**Certificate Course in Machine Operation Details**

* Course ID **: MSME/CCMO/21**
* Candidate Eligibility **: Pass Class 10th , Minimum 15 Years of age.**
* No. of NOS (if QP) : Under process
* NSQF Level : **3**
* Cost Category : **1**
* Course Duration **:**
* Theory duration **: 530 hrs.**
* Practical + OJT **: 1030 hrs.**

**Trainer Qualification and Work Experience :**

**Trainer Qualification : Degree in Mechanical Engg and Minimum Diploma in Mechanical Engineering / Diploma in Tool & Die Making**

**Work Experience : Minimum 3 years of industry experience in relevant job role and training experience.**

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

**Name and address of submitting body:**

**MSME TOOL ROOM – KOLKATA**

**(Central Tool Room & Training Centre)**

**Ministry of MSME , Govt. of India**

**Bonhooghly Industrial Area**

**Kolkata – 700108 , West Bengal**

**Ph: (033)25788769,25771068**

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

**Name: Shri Kanakendu Das**

**Position in the organisation: Senior Manager-Trg**.

**Tel number(s): 9231897100**

**E-mail address:** **cttc@cal.vsnl.net.in** **/ cttc-msme@gov.in**

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| **Qualification Title :** | **CERTIFICATE COURSE IN MACHINE OPERATION** |
| **Qualification Code** | **MSME / CCMO /21** |
| **Nature and purpose of the :****Qualification**  | Nature of the course is trade **Certificate Course.**The purpose of the qualification are * Learners who attend this qualification are competent to work on conventional machine tools in order to produce / Manufacture components as per predefined shape and size.
* Qualified learners get employed into work.
* People upgrade their skills and knowledge already in work.
* People with vocational – professional skill access to the

higher education courses. * Qualifying learners of this qualification would be able to get opportunity in particular sector to learn new skills to deal with technological change.
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| **Body/bodies which will** **award the qualification**  | MSME TOOL ROOM – KOLKATA (Central Tool Room & Training Centre - Kolkata) |
| **Body which will accredit providers to offer courses** **leading to the qualification**  | MSME TOOL ROOM – KOLKATA (Central Tool Room & Training Centre – Kolkata) |
| **Body/bodies which will****carry out assessment of****learners**  | Examination Cell of MSME TOOL ROOM - KOLKATA |
| **Occupation(s) to which the qualification gives access** | Technician / Machine tools operator / Skilled worker in machine tool and manufacturing sectors. |
| **Licensing requirements** | NA |
| **Level of the qualification in****the NSQF**  |  **3** |
| **Anticipated volume of** **training/learning required to complete the qualification** | **12 Months / 1 Year / 1560 hrs.**

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| Sr. No | Course Elements (Subject) | Hourly Distribution |
| Module-1 | Practical Lab | 1030 hrs. |
| Module-2Module-3Module-4Module-5Module-6 | - Machine shop Theory- Engineering Metrology- Engineering Drawing- Workshop Calculation & Science- Employability Skill- Examination | 100 hrs.50 hrs.250 hrs.50 hrs.50 hrs.30 hrs. |
|  | Total | 1560hrs. |

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| **Entry requirements and/or****recommendations** | **Passed 8thclass** **Minimum Age: 15 Years , maximum 25 years** |
| **Progression from the** **qualification**  | Qualifying trainee should obtain a NSQF certificate in Machine Operation trade. This qualification shall enable the trainee to find employment on a skilled work in Machining (Machine tools) Industries.Having Scope to access to other qualification at the same level and at the next higher level.After completion of course the trainee can work as a Junior Machinist / Technician / Machine Tools Operator and after that 3 years of experience, the person can work as a Senior Machinist / Technician / Machine Tools Operator. |
| **Planned arrangements for the Recognition of Prior** **learning (RPL)**  | Learner who have passed 8th class & 3 years experience in this field, the qualification certificate can be achieved by the learner through appearing / passing the examination of the qualification modules. RPL Assessment will done by the assessment body. |
| **International comparability** **where known**  | Not Known |
| **Date of planned review of the qualification.**  | After 3 years of recognition. September, 2019 |

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| **Formal structure of the qualification**  |
| **Title and identification code of component.**  | **Mandatory/****Optional** | **Estimated size****(learning hours)** | **Level** |
| **“Certificate Course in Machine Operation”****Title Code : MSME / CCMO / 21** |
| **Sl. No**  | **Subject Code** | **Subject Name** |
| 1 | **P1** | **Practical Lab** | Mandatory | **1030 hrs.** | **3** |
| 2 | **T1** | **Machine Shop Theory** | Mandatory | **100 hrs.** | **3** |
| 3 | **T2** | **Engineering Metrology** | Mandatory | **50 hrs.** | **3** |
| 4 | **T3** | **Engineering Drawing** | Mandatory | **250 hrs.** | **3** |
| 5 | **T4** | **Workshop Calculation and Science.** | Mandatory | **50hrs.** | **3** |
| 6 | **T5** | **Employability Skills** | Mandatory | **50 hrs.** | **3** |
| **Examination** | Mandatory | **20 hrs.**  |  |
| **Total =**  |  | **1560 hrs.** |  |

**ASSESSMENT**

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

**Examination Cell of MSME Tool Room – Kolkata**

**Will the assessment body be responsible for RPL assessment?**

: Yes**.** Assessment body will be responsible for RPL assessment.

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

The Learners who have met the requirements of any Unit Standard that forms part of this qualification may apply for recognition of prior learning (RPL) to the relevant Education body/Institute with proper evidences. The applicant must be assessed against the specific outcomes and with the assessment criteria for the relevant Unit Standards by the Assessment Body of Respective Institute.

**Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.**

The assessment for the Session -based qualification is carried out by conducting formative assessments, and end-of-session examinations for all trainees aspiring for this qualification, as per the guidelines given. The internal assessments for theory subjects and practical are conducted by the concerned instructors for evaluating the knowledge and skill acquired by trainees and the behavioural transformation of the trainees as per the learning outcomes specified the qualification. This assessment is primarily carried out by collecting evidence of competence gained by the trainees by observing them at work, asking questions and initiating formative discussions to assess understanding and by evaluating records and reports, and marks are awarded to them. Theory examinations are conducted in Machine Shop Theory, Engineering Metrology, Workshop Calculation & Science, Engineering Drawing and Employability Skills. The question papers for the theory Examinations contain objective type questions. Trade practical examinations are conducted. Criteria for assessment based on each learning outcomes, will be assigned marks proportional to its importance. The assessment for the theory &practical part is based on knowledge bank of questions created by trainers and approved by Examination cell/Assessment body. The distribution of marks for the qualification are as under:

**ELIGIBILITY TO APPEAR IN THE EXAM:** Minimum 75% class attendance is compulsory for the students to appear for the assessments

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| **Marking Pattern** |
| **S. No. / Subject Code** | **Subject for the trade test** | **Maximum marks for the each subject** |
| 1 / P1 | Practical Lab | 400 |
| 2 / T1 | Machine Shop Theory | 200 |
| 3 / T2 | Engineering Metrology | 100 |
| 4 / T3 | Engineering Drawing | 100 |
| 5 / T4 | Workshop Calculation and Science. | 100 |
| 6 / T5 | Employability Skills | 100 |
|  |  **Total** | **1000** |

**Minimum pass mark (COMPETENT): 40% for each theory subject and 60% for practical;**

**Fail candidates are entitled three chances to clear the paper.**

**RESULTS AND CERTIFICATION:** Successful trainees will be awarded the Final Mark Sheet and Certificates by **MSME TECHNOLOGY CENTRE**.

**ASSESSMENT EVIDENCE:** Assessment evidence comprises the following components document in the form of records:

* Job carried out in labs/workshop ; Record book/ work diary
* Examination - Answer sheet of assessment
* Viva –voce ; Class test
* Progress chart ; Attendance and punctuality
* Assignment of practical exercise job ; Practical Exam for each module

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| **EVALUATION PATTERN FOR CERTIFICATE COURSE IN MACHINE OPERATION** |
| **SUBJECTS** | **EVALUATION PATTERN** |
| **INTERNAL ASSESSMENT MARKS** | **ANNUAL EXAMINATION MARKS** |  **TOTAL MARKS** | **PASSING** | **PASSING MARKS** |
|  **Class Test** |  **Assignment , Attendance & Behaviour** |  **Practical Exercises & Project** |  **Oral (Viva)** |  **Theory** |  **Practice** |
| **Practical Lab** |  | **20** | **100** | **40** |  | **240** | **400** | **Minimum 40 % for theory and 60% for Practical.** | **240** |
| **Machine Shop Theory** | **40** | **20** |  | **20** | **120** |  | **200** | **80** |
| **Engineering Metrology** | **20** | **10** |  | **10** | **60** |  | **100** | **40** |
| **Engineering Drawing** | **20** | **10** |  | **10** | **60** |  | **100** | **40** |
| **Workshop Calculation & Science** | **20** | **10** |  | **10** | **60** |  | **100** | **40** |
| **Employability Skill** | **20** | **10** |  | **10** | **60** |  | **100** | **40** |
| **TOTAL** |  |  |  |  |  |  | **1000** |  |

**Title of Component: “Certificate Course in Machine Operation”**

**Assessable outcomes:**

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| **Outcomes to be assessed**  | **Assessment Criteria for the Outcome**  |
| Performance on operating of conventional machines and techniques of various operations on – Bench Work- filling, layout, sawing , punching , using of tools & instruments , drill machine and performing of drilling operations , tapping using suitable tools, accessories, and measuring instruments  | Identify the parts of a file, hammer, chisel, punch, hacksaw, bench vice, and their uses and all features. |
| Identify the features of a steel rule, try square and its uses. |
| Identify vernier calliper, common gauges and its uses. |
| Select material piece, study the drawing of exercise job. |
| Practice sawing, Filing work etc. |
| Layout and marking of job using surface plate, height gauge, angle plate, vee block, vernier calliper, scriber etc.  |
| Marking as per drawing. |
| Identify & select of drill machine, vice or clamp holding devices, Drill chuck, sleeve, etc. |
|  Knowing of belt drive and gear drive. |
| Centre punching , setting of job on machine. |
| Setting parameter on machining. |
| Operation of Centre drilling, drilling, counter sinking, Counter boring, reaming, boring , etc. Using coolants. |
| Selection of tap , parameter setting and tapping using lubricating oil. |
| Inspecting of job by measuring tool , gauges. |
| Cleaning of machine and oiling. |
| Performance on operating of Lathe Machine and techniques of various operations on lathe machine for manufacturing a job using suitable tools, accessories, and measuring instruments  | Identify and knowing the functions, features and uses of different parts of a lathe machine. |
| Study the drawing, identify and select material , machine, tools, & measuring instruments.  |
| Formation of cutting tool. |
| Setting of job and machining parameter. |
| Setting of cutting tool to the centre height. |
| Operation carried out on facing, centre drilling, drilling, turning, step turning, grooving, knurling thread cutting, taper turning, Parting off, chamfering, boring, etc. |
| Use of three jaw chuck, four jaw chuck , steady rest, follow rest, face plate, taper turning attachment, lathe carrier, mandrel etc. |
| Inspecting of job by measuring tool , gauges. |
| Cleaning of machine and oiling. |
| Performance on operating of Milling Machine and techniques of various operations on milling machine for manufacturing a job using suitable tools, accessories, and measuring instruments. | Identify and knowing the function and features and uses of different parts of a milling machine. |
| Study the drawing, identify and select material , machine, tools, & measuring instruments.  |
| Selection of different milling cutters for specific operation. |
| Setting and dialling of job and setting of machining parameter,  |
| Operation carried out on surface milling, open & close slot milling, angle milling, form milling, vee slot milling, narrow slot milling, ‘T’- slot milling, dovetail milling etc. |
| Use of machine vice ,’T’ bolt clamps, vee block, rotary table, indexing devices, etc. |
| Uses of cutter holding device like arbour, collets, adapters, spring collect etc. |
| Inspecting of job by measuring tool, gauges. |
| Cleaning of machine and oiling. |
| Performance on operating of Grinding Machine and techniques of various operations on grinding machine for manufacturing a job using suitable tools, accessories, and measuring instruments) | Identify and knowing the function and features and uses of different parts of a grinding machine. |
| Study the drawing, identify machine, tools, & measuring instruments. |
| Selection of different grinding wheel for specific operation. |
| Setting and dialling of job and setting of machining parameter, |
| Operation carried out on surface grinding , slot grinding, angle grinding, form grinding , vee slot grinding , narrow slot grinding, external and internal cylindrical grinding etc. |
| uses of sine table, magnetic vice, stick dresser , sitting dresser, etc. |
| Inspecting of job by measuring tool, gauges. |
| Cleaning of machine and oiling. |
| Practical test in order to access skill and knowledge of trainees on their trade training curriculum by allotting test piece / project  | Performing work by identifying and selecting all relevant items in order to complete the job with individual effort with in stipulated time period |
| Describe Principle function of various machines and machining techniques.Measuring instruments used | Sessional examination to test the knowledge on conventional machines and machining techniques. Principle function and application of Measuring instruments and gauges. |
| Use basic health and safety practice at the work place, environment regulation and housekeeping. |  Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy. |
| Recognize and report all unsafe situations according to site policy. |
| Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures. |
| Identify, handle and store / dispose of dangerous goods and substances according to site policy and procedures following safety regulations and requirements. |
| Identify and observe site policies and procedures in regard to illness or accident. |
| Identify safety alarms accurately. |
| Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures. |
| Identify and observe site evacuation procedures according to site policy. |
| Identify Personal Productive Equipment (PPE) and use the same as per related working environment. |
| Identify different fire extinguisher and use the same as per requirement. |
| Identify environmental pollution & contribute to the avoidance of instances of environmental pollution. |
| Deploy environmental protection legislation & regulations. |
| Take opportunities to use energy and materials in an environmentally friendly manner. |
| Avoid waste and dispose waste as per procedure. |
| Recognize different components of 5S and apply the same in the working environment. |
| Work effectively with others Work in a team,understand and practice softskills, technical English tocommunicate with requiredclarity | Obtain sources of information and recognize information. |
| Use and draw up technical drawings and documents. |
| Use documents and technical regulations and occupationally related provisions. |
| Conduct appropriate and target oriented discussions with higher authority and within the team. |
| Present facts and circumstances, possible solutions &use English special terminology. |
| Resolve disputes within the team. |
| Conduct written communication. |

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| Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, coordinate system and apply knowledge of specific area to perform practical operations.Describe Materials used  | Sessional examination to test basic skills on arithmetic, algebra, trigonometry and statistics.Knowledge of different material, properties, applications of materials. |
| Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination. |
| Understand basic maintenance work in the field of study  | Sessional examination to test basic skills in the field of study including basic mechanical, electrical and hydraulics & pneumatics. |
| Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination. |
| Read and apply engineering drawing for different application in the field of work. | Sessional examination to test basic skills on engineering drawing. |
| Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination. |
| Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality. | Sessional examination to test the concept in productivity,quality tools and labour welfare legislation. |
| Their applications will also be assessed during execution of assessable outcome. |
| Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources. | Sessional examination to test knowledge on energyconservation, global warming and pollution. |
| Their applications will also be assessed during execution of assessable outcome. |
| Understand and applybasic computer working,basic operating system anduses internet services to getaccustomed & take benefitof IT developments in theindustry. | Sessional examination to test knowledge on basic computer working, basic operating system and uses internet services. |
| Their applications will also be assessed during execution of assessable outcome. |

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| **Means of assessment :**Assessment comprises the following components:* Job carried out in labs/workshop (Based on degree of Individual skill & knowledge on specific task, habit on safe working practices, environment regulation & housekeeping, mentality & flexibility to work in a team.
* Record book/ work diary
* Answer sheet of assessment
* Written Class Test
* Viva-voce
* Progress chart
* Attendance and punctuality
* Assignment of each module
* Practical Exam for each module
 |
| **Pass(Competent)/Fail (Not yet Competent): 40% for each Theory subject and 60% for Practical.****Fail candidates (not yet competent) are entitled three chances to clear the paper in order to be competent.** |

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| **EVIDENCE OF PROGRESSION**

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| **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?**Qualified learner of this qualification will obtain NSQF compliance certificate in the trade of machine operation which place the learners in the position to **level 3 of NSQF.** There is a clear path for progression to higher level of qualification. There is a facility of mobility for horizontal and vertical progression from qualification to qualification (same level as well as higher level) within the sector/sub sectors. |

**Diagram shows the mobility for horizontal and vertical progression from qualification to qualification within same sector / sub sector** |
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**COURSE CURRICULUM**

**Course Title : Certificate Course in Machine Operation**

**Duration : 1560 Hrs.**

**COURSE NAME: PRACTICAL LAB**

**COURSE CODE: P1**

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| **Teaching Hours** | **Examination Hours** | **Examination Marks** |
| **Theory** | **Practical** | **Theory** | **Practical**  | **Internal Marks** | **Viva** | **Examination Marks** | **Total Marks** |
|  | **1030** |  | **20** | **120** | **40** | **240** | **400** |

**COURSE OUTCOMES: After completion of course Student should be able to:**

* Explain various machine tools and their principle functions.
* Describe proper safety rules and environment regulation and housekeeping in machine shop.
* Explain different cutting tools, accessories, instruments used.
* Explain measuring tools and instruments.
* Explain sequence of machining operations.
* Develop their skill & knowledge on operating of conventional machines

(Bench Work- filling, layout, sawing, punching, using of tools & instruments.

* Set machining parameter with all relevant calculation.
* Perform various drilling operation, reaming operations, tapping operation using suitable tools,

accessories, and measuring instruments.

* Perform various machining operations on lathe machines for manufacturing job using suitable tools,

 accessories and measuring instruments.

* Perform various machining operations on Milling Machines for manufacturing of job using suitable tools,

accessories and measuring instruments.

* Perform various machining operations on Grinding Machines for manufacturing job using suitable tools

accessories and measuring instruments.

* Understand and follow basic maintenance work of machines, machineries and instruments.

**THEORY HOURS: PRACTICAL HOURS: 1030 THEORY MARKS: PRACTICAL MARKS: 400**

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| **Unit No.** | **Unit Name** | **Unit level outcomes** | **Contents (chapters/topics)** | **Hours** | **Marks** |
| UNIT-I | Introduction to machine shop, instruments, tools, machineries, machine tools and machining technology.Project Work. | After completion of unit Student should be able to Develop their skill & knowledge * on Bench work and operating of drilling machines
* Demonstrate and explain Bench Work- filling, layout, sawing , punching , using of tools &instruments , drill machine and performing of drilling operations , tapping using suitable tools accessories, and measuring instruments
* Appropriate parameters setting of drilling, reaming operations
* operation sequence for the operations

• After completion of unit Students will be evaluated on their level of competency of performance on operating conventional machine tools.Project/Practical test will be assigned to individual student in order to access skill and knowledge on their trade training curriculum.During the session of learning, students are assigned with specific job to be carried out by them in individual / in group responsibility. | Introduction to Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Introduction to Bench work, tools, machineries, instruments, machine tools.Performance on Bench work and drilling Machines**.**Introduction and Identify the parts of a file, hammer, chisel, punch, hacksaw, bench vice, and their uses and all features.Identify the features of a steel rule, divider, try square and its uses.Identify vernier caliper, common gauges and its uses.Select material piece, study the drawing of exercise jobPractice sawing, Filing work etc.Layout and marking of job using surface plate, height gauge, angle plate, vee block, vernier calliper, scriber etc. Marking as per drawingIdentify & select of drill machine, vice or clamp holding devices, Drill chuck, sleeve, etc. Knowing of belt drive and gear drive.Centre punching, setting of job on machine. Setting parameter on machining.Operation of Centre drilling, drilling, counter sinking, Counter boring, reaming, boring, etc. using coolants.Selection of tap, parameter setting and tapping using lubricating oil.Inspecting of job by measuring tool, gauges.Cleaning of machine and oiling.Performing of assigned work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of job process sequence sheet.Performing of assigned project work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of project report. | 210 | 50 |
| UNIT-II | Performing various machining practices on Lathe machines.Project Work. | After completion of unit Student should be able to understand and develop their skill and knowledge on * Lathe Machine and performing of different operations on lathe machine for manufacturing a job using suitable tools, accessories, and measuring instruments.
* Appropriate parameters setting of lathe operations
* operation sequence for the lathe operations
* After completion of unit Students will be evaluated on their level of competency of performance on operating conventional machine tools.

Project/Practical test will be assigned to individual student in order to access skill and knowledge on their trade training curriculum.During the session of learning, students are assigned with specific job to be carried out by them in individual / in group responsibility | Introduction to Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Introduction to Lathe Machine :Identify and knowing the functions, features and uses of different parts of a lathe machine.Study the drawing, identify and select material, machine, tools, & measuring instruments.Formation of cutting tool.Setting of job and machining parameterSetting of cutting tool to the centre height.Operation carried out on facing, centre drilling, drilling, turning, step turning, grooving, knurling thread cutting, taper turning and checking its taper, Parting off, chamfering, boring, etc.Performing of assigned work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of job process sequence sheet.Performing of assigned project work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of project report. | 330 | 50 |
| UNIT-III | Performing various machining practices on Milling Machines.Project Work. | After completion of unit Student should be able to understand and develop their skill and knowledge on* Milling Machine and performing of different operations on milling machine for manufacturing a job using suitable tools, accessories, and measuring instruments
* Appropriate parameters setting of milling operations
* operation sequence for the milling operations
* After completion of unit Students will be evaluated on their level of competency of performance on operating conventional machine tools.

Project/Practical test will be assigned to individual student in order to access skill and knowledge on their trade training curriculum.During the session of learning, students are assigned with specific job to be carried out by them in individual / in group responsibility | Introduction to Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Identify and knowing the function and features and uses of different parts of a milling machine. Study the drawing, identify and select material, machine, tools, & measuring instruments.Selection of different milling cutters for specific operation.Setting and dialling of job and setting of machining parameter,Operation carried out on surface milling, open & close slot milling, angle milling, form milling, v- slot milling, narrow slot milling, ‘T’- slot milling, dovetail milling etc.Use of machine vice, ’T’ bolt clamps, v-block, rotary table, indexing devices, etc.Uses of cutter holding device like arbour, collets, adapters, spring collect etc. Inspecting of job by measuring tool, gauges.Cleaning of machine and oiling.Performing of assigned work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of job process sequence sheet.Performing of assigned project work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of project report.Performing of assigned work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of job process sequence sheet.Performing of assigned project work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of project report. | 330 | 50 |
| UNIT-IV | Performing various machining practice on Grinding Machines Project Work. | After completion of unit Student should be able to understand and develop their skill and knowledge on* Grinding Machine and performing of different operations on grinding machine for manufacturing a job using suitable tools accessories, and measuring instruments
* Appropriate parameters setting of grinding operations
* operation sequence for the grinding operations
* After completion of unit Students will be evaluated on their level of competency of performance on operating conventional machine tools.

Project/Practical test will be assigned to individual student in order to access skill and knowledge on their trade training curriculum.During the session of learning, students are assigned with specific job to be carried out by them in individual / in group responsibility | Introduction of Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Identify and knowing the function and features and uses of different parts of a grinding machine.Study the drawing, identify machine, tools, & measuring instruments.Selection of different grinding wheel for specific operation.Setting and dialling of job and setting of machining parameter.Setting and dialling of job and setting of machining parameter.Operation carried out on surface grinding , slot grinding, angle grinding , form grinding , vee slot grinding , narrow slot grinding, external and internal cylindrical grinding etc. uses of sine table, magnetic vice, stick dresser , sitting dresser, etc. Use of Jigs and Fixture tool to perform specific operationInspecting of job by measuring tools and gauges.Cleaning of machine and oiling.Development of skill on performing of Inspection and checking for all operations on jobs as per design and drawing specifications with the help of different and appropriate measuring instruments and gauges.Performing of assigned work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of job process sequence sheet.Performing of assigned project work by identifying and selecting all relevant items in order to complete the job as per specification with in stipulated time period.Preparation of project report. | 160 | 50 |

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| **Program Name**  | **: Machine Shop Theory** |
| **Course Title**  | **: “CERTIFICATE COURSE IN MACHINE OPERATION“**  |
| **Course Code**  | **: T1** |

Teaching and Examination Scheme:

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| Teaching Hours | Examination Hours | Examination Marks |
| Theory | Practical | Theory | Practical | Internal Marks | Viva | Examination Marks | Total Marks |
| 100 |  | 2.5 |  | 60 | 20 | 120 | 200 |

COURSE OUTCOMES: The aim of this course student should be able to:

* Identify working principle of hand tools and their uses.
* Describe working principle of conventional machine tools, function of various machine tools and

their field of applications.

* Identify method of machining and sequence of operations.
* Identify the function of instruments, accessories and attachments used.
* Identify various machining operation techniques.
* Describe basic maintenance of machines, machineries, accessories, and instruments.
* Identify safe working practice and environment regulation and housekeeping.

 **Theory Hours: 100 Practical Hours: Theory Marks: 200 Practical Marks:**

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| --- | --- | --- |
| Topic and Contents | Hours | Marks |
| **Topic 1: Basic Trade theory on Bench work, drilling** **Objectives:*** Understand the importance of safety rule in machine shop.

• Understand various feature of safety • Describe and classify hand tools• Describe and classify machine tools• Describe and classify measuring instruments• Describe and classify accessories • Describe machines and function of machine parts• Machining parameter setting and calculation**Contents:** Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident. Designation of a file, parts of a file, kinds of file. Types of hammer, parts of a hammer, material of hammer, material of handle.Common types of chisel, designation, material, hardness, cutting angles for different metals. Centre and Dot Punch.Parts of a Hacksaw Frame and Blade, kinds of metal cutting Blade, Types of Blade, Material of Blade, Hardness of Blade, Selection of Blade, Standard Blades, Classification of Blade. Types of vices, parts of a bench vice, designation of a bench vice.Filing method, grasping of the file, fixing of the blade in the hacksaw, Sawing method, holding of chisel, How to fit handle in a hammer, Calculating the force of a hammer blow. Description of a surface plate and its material, description of a angle plate and its type, description and uses of a vee block.Marking and Marking Tools: Equipment and Instruments-Surface plate, Marking Table, Scriber, Divider, Trammel, Prick Punch, Centre Punch, Surface Gauge. Marking Methods- Vee Block, Combination Set, Angle Plates. Types of drill machine, specification of a drill machine, uses of angle plates, c- clamps, T bolts, sockets or sleeves, drill chuck , drill drift.Definition of Cutting speed and feed of drill, Calculating cutting speed and drilling time. Types of drill, parts of a twist drill, sharpening of drill, process of centre drilling, counter sinking, counter boring.Parts of a reamer, Types of a reamer, selection of a reamer, proper use of reamer, causes of excessive wear and breakage of reamers, reaming of tapper holes, care of reamer. Properties and uses of coolants. Description of tap, Kinds of tap, method of tapping, calculation for tap drill size. Description of die, Kinds of die, method of using die for cutting thread.Description of lubricating soluble and machine oil, grease.Sessional examination to test basic theoretical knowledge on machine shop theory. | 30 | 50 |
| **Topic 2: Basic Trade theory on Lathe machines.****Objectives:*** Understand the importance of safety rule in machine shop.

• Understand various feature of safety • Describe and classify Lathe machine • Describe and classify cutting tools• Describe and classify measuring instruments• Describe and classify accessories , attachments• Describe machines and function of machine parts of lathe• Describe various turning operations• Machining parameter setting and calculation**Contents:** Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Definition of lathe, function of lathe, types of lathe, specification of lathe. Lathe cutting tool nomenclature.Influence of tool angles. Use of Pedestal grinder. Description and function of lathe parts – bed, headstock, tailstock, carriage, feed mechanism, screw cutting mechanism.Lathe accessories and attachments – lathe centres, carriers and catch plates, chucks, face plates, mandrel, rests.Lathe operation – straight turning, shoulder turning, taper turning, eccentric turning, facing, chamfering, thread cutting, knurling, polishing, grooving, spinning, forming, drilling, reaming, boring, counter boring, taper boring, internal thread cutting, tapping, parting off, undercutting, Calculation for taper turning and thread cutting.Taper turning method: by a broad nose, form tool, by setting over the tail stock method, by swivelling the compound rest, by a taper turning attachment, by combining longitudinal cross feed in a special lathe.Standard taper.Definition and types of thread and their applications, pitch, lead, helix angle, Change gears calculation for cutting threads.Checking of taper surface by roller and dialling method. Surface finishing with emery cloth.Definition of limit, fit, tolerance.Sessional examination to test basic theoretical knowledge on machine shop theory. | 25 | 50 |
| **Topic 3: Basic Trade theory on Milling machines.****Objectives:*** Understand the importance of safety rule in machine shop.

• Understand various feature of safety • Describe and classify Milling machines. • Describe and classify cutting tools• Describe and classify measuring instruments• Describe and classify accessories , attachments• Describe machines and function of machine parts of milling machine.• Describe various milling operations• Machining parameter setting and calculation**Contents:** Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Definition of milling, Type of milling machine- column and knee type, manufacturing of fixed bed type, planer type, special type.Principle parts- base, column, knee, saddle, table, overhanging arm, front brace, spindle, arbor.Milling machine mechanism, Specification of a milling machine.Work holding devices- T- bolts and clamps, angle plates, vee blocks, vices.Cutter holding devices – arbors, collets, adapters, spring collets, bolted cutters, screwed on cutters.Types of attachments – Universal head , high speed, vertical milling , etc. Types of milling cutters – plain milling cutter, side milling cutter, end mill etc.Milling cutter nomenclature.Types of milling process – up milling, down milling etc. Type of milling operation - plain milling, gang milling, face milling, side milling, gear cutting. blind slot milling etc.Definition of cutting speed , feed, and depth of cut.Calculation of machining time.Definition of indexing, types of indexing – direct, plain, compound, differential, angular indexing. Features of indexing device, Rotary table.Inspection of milling operations with the help of suitable measuring tools.Sessional examination to test basic theoretical knowledge on machine shop theory. | 25 | 50 |
| **Topic 4: Basic Trade theory on Grinding machines.****Objectives:**At the end of this Unit the student should be able to:• Understand the importance of safety rule in machine shop. • Understand various feature of safety • Describe and classify Grinding machines • Describe and classify cutting tools• Describe and classify measuring instruments• Describe and classify accessories , attachments• Describe machines and function of machine parts of grinding machines.• Describe various grinding operations.• Machining parameter setting and calculation. **Contents:** Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Definition of Grinding, Kinds of grinding-Rough grinding , precision grinding.Types of grinding machines – Surface and Cylindrical grinder. Specification of grinding machines. Work holding devices and attachments. Grinding operations – flate surface, taper surface , cylindrical surface.Grinding allowance and tolerance. Grinding wheel – Abrasive, bonds, Grade, structures, grain size.Wheel shape and size , Mounting of wheel, Specification of grinding wheel, Selection of grinding wheel. Balancing of wheel, Dressing and truing of wheel. Types of dressing tools.Cutting speed, feed, machining time.Angle grinding – Use of sin table, use of slip gauge, Dial indicator.Inspection of grinding operation- Definition of Jigs and Fixture, Types of Jigs and Fixture.Sessional examination to test basic theoretical knowledge on machine shop theory. | 20 | 50 |

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| **Program Name**  | **: Engineering Metrology** |
| **Course Title**  | **: “CERTIFICATE COURSE IN MACHINE OPERATION“**  |
| **Course Code**  | **: T2** |
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 **Teaching and Examination Scheme:**

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| --- | --- | --- |
| **Teaching Hours** | **Examination Hours** | **Examination Marks** |
|  |  |  |  |  |  |  |  |
| **Theory** | **Practical** | **Theory** | **Practical** | **Internal Marks** | **Viva** | **Examination Marks** | **Total Marks** |
| **50** |  | **1.5** |  | **30** | **10** | **60** | **100** |

COURSE OUTCOMES: The aim of this course student should be able to:

* Demonstrate the Working Principles of measuring instruments and their types and uses
* Know the Selection of measuring instruments and their Functions and applications
* Identify the difference between measuring instruments and gauges
* The Techniques of different measurement
* Understand Limit, fit, Tolerance.
* Apply safe working practices with measuring instruments.

Theory Hours: **50** Practical Hours: Theory Marks: **100** Practical Marks:

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| --- | --- | --- |
| Topic and Contents | Hours |  Marks |
| **Topic 1: Metrology - measuring Instruments , gauges** **Objectives:** **•** Understand the importance of metrology.• Safety use of measuring instrument. • Understand various feature of measuring instruments• Describe and classification of measuring instruments• Least count of measuring instruments• Measuring errors• Application of various instruments• Material of measuring instruments**Contents:**Safety work rules and precautions to be maintained in the work shop, housekeeping, causes of accident.Definition and concept of Metrology, Need of Inspection, Principles of measurements, Process of measurements, Methods of measurements, Measuring and accuracy of measurement, Precision and accuracy, Errors in measurements.Description of Measuring Tools- Steel Rule, Divider, Calipers, Straight Edge, Try Square. – Definition and their material, designation, and uses,Precision Instruments- Outside Micrometer, Vernier Caliper, Height Gauge, Vernier Depth Gauge, Vernier Bevel Protector, Dial Test Indicator.Introduction of vernier calliper, main parts of a vernier calliper, how to read the vernier calliper in millimetre and inches, how to use vernier caliper- Least count. Calibration of error in reading.Checking radius with a radius gauge, checking gap with filler gauge, checking thread with plug gauge and ring gauge.Description of a vernier height gauge, how to set measurement in it.Classification and uses of slandered gauges pitch gauge, snap gauge, angl e gauge, vernier bevel protector, depth gauge etc.Description of Micrometer (inside, outside, depth-least count and calibration), bore dial gauge, pitch gauge.Dial gauge, slip gauge etc | 25 | 50 |
| **Topics 2: Metrology – measuring Instruments, gauges.** **Objectives:** * Understand Limit – Fit – Tolerance
* Limit gauge
* Taper / angular measurement
* Measuring machines
* Application of different gauges
* Surface finish symbol

**Contents:**Limit Gauges- Plug Gauge, Ring Gauge, Snap Gauge, Telescopic Gauge, Radius Gauge, Angle Gauge, Screw Pitch Gauge, Filler Gauge, Wire Gauge, Drill Point Gauge, Bevel Gauge, Length Gauge, Bore Gauge, Drill Gauge, Centre Gauge, Profile Projector, Sine Bar. Angular Measurements. Geometric shapesLimits, Fits and Tolerances: - Introduction of Limits, Fit, Tolerance, Unilateral Tolerance, Bilateral Tolerance, Relation between Tolerance and cost, Maximum and Minimum limit, Conventional diagram of Limits, Fits and Tolerance, Terminology of limits and Fits, Types of Fits (Clearance, Interference, Transition Fit), Allowance, Hole basis system, Shaft Basis System, Standard limit system. Surface Texture, Name and uses of measuring machines. CMM.Sessional examination to test basic theoretical knowledge on Engineering Metrology.Checking of taper surface by roller and dialling method. Surface finishing with emery cloth.Sessional examination to test basic theoretical knowledge on machine shop theory. | 25 | 50 |

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| **Program Name**  | **: Engineering Drawing** |
| **Course Title**  | **: “CERTIFICATE COURSE IN MACHINE OPERATION“**  |
| **Course Code**  | **: T3** |

**Teaching and Examination Scheme:**

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| --- | --- | --- |
| **Teaching Hours** | **Examination Hours** | **Examination Marks** |
| **Theory** | **Practical** | **Theory** | **Practical** | **Internal Marks** | **Viva** | **Examination Marks** | **Total Marks** |
| **50** | **200** | **0.5** | **2.5** | **30** | **10** | **60** | **100** |

COURSE OUTCOMES: The aim of this course student should be able to:

* Know the reading of Engineering Drawing.
* Draw Engineering Drawing.
* Making geometrical figures using drawing instruments
* Free hand sketching of machine parts.
* Apply dimensions and Style in dimensioning.
* Know the Drawing Scale.
* Draw and understand Sectional views showing Orthographic, Isometric and Oblique projection.
* Draw and understand Projection and surface development of solid blocks and machine parts.
* Draw and understand different fasteners and locking devices as per standard.
* Drawing machine parts with tolerance dimension and surface finish symbol.
* Drawing of detailed and assembled production and process tools with conventional sign and symbols.

Theory Hours: **50** Practical Hours: **200** Theory Marks: **20** Practical Marks: **80**

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| --- | --- | --- |
| Topic and Contents | Hours(Pr+Th) |  Marks |
| **Topic 1: Basic Engineering Drawing – Geometric constriction** **Objectives:** * Understand the importance of knowing engineering drawing
* Handle drawing instruments
* Draw free hand sketches
* Draw geometric construction
* Apply drawing dimensions
* Know the drawing scale and title block

**Contents:**Meaning of Engineering Drawing, Drawing Instruments and its uses, Drawing boards designation, Drawing Sheet Sizes, Layout of different Drawing sheet sizes, Title Block.  Types of lines – Description, Illustration, application. Types of Lettering.Construction of different types of scales, their appropriate uses, principle of R.F, diagonal and vernier scale.Contraction of geometric drawing, Terms and definition of polygon, circle and ellipse.Drawing of Title blockDimensioning technique - Terminology, feature, Principles, Units of dimensioning, system of dimensioning, method of dimensioning and common feature. Sessional examination to test basic knowledge on Engineering Drawing. | 75 | 25 |
| **Topic 2:** **Engineering Drawing – projection views** **Objectives:** * Understand the projection views of solid part
* Draw 2d -orthographic views

**Contents:**Projection of points and lines, projection of plane. Projection of Solid – Projection and orthographic projection. 1st and 3rd angle projection, Principle of orthographic projection.Sessional examination to test basic theoretical knowledge on machine shop theory. | 75 | 25 |
| **Topic 3: Engineering Drawing – Section views , Isometric Views****Objectives:** * Understand the section views of solid part and its need
* Draw 2d –orthographic section views
* Draw isometric vies

**Contents:**Sectional Views – Different types of section, types of sectional views and their uses.Construction of Isometric drawing. Sessional examination to test basic theoretical knowledge on machine shop theory. | 50 | 25 |
| **Topic 4: Engineering Drawing –Study of Assembly drawing.****Objectives:** •Understand the symbol applied on drawing•Study assembly drawing**Contents:**Application and meanings of symbols – Welding, Surface texture, etc.Drawing of fasteners, rivets, etc.Graphical representation of Limit, Fit, Tolerances.Blue Print Reading.Study of Assemble drawingSessional examination to test basic theoretical knowledge on machine shop theory. | 50 | 25 |

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| --- | --- |
| **Program Name**  | **: Workshop Calculation and Science** |
| **Course Title**  | **: “CERTIFICATE COURSE IN MACHINE OPERATION“**  |
| **Course Code**  | **: T4** |

**Teaching and Examination Scheme:**

|  |  |  |
| --- | --- | --- |
| **Teaching Hours** | **Examination Hours** | **Examination Marks** |
| **Theory** | **Practical** | **Theory** | **Practical** | **Internal Marks** | **Viva** | **Examination Marks** | **Total Marks** |
| **50** |  | **1.5** |  | **30** | **10** | **60** | **100** |

COURSE OUTCOMES: The aim of this course student should be able to:

• Demonstrate basic arithmetic to derive value of unknown quantity / variable.

• Understand & apply engineering material, their classification, properties and applications in the day to

 day technical application heat treatment & their advantages.

• Explain & apply speed, velocity, work, power & energy for application in field of work.

• Demonstrate basic algebraic, mensuration, trigonometric facts and formulas to derive value of unknown

 quantity / variable.

• Explain & apply principles of simple machine & levers for mechanical advantage, efficiency for practical application.

• Demonstrate & apply calculation of area of cut-out regular & irregular surfaces, Volume of geometrical

 shapes and their cut section in related shop floor problems.

• Calculate value of unknown sides and angles of geometrical shapes by trigonometrically methods and

 apply in shop floor problems.

• Understand& apply transmission of power.

**Theory Hours: 50 Practical Hours: Theory Marks: 100 Practical Marks:**

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| --- | --- | --- |
| Topic and Contents | Hours |  Marks |
| **Topic 1: Unit system And simple calculations****Objectives:** * Know the different unit
* Know to solve Multiplication decimals , root , ratios , percentage calculation ,
* Velocity and speed

**Contents:**Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of unitsFractions: Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.Square Root: Square and Square Root, method of finding out square roots, Simple problem using calculator.Ratio & Proportion: Simple calculation on related problems.Percentage: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice versa.Mass, Weight and Density: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.Sessional examination to test basic theoretical knowledge on Workshop Calculation & Science. | 10 | 25 |
| **Topic 2: Simple calculation on Algebra , mensuration and trigonometry****Objectives:** * Solve simple algebra , mensuration and trigonometry problems

**Contents:**Algebra:- Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).Mensuration:- Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi-circle, Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere.Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tablesSessional examination to test basic theoretical knowledge on Workshop Calculation & Science. | 10 | 25 |
| **Topic 3: Engineering materials****Objectives:** * Understand the materials:
* Type of material
* Properties of material
* Alloying of materials
* Heat treatment of material and its process

**Contents:**Material Science : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Pig Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.Heat treatment and advantages.Sessional examination to test basic theoretical knowledge on machine shop theory. | 20 | 30 |
| **Topic 4: Simple Mechanics****Objectives:** * Understand the basic science about work, power, energy
* Understand the basic function of livers and mechanics of simple machines
* Understand transmission of power by different mechanism

**Contents:**Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.Levers and Simple Machines: levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage. Transmission of power by belt, pulleys & gear drive.Calculation of Transmission of power by belt pulley and gear drive.Sessional examination to test basic theoretical knowledge on machine shop theory. | 10 | 20 |

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| --- | --- |
| **Program Name**  | **: Employability Skill**  |
| **Course Title**  | **: “CERTIFICATE COURSE IN MACHINE OPERATION“**  |
| **Course Code**  | **: T5** |

**Teaching and Examination Scheme:**

|  |  |  |
| --- | --- | --- |
| **Teaching Hours** | **Examination Hours** | **Examination Marks** |
| **Theory** | **Practical** | **Theory** | **Practical** | **Internal Marks** | **Viva** | **Examination Marks** | **Total Marks** |
| **50** |  | **1.5** |  | **30** | **10** | **60** | **100** |

COURSE OUTCOMES: The aim of this course student should be able to:

* Read, write and communicate in English language for day to day work.
* Communicate in written and oral and with required clarity ensuring that the information communicated

 is clear, concise and accurate.

* Understand and apply basic computer working, basic operating system and uses internet services

to get accustomed & take benefit of IT developments in the industry.

* Understand and apply productivity, its benefits and factors affecting the productivity.
* Follow and maintain procedures to achieve a safe working environment in line with occupational

health, safety, environment regulations and labour welfare legislation and requirements.

* Understand and apply quality concepts as per ISO and BIS system and its importance.

 Recognize different components of 5S and apply the same in the working environment.

Theory Hours: **50** Practical Hours: Theory Marks: **100** Practical Marks:

|  |  |  |
| --- | --- | --- |
| Topic and Contents | Hours(Pr+Th) |  Marks |
| **Topic 1: English Literacy and Communication skill****Objectives:** * Read, write and communicate in English language for day to day work

**Contents:**Pronunciation:- Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)Functional Grammar:- Transformation of sentences, Voice change, Change of tense, Spellings.Reading:- Reading and understanding simple sentences about self, work and environmentWriting:- Construction of simple sentences , Writing simple EnglishSpeaking / Spoken English:- Speaking with preparation on self, on family, on friends/ classmates, on known, , asking about someone’s job habitual actions. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication. Sessional examination to test basic theoretical knowledge on English Literacy.Introduction to Communication Skills:- Communication and its importancePrinciples of Effective communicationTypes of communication – verbal, nonverbal, written, email,Talking on phone.Nonverbal communication –characteristics, components-ParalanguageBody – languageBarriers to communication and dealing with barriers.Handling nervousness/ discomfort.Listening Skills:- Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.Triple- A Listening – Attitude, Attention & Adjustment .Active Listening Skills.Motivational Training:- Characteristics Essential to Achieving SuccessThe Power of Positive AttitudeSelf-awarenessImportance of CommitmentEthics and Values, Ways to Motivate OneselfPersonal Goal setting and Employability Planning.Facing Interviews:- Manners, Etiquettes, Dress code for an interview, Do’s & Don’ts for an interviewBehavioural Skills:- Problem Solving Confidence Building ,AttitudeSessional examination to test basic theoretical knowledge and practical - Communication Skills. | 13 | 30 |
| **Topic 2: IT Literacy****Objectives:** * Understand and apply basic computer working

**Contents:**Basics of Computer:- Introduction, Computer and its applications, Hardware and peripherals,Switching on-Starting and shutting down of computer.Computer Operating System:-Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc., Use of Common applications. Word processing and Worksheet:- Basic operating of Word Processing, Creating, opening and closing, Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets. Computer Networking and INTERNET:- Basic of computer Networks (using real life examples), Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do’s and Don’ts in InformationSecurity, Awareness of IT – ACT, types of cyber-crimes.Sessional examination to test basic theoretical knowledge and practical skill on I.T. Literacy. | 18 | 35 |
| **Topic 3: Productivity & Quality Tools****Objectives:** * Understand and apply productivity, its benefits and factors affecting the productivity.
* Understand and apply quality concepts as per ISO and BIS system and its importance.

**Contents:**Productivity:- Definition, Necessity, Meaning of GDP.Benefits:- Personal / Workman – Incentive, Production linked Bonus,Improvement in living standard.IndustryNation.Affecting Factors:- Skills, Working Aids, Automation, Environment, MotivationPersonal Finance Management:- Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.Sessional examination to test basic theoretical knowledge on Productivity.Quality Consciousness :- Meaning of quality, Quality CharacteristicQuality Circles :- Definition, Advantage of small group activity, objectives of Quality Circle, Roles and Functions of Quality Circles in organization, Operation of Quality Circle, Approaches to Starting Quality Circles, Steps for Continuation Quality CirclesQuality Management System:- Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.House Keeping:- Purpose of Housekeeping, Practice of good Housekeeping. 5SPrinciples of HousekeepingSessional examination to test basic theoretical knowledge on Quality Tools. | 06 | 10 |
| **Topic 4: Occupational Safety, Health & Environment****Objectives:*** Follow and maintain procedures to achieve a safe working environment in line with occupational health, safety, environment regulations

**Contents:**Safety & Health:- Introduction to Occupational Safety and Health and its importance at workplaceOccupational Hazards:- Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its preventionAccident & safety:- Accident prevention techniques- control of accidents and safety measuresFirst Aid:- Care of injured & Sick at the workplaces, First-aid & Transportation of sick personBasic Provisions:- Idea of basic provisions of safety, health, welfare under legislation of IndiaEcosystem:- Introduction to Environment. Relationship between Society Environment, Ecosystem and Factors causing imbalance. Pollution:- Pollution and pollutants including liquid, gaseous, solid and hazardous waste. Energy Conservation:- Conservation of Energy, re-use and recycle. Environment:- Right attitude towards environment, maintenance of in-house environment.Sessional examination to test basic theoretical knowledge on Occupational Safety, Health & Environment. | 13 | 25 |

**EVIDENCE OF LEVEL**

**NSQF LEVEL – 3**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Job function** | **Learning outcomes** | **Process** | **Professional knowledge** | **Professional skills** | **Core Skill** | **Responsibility** |
| 1 | Producing of mechanical part / component by metal cutting process in predefined shape & sizes. | * Development of skill & knowledge on operating of conventional machine tools
* Identify the process and sequence of operations
* Identify the proper cutting tool & accessories
* Identify the proper measuring instruments
* Identify the proper parameter setting of machining.
 | Study of drawing – Process planning - selection of machine - material – accessories – cutting tools – measuring instruments - Operation sequence – Operations Inspection  | Technician have knowledge on – * Safe working practices and procedures before starting the machine ensuring personal protective equipment.

Principle knowledge on operating machines, tools and instruments.Basic technical knowledge for machining process.Types and valid sources of appropriate job specification such as work drawing and instructions from supervisor, etc.Understanding of technical drawing of the job to be performed.To decide parameter setting of machine. Sequence of operation.Selection of tools and instruments required for the job. Importance of ensuring work pieces / materials and consumables for the specified job and related procedures.To ensure that tool and equipment’s are in a safe and useable condition.Should understand how to do self. Inspection of shaped components against specified quality standards.Importance of leaving the work area and machine in a safe condition on completion of the activities. | Technician have skill and ability to :Operate machines in order to manufacture part with specific shape and size.Identify problems with work planning, procedures, output and behaviour and their implications.Communicate problems appropriately to others identify sources of information and support for problem solving.Plan, prioritize and sequence of work operations as per job requirement.Understand basic concepts of shop floor work productivity including waste reduction, efficient material usage and optimization of time.Manage own time for achieving better result.Seek assistance from team members. | Technician understands how to :Read and interpret information correctly from various job specification documents, manuals etc.Communicate with people in respectful form and manner in line with organizational protocol.Undertake basic numerical operations and calculations / formulae.Identify various basic, compound and solid shape as per dimensions given.Use appropriate measuring techniques and units of measurements and also units and numbers systems to express degree of accuracy.Clarify task related information with appropriate or technical adviser. | Technician follows instructions from superior and works with close supervision. Taking personal responsibility for own actions and for the quality and accuracy of the work. |
| 2 | Study of job drawing and sequence of operation. | Read the component drawing to be manufactured.  | Study angle of projection symbol. View identification. Read the dimensions. | Study of Engineering drawing. | Doing correct job as per given dimensions and tolerance. | Perception of Engineering Drawing. | Team work |
| 3 | Implements the supervisor’s instruction. | Helping management by communicating job information. | Gather the information and communicate to management. | Proper understanding of instruction. | Communication. | Knowledge of Language. | Reporting about job and related information. |
| 4 | Operating machines for producing jobs. | Work on machine tools independently. | Study of machine. Selection of cutting tools, measuring instruments and setting of machining parameters. | Knowledge on principle function of machine tools, and application of cutting tools. | Operating skill. | Conception of Safety precaution and productivity. | Self-discipline. Work under close super vision. |
| 5 | Using of different measuring tools for the given job. | Measure the job as per drawing. | Study the drawing.Selection of measuring tools.Preparation of inspection report. | Quality consciousness. | Selecting of method of inspection and Perfection of reading of measurement.  | Metrology.Arithmetical calculation. | Self-discipline.Performing job under close supervision.Have responsibility with limited range. |
| 6 | Proper communication with supervisor & co - workers. | Assist supervisor providing proper information about job. | Gather information communicate to management. | Technical English report writing. | Positive attitude. | Communication Skill. | Reporting team work. |
| 7 | Maintaining safety precautions.  | Trained for precautionary measure for self and others from accident. | Selection of proper PPE.Disbursal of toxic materials in defined place. | Electrical supply machines functional mechanism firefighting. | Uses of safety equipment’s. | Safety Consciousness. | Self-discipline. |
| 8 | Basic maintenance work of machines & Instrument. | Concept of machine construction. | Finding the fault.Selection of proper tools & equipment. | Internal mechanism of machines.Reading of machine tool drawing. | Proper fault finding & solve the issue. | Machine tool Design. | Team work. |

**CURRICULUM REVIEW**

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| **Sr. No** | **Subject code**  | **Subject Name** | **Examination Scheme** |
| **Theory** | **Practice** | **Total Marks** | **Passing** **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 | P1 | **Practical Lab** |  |  |  |  | 160 | 96 | 240 | 144 | **400** | **240** |
| 2 | T1 | **Machine shop Theory** | 80 | 32 | 120 | 48 |  |  |  |  | **200** | **80** |
| 3 | T2 | **Engineering Metrology** | 40 | 16 | 60 | 24 |  |  |  |  | **100** | **40** |
| 4 | T3 | **Engineering Drawing** | 40 | 16 | 60 | 24 |  |  |  |  | **100** | **40** |
| 5 | T4 | **Workshop Calculation & Science** | 40 | 16 | 60 | 24 |  |  |  |  | **100** | **40** |
| 6 | T5 | **Employability Skill**  | 40 | 16 | 60 | 24 |  |  |  |  | **100** | **40** |
| **Examination**  |  |  |  |  |  |  |  |  |  |  |
| **Total:** |  |  |  |  |  |  |  |  | **1000** |  |

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