction Analysis, Materials  Characterization Automation of Surface Defect Detection, Image Analysis. | 7.1To describe various inspection test.  7.2 To describe various procedure of inspection and testing  7.3 To assist in execution of various testing and inspection activities. |
| 8.Demonstrate the melting process of steel, cast iron, S.G iron. To apply basic facts and concepts in pouring and solidification of metals and alloys. | The candidate should able to –  8.1 Describe physical and chemical properties of metals and alloys.  8.3 Use of temperature measuring instruments . |
| 9. Selecting the molding and core making material and tools to be used. Demonstrate core and mould making. | The candidate will able to –  9.1 Prepare sand for mould and core making with desire runner and gates.  9.2Make Mould for pouring of metals and alloys.  9.3 Prepare materials for coating of moulds and core and achieve the desire parameters for coating materials like viscosity, specific gravity. |

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| 10. Understanding the Use of digital equipment in melting and casting practices. | The candidate should able to-  4.1Understand the thermostats, PID controller etc.  4.2Adopt modern technology in melting using radiation pyrometer & other digital temperature controller. |
| 11. Understand and interpret engineering drawings and sketches related to casting  . | The candidate should able to –  11.1 Understand the engineering drawings, sketches and work order and identify required work step |

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| --- | --- |
| 12. Describe the Post production activities. | The Candidate should able to -  12.1 Understand Fettling & Reworking process.  12.2 Undertake various surface finishing operations like grinding, filing etc.  12.3 Understand & Operation of various machining works on Lathe, Milling, Drilling etc.& including CNC  based machines. |
| 13. Measurement and metrology of the components. | The Candidate should able to –  13.1 To use measuring instruments like Calipers, depth gauges, height gauges, Outside micrometers, thickness gauges.  Bore gauges, air plug gauges |

**SECTION 2**

**EVIDENCE OF LEVEL**

Awarding bodies will enter a proposed NSQF level for the qualification in the Qualification File Summary. This section asks for the evidence on which that proposal is based. The evidence must refer to the level descriptors of the NSQF.

NSDA recommends an approach to working out the level of qualifications which starts with the level descriptor domains (Process, Professional knowledge, Professional skill, Core skill and Responsibility: see annex A). Two variants for providing the evidence of level are offered here: Option A and Option B in the following pages. Awarding bodies should choose the option which best suits the qualification.

**OPTION A**

|  |  |  |  |
| --- | --- | --- | --- |
| **Title/Name of qualification/component Certificate Course in Foundry Technology Level: 3** | | | |
| **NSQF Domain** | **Outcomes of the Qualification/Component** | **How the job role relates to**  **the NSQF level descriptors** | **NSQF**  **Level** |
| Process | Casting of Cast Iron, SG, Brass, aluminum Components, Sand preparation, Making of Moulds and cores by using different sand for various types of components and patterns.  Cleaning and surface finishing of castings, Documentation of the process. | Cleaning and surface finishing of castings require activities which predictable in nature. Casting and molding for different components are routine work. | 3 |
| Professional knowledge | Different types of sand making, core making and mould making processes and associated equipments.  Different types of tools and machinery for casting and trim the output.  Sketches and engineering drawings.  Basic principles of geometric and drawing.  Different specifications of sand to be used for preparing cores and moulds  Different types of core making and mould making methodologies.  different types of automated processes pertinent to sand making, core making, mould making or casting.  final product output and hence decide on the key steps to be followed for preparing output and trimming  impact of various physical parameters like temperature, etc on the properties of final output product like strength, shape etc  hazards and safety aspects involved in handling molten metal  Safety precautions to be taken for all types of casting activities especially while handling hot , caustic solutions etc.  Mechanical/ heat laws and working of casting machines etc.  latest cleaning and lubricating agents and chemicals  Measuring instruments like venirer calipers, micrometer and other measurement systems. geometry and dimensions  Basic knowledge of 5S procedures know various types 5s practices followed in various areas. Understand the 5S checklists provided in the department/ team have skills to identify useful & non useful items. have knowledge of labels , signs & colors used as indicators | Basic facts & theory of metallurgy, Principles of thermodynamics and metal flow helps in manufacturing casting of different metallurgical grade. | 3 |
| Professional skill | Follow instructions and work on areas of improvement identified  complete the assigned tasks with minimum supervision.  complete the job defined by the operator/supervisor within the timelines and  organize all process/ equipment manuals so that sorting out information is fast organize apparatus etc. in an orderly  manner at proper designated areas  co relate the type of job output required with the casting  methodology to be used  persuade co team members to follow 5 S Ensure that the co team members understand the importance of using 5 S tool | Use of measuring instruments, application of various foundry materials, different types of sand ,use safety tools and identification of hazards on shop floor, Proper handling and transportation of molten metal. Use of tools and equipments for molding, cleaning and surface finishing. | 3 |
| Core skill | Read and interpret engineering drawing and sketches read equipment manuals and process documents to understand the equipment and processes better read safety instructions especially symbols while us the equipment in the plant area  Write a log book in terms of output number, set up parameters, machine setting parameters and loss details etc.  **Oral Communication (Listening and Speaking skills**  discuss task lists, schedules, and work-loads with co-workers  question internal customers/ Casting shop supervisor in order to understand  the nature of the problem and make a diagnosis | The Job holders needs to have generic skills of writing, oral and communication. Job holder needs documents on post &pre production requirement. Understand the products and requirement of clients which require clarity in oral & written skills. Also job holder needs to aware of social, political & natural environment. | 3 |
| Responsibility | To manufacture of defect free castings with allowable rejections and at competitive cost.  To meet the delivery schedule.  To meet the quality of product as per desire.  To meet the customer requirements. | Job holder is required to execute the production plan given by the supervisor. Quality of final product is managed by job holder. | 3 |

**SECTION 3**

**EVIDENCE OF NEED**

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| **What evidence is there that the qualification is needed?**  Foundry-technician, have high demand in industry to supervise complicated tasks and duties with in the Melting/ Moulding /Quality control department. The Indian Foundry Industry occupies a special place in shaping the country’s economy. The TIFAC report looks into the status of technologies world over and India in particular. The country’s foundry industry has created the greater support and impact on the auto motive and other manufacturing sector. The Indian Foundry(MetalCasting) Industry is 2nd largest globally. The industry growth in 2015-16 was more than 25% and employs approximately 500,000 people directly and another 1.5 Million in directly. |
| **What is the estimated uptake of this qualification and what is the basis of this estimate?**  Government of India has ambitious plans to boost share of manufacturing in the GDP to 25% from present 15-16% , the industry is likely to be driven by huge demand from various industrial sectors which will create an additional demand for 200,000 -250,000 skilled workforce in foundry industry at various levels in next five years. The foundry industry is facing acute shortage of skilled manpower and this shortage is likely to compound in next 5 years.  In this background, the Institute is proposed to offer Diploma programme with an intake of 40 students every year. |
| **What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF?**  The institute has referred to the existing Qualification Register and the qualification under this application does not exist. |
| **What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?**  The institute is dedicated for the education, training and skill development in the domain of foundry technology. The institute shall ensure to seek the continuous feedback from industry on the latest trends and technology and shall incorporate in the components of qualification. The qualification shall be revised every year with respect to the descriptors. |

**NSQF QUALIFICATION FILE**

Version 6: Draft of 08 March 2016

**SECTION 4**

**EVIDENCE OF PROGRESSION**

**What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?**

The horizontal and vertical mobility has been the part of the qualification design. The courses are design so that the trainee will be able to acquire advanced skills and achieve higher level in the qualification to reach to the position of manager and above. The trainees can move horizontally in the field of production to quality control, Heat Treatment in the field of manufacturing sector.

The students can achieve higher qualification like Grade IIF offered by Institute of Indian Foundryman which is equivalent to Graduate in Foundry Technology.

Please attach any documents giving further information about any of the topics above.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

**PROGRESSION MAP**

**FOUNDRY SUPERVISOR**

**SR. FOUNDRY**

**TECHNICIAN**

**FOUNDRY**

**TECHNICIAN**

**CURRICULUM: COURSE WISE DETAILS CONTENTS**

**CERTIFICATE COURSE IN FOUNDRY TECHNOLOGY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Session name - Industrial Safety & Management** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration (40 hours)** | **Activity (60hours)** |  | **Practical** | **Theory** |
| **Introduction To Industrial Safety** |  | History and development of safety movement, Need for safety, Safety legislation: Acts and rules, Safety standards and codes, Safety policy: safety organization and responsibilities and authorities of different levels. Accident sequence theory, Causes of accidents, Accident prevention and control techniques, Plant safety inspections, Job safety Analysis and investigation of accidents, First aid. . | 12 | 8 |
| **Plant Design & Housekeeping** |  | Concept of workplace and its design. Improving safety and productivity through work place design control measures. Technical and engineering control measures. Control measures against human error. Preventive maintenance. Role of Preventive maintenance in safety and health. Standards and code of practices for plant and equipment. Standardization and its benefits, Purchasing policy. Safety and good housekeeping. Need for planning and follow-up. Typical accidents due to poor housekeeping. Disposal of scrap and other trade wastes. Prevention of spillage. Marking of gangways and other locations. Use of colour as an aid for good housekeeping. Clean-up campaigns. Cleaning methods, employee assignment. Inspections and check-list. Result of good housekeeping. Plant safety observation, Plant Safety Inspections. Safety Sampling. Safety Surveys. Job Safety Analysis. Safety Inventory System. | 12 | 8 |
| **Control Of Workplace Hazards** |  | Control of Physical Hazards:  Purpose of lighting. Advantages of good illumination. Lighting and safety. Lighting and the work.  Sources and types of artificial lighting. Principles of good illumination. Recommended minimum  standards of illumination. Design of lighting installation, Lighting and colour,  Control of Fire Hazards:  Statutory provisions regarding fire safety. Factors contributing towards fire. Chemistry of fire.  Classification of fires. Common causes of industrial fires. Determination of fire load. Fire resistance  of building materials. Design of building plant, exits, etc. for fire safety. Prevention of fire. Portable  extinguishers. Water systems, carbon-di-oxide systems | 12 | 8 |
| **Use Of English In Business Environment** |  | 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 | 12 | 8 |
| **Verbal Communication** |  | Preparing for a Group Discussion Initiating a Discussion Eliciting Opinions, Views, etc. Expressing Agreement/ Disagreement  Making Suggestions; Accepting and Declining  Suggestions Summing up. | 12 | 8 |

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| **Session name - Casting Process & Materials** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration (40hours)** | **Activity (60 hours)** |  | **Practical** | **Theory** |
| **Ferrous &** N**on- ferrous metals** |  | Physical and mechanical properties viz. strength, elasticity, ductility, toughness, malleability, brittleness, hardness, stiffness, fatigue, Classification of iron and steel; pigiron, cast iron, wrought iron, steel, alloy steel, stainless steel and carbon steels.  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. | 15 | 8 |
| **Engineering plastics and fiber** | **:** | 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. | 8 | 8 |
| **Fuels & Refractory** |  | Coal, coke, liquid fuel, light diesel Oil(LDO), HSD,LPG, Natural gas, Principles of efficient combustion, liquid and gas fuel burners.  Definition, classification and properties of Refractoriness. Manufacture of Refractoriness.  Testing of refractoriness  •Specific gravity  •Bulk density  •Porosity  •Refractoriness  •Slag attack  •Cold crushing strength  Refractory failure | 12 | 8 |
| **Patterns** |  | Pattern materials. Pattern making tools, different pattern materials their merits and Demerits.  Different types of patterns such as single piece, Cope and Drag, Follow board, Match plate pattern etc.  Tools for making Wood patterns and Metal patterns. Patterns for special processes such as foam moulding, shell moulding | 15 | 10 |
| **Investment casting** |  | Die making , pattern making , cluster making , sprue making ,washing ,cell making , de-waxing , drying of cell , melting and pouring , knock out. | 10 | 6 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Session name – Melting Technology** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration (60 hours)** | **Activity (90 hours)** |  | **Practical** | **Theory** |
| ***Melting of primary and secondary metals*** |  | 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. | 18 | 12 |
| ***Melting technology:*** |  | Role of flux ; Reducing agents ; Air reluctant 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 the reform; 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. | *18* | *12* |
| ***Composition control and melt quality*** |  | Importance of metal clean lines ; 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 superheat | *18* | *20* |
| ***Efficient Operation:*** |  | 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 re cuperators and regenerators, regulation control of power input into the | *18* | *20* |

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| ***Handling of liquid metal:*** |  | 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. | *18* | *15* |

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| --- | --- | --- | --- | --- |
| **Session name – Molding Technology** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration (60 hours)** | **Activity (90 hours)** |  | **Practical** | **Theory** |
| ***Conventional Sand moulding*** |  | Hand moulding with greens and using natural binders like clay, use of mechanical ramming aids & mould manipulation dries and process, loam sand moulding, use of cow dung, Betonies dextrin core oils & molasses as binder, mould washers Skin drying of moulds. | 18 | 12 |
| ***Moulding Machine:*** |  | 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 di-oxide process, shell moulding & metal moulds, gravity & pressure die  casting, V moulding processes. | *18* | *12* |

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| ***Mould Quality:*** |  | 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 & rattails, storage of mould &  moisture pickup. | 18 | 12 |
| ***Functions & design of mould:*** |  | Function of cavity, components of mould, gating system & risers, Directional solidification of metals, stream lined pouring of mould, maintenance of metal purity, Rigging and shakeout, recycling of sand, reclamation of sand. | *18* | *12* |
| ***Core Making*** |  | Importance and requirement of cores, Core making materials. Core sand, its ingredients and properties.  Binders & machines used in core making.  Types of Cores, Core making processes. Core venting, Core baking by different methods.  Finishing of Cores. Core setting chaplets.  Core sand disposal. | *18* | *12* |

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| **Session name - : Fettling And Inspection of Casting** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration (40 hours)** | **Activity (60 hours)** |  | **Practical** | **Theory** |
| ***Machining Operation*** |  | Introduction to shop safety Hand tool safety Measurement tools  Cutting tools  Drill Press and Band saw  Vertical Milling operation Vertical Milling operation Lab open fabrication Lathe operation | 12 | 12 |
| ***Unconventional Machining*** |  | Ultrasonic Machining (USM)  Water-Jet Machining & Abrasive-Jet  Machining  Chemical Machining Electrochemical Machining (ECM) Electrical-Discharge Machining (EDM)  High-Energy-Beam Machining – Laser-beam machining (LBM) – Electron-beam machining (EBM) | 12 | 12 |

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| ***Testing & Inspection I*** |  | Introduction to Inspection and Testing Procedures - Visual Inspection, Dimensional Inspection, Examination of Surface Sound Test, Pressure Testing \ Leak Testing, Testing Of Mechanical Properties: Tensile Testing Hardness Testing The brinell Test or The Rockwell Test, Fracture Test, Impact Test, Creep Testing. | 12 | 8 |
| ***Testing & Inspection II*** |  | NON- DESTRUCTIVE TEST: Introduction, Radiography, (X-ray  &y- ray) Magnetic Particle Inspection, Fluorescent - Penetrate Inspection. Ultrasonic Inspection SOME ADVANC INSPECTION AND TESTING | 6 | 8 |

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| ***Heat Treatment of Casting*** |  | Heat-Treated all Types of Metal Casting and Salvaging of Metallurgical Problems | 18 | 10 |

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| --- | --- | --- | --- | --- |
| **Session name - Design, Measurement & Metrology** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration (40hours)** | **Activity (60hours)** |  | **Practical** | **Theory** |
| **Drawing office practice** |  | Importance of engineering drawing- drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets etc. - layout of drawing sheets.  Importance of legible lettering and numbering- single stroke letters- uppercase and lower case letters-general procedures for lettering and numbering- height of letters- guidelines.  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.  Scales- Study of scales- full size scale, reduced scale and enlarged scale. | 12 | 10 |
| **Computer aided design** |  | Getting Started with CAD  Basic Drawing & Editing Commands  Drawing Precision in CAD  Drawing Organization and Information  Advanced Editing Commands  Inserting Blocks | 12 | 6 |
| **Mechanical Measurement** |  | Need of mechanical measurement, Basic definitions: Hysteresis, Linearity, Resolution of measuring instruments, Threshold, Drift, Zero stability, loading effect and system response. Measurement methods, Generalized Measurement system, Static performance characteristics, Errors and their classification. | 12 | 8 |
| **Temperature measurement** |  | Temperature Measuring Devices: Thermocouples, Resistance Temperature Detectors, Thermostat, Liquid in glass Thermometers, Pressure Thermometers, Pyrometer, Bimetallic strip. Calibration of temperature measuring devices, Numerical Examples on Flow Measurement | 12 | 8 |
| **Metrology of Surface finish** |  | Surface Metrology Concepts and terminology, Analysis of surface traces, Specification of surface Texture characteristics, and Method of measuring surface finish, frequency and cut off, other methods for measuring surface roughness: Pneumatic method, Light Interference microscopes. | 12 | 8 |

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| **Session name – On Job Training** | | | | |
| **Practical competencies**  **(includes demonstration and activity)** | | **Underpinning Knowledge** | Duration (in hours) | |
| **Demonstration** | **Activity (80 hours)** |  | **Practical** | **Theory** |
| Orientation programme project work in the industry report writing and evaluation |  | 2. Observe the processes, tools, machinery and equipment used  3. Observe testing of castings at each stage  4. Study drawings and interpret the drawings  5. Study the organizational structure of the company  6. Study the product development from raw material to finished goods  7. Observe safety norms adopted  Prepare a report on a case study which includes all the components referred above. | 80 | - |

**Evidence of level**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **LEVEL** | **Process required** | **Professional knowledge** | **Professional skill** | **Core skill** | **Responsibility** |
| 3 | Molding & melting for Casting of different components are routine work. Cleaning and surface finishing of castings require activities which is predictable in nature. | Basic facts & theory of Molding & melting Principles helps in manufacturing casting of different metallurgical grade. | Use of measuring instruments, application of various foundry materials, different types of sand ,use safety tools and identification of hazards on shop floor, Proper handling and transportation of molten metal. Use of tools and equipments for molding, cleaning and surface finishing. | The Job holders needs to have generic skills of writing, oral and communication. Job holder needs documents on post &pre production requirement. Understand the products and requirement of clients which require clarity in oral & written skills. Also job holder needs to aware of social, l & natural environment. | Job holder is required to execute the production plan given by the supervisor. Quality of final product is managed by job holder. |
| Level 3 | Level 3 | Level 3 | Level 3 | Level 3 |

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| ***CURRICULUM REVIEW*** | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | |
| **Sr. No** | **Subject code** | **Subject Name** | **Teaching Scheme / No. of Hours** | | **Examination Scheme** | | | | | | | | |
| **Theory** | **Practice** | **Theory** | | | | **Practice** | | | | **Total Marks** |
| **Sessional** | | **Semester Exam** | | **Sessional** | | **Semester Exam** | |
| **Max. Marks** | **Min to pass** | **Max. Marks** | **Min to pass** | **Max. Marks** | **Min to pass** | **Max. Marks** | **Min to pass** |
| 1 | **CCFT101** | Industrial Safety & Management | 40 | 60 | 20 | 08 | 50 | 20 | 30 | 18 | 50 | 30 | 150 |
| 2 | **CCFT102** | Casting process & Materials | 40 | 60 | 20 | 08 | 50 | 20 | 30 | 18 | 50 | 30 | 150 |
| 3 | **CCFT103** | Melting Technology | 60 | 90 | 30 | 12 | 100 | 40 | 50 | 30 | 100 | 60 | 280 |
| 4 | **CCFT104** | Moulding Technology | 60 | 90 | 30 | 12 | 100 | 40 | 50 | 30 | 100 | 60 | 280 |
| 5 | **CCFT105** | Fettling & Inspection of Casting | 40 | 60 | 20 | 08 | 50 | 20 | 30 | 18 | 50 | 30 | 150 |
| 6 | **CCFT106** | Design ,Measurement & Metrology | 40 | 60 | 20 | 08 | 50 | 20 | 30 | 18 | 50 | 30 | 150 |
| 7 | **CCFTP01** | Project/ OJT |  | 80 | - | - | - | - | - | - | 40 | 24 | 50 |
|  | **TOTAL -** | | **280** | **500** | **140** | **56** | **400** | **160** | **220** | **132** | **440** | **300** | **1200** |