

**COMPETENCY BASED CURRICULUM**

**FOR THE TRADE OF**

**TURNER**

**UNDER**

**CRAFTSMAN TRAINING SCHEME (CTS)**

**IN SEMESTER PATTERN**

**BY**



**GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP  
DIRECTORATE GENERAL OF TRAINING**

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# 1. INTRODUCTION

India is one of the youngest nations in the world. Our youth are our strength. However, a challenge facing the country is that of skilling our youth as per the demands of the industry. Recognizing the need for quickly coordinating the skill development and entrepreneurship efforts of all concerned stakeholders, the Government of India created the Ministry of Skill Development and Entrepreneurship on 9<sup>th</sup> November, 2014. To create further convergence between the Vocational Training System through Industrial Training Institutes (ITIs) and the new skill initiatives of the Government, the Training and Apprenticeship Training divisions from the Directorate General of Employment and Training (DGET) under the Ministry of Labour and Employment stand transferred to the Ministry of Skill Development and Entrepreneurship (MSDE) with effect from 16<sup>th</sup> April, 2015. This move brings over 11000 ITIs and scores of other institutions, and the Apprenticeship and Training divisions, under the Ministry.

The Ministry of Skill Development and Entrepreneurship is an apex organization for the development and coordination of the vocational training including Women's Vocational Training in our country. The Ministry conducts the vocational training programmes through the Craftsmen Training Scheme (CTS), Apprenticeship Training Scheme (ATS), Modular Employable Scheme (MES) under the Skill Development Initiative (SDI) Scheme, and Craftsmen Instructor Training Scheme (CITS) to cater the needs of different segments of the Labour market. The National Council for Vocational Training (NCVT) acts as a central agency to advise Government of India in framing the training policy and coordinating vocational training throughout India. The day-to-day administration of the ITIs rests with the State Governments/ Union Territories.

- Training courses under the CTS is being offered through a network of more than 11000 Government and Private Industrial Training Institutes (ITIs) located all over the country with a total seating capacity of more than 16 Lakhs with an objective to provide skilled workforce to the industry in 126 trades. Skill development courses exclusively for women are also being offered under CTS and other schemes through Government and Private ITIs and Regional Vocational Training Institutes (RVTIs) for Women.
- The Apprentices Act, 1961 was enacted with the objective of regulating the program of apprenticeship training in the industry by utilizing the facilities available within for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart on the job training for school leavers, and ITI passed outs to develop skilled manpower for the industry.
- The Ministry is implementing the Employable Scheme (MES) under the Skill Development Initiative Scheme to provide vocational training to people to develop skilled manpower for the industry through a network of Vocational Training Providers (VTPs) located across the country.

Central Staff Training and Research Institute (CSTARI), Kolkata is the nodal institute for the development/revision of curricula under all vocational training schemes of the Ministry. National Instructional Media Institute (NIMI), Chennai is to make available

instructional material in various trades for the use of trainees and trainers to ensure overall improvement in the standard of institutional training under the CTS and ATS schemes. The institute is actively involved in the development, production and dissemination of instructional media Packages (IMPs) comprising of books on Trade Theory, Trade Practical, Test/Assignment, and Instructor's Guide.

The National Skills Qualification Framework (NSQF), published in the Gazette of India on 27<sup>th</sup> December, 2013, is a national framework that aims to integrate general and vocational streams of education and training. The main goal of the NSQF is to focus on competency-based qualifications, which in turn facilitate and enhance transparency, both within and between general and vocational streams. The National Skill Development Agency (NSDA) under the Ministry is responsible for anchoring and implementation of the Framework, by bringing together the key stakeholders through the National Skill Qualifications Committee (NSQC).

The competency-based framework organizes qualifications into ten levels, with the entry level being 1, and the highest level being 10. Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are (1) Process, (2) Professional knowledge, (3) Professional skill, (4) core skill, and (5) Responsibility. The paradigm shift from learning focused on inputs to an outcome/competency-based education would help in the Recognition of Prior Learning (RPL), and simultaneously enable the alignment of the Indian qualifications with international ones. Government funding is expected to be on a preferential basis for NSQF compliant courses. The NSQF notification provides a Qualification Register, which is the official national database of all qualifications aligned to NSQF levels. Through this Register, learners can expect access to all NSQF compliant qualifications.

The Ministry has set up Mentor Councils to focus on courses under NCVT in various sectors with representation from thought leaders among different stakeholders viz., industries, innovative entrepreneurs who have proved to be game-changers, academic/professional institutions, and champion ITIs for each of the sectors. The Mentor Council for each sector reviews curriculum, admission criteria, course duration, and requirement of trainers and assessment/evaluation systems for the sector on a continuous basis and make recommendations regarding the same. Sector-wise Core Groups are formed to plan and prepare the documentation for the competency-based curricula for the courses under each sector.

## 2. JOB ROLES: Reference NOS & NCO

### Brief description of Job roles:

Turner: Lathe Operator makes metal articles to required specifications using lathe and cutting tools. Studies drawings and other specifications of parts to be made. Selects metal, holds it in chuck, fixture on lathe as required, centres it by manipulating chuck jaws or otherwise using dial indicator or marking block and securely tightens it in position. Selects correct cutting tool, grinds it if necessary and holds it tight in tool post at correct height. Sets feed and speed and starts machine. Manipulates hand wheels or starts automatic controls to guide cutting tool into or along metal. Controls flow of coolant (cutting lubricant) on edge of tool. Arranges gears in machine to obtain required pitch for screw cutting. Calculates tapers and sets machine for taper turning, controls lathe during operation by means of hand wheels and levers and frequently checks progress of cutting with measuring instruments such as calipers and rule, micrometers, etc. Stops machine, removes completed part and checks it further with instruments to ensure accuracy. Repeats operations if necessary. Cleans and oils machine. Demonstrate the operation of CNC turning machine and producing components as per drawing by preparing part programmes. May be designated as Turner according to nature of work done. May improvise devices and make simple adjustments to machine. May recondition lathe tools.

Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

### **Reference NCO & NOS:**

**i)NCO-2004: 8211.15**

#### **NOS:-**

- i) CSC/Q0110 (Operator-Conv. Turning)**
- ii) CSC/Q0115 (CNC operator Turning)**
- iii) ASC/Q1901 (Lathe operator)**
- iv) ASC/Q1903 (CNC operator)**
- v) ASC/Q3501 (Machining technician/CNC operator Level-III)**
- vi) ASC/Q3503 (Machining technician/CNC operator Level-IV)**

### **3. NSQF LEVEL COMPLIANCE**

#### **NSQF level for Turner trade under CTS: Level 4**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

- a. Process
- b. professional knowledge,
- c. professional skill,
- d. core skill and
- e. Responsibility.

The Broad Learning outcome of Turner trade under ATS mostly matches with the Level descriptor at Level- 4.

The NSQF level-4 descriptor is given below:

<b>LEVEL</b>	<b>Process required</b>	<b>Professional knowledge</b>	<b>Professional skill</b>	<b>Core skill</b>	<b>Responsibility</b>
Level 4	work in familiar, predictable, routine, situation of clear choice	factual knowledge of field of knowledge or study	recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning.

## **4. Learning outcome**

The following are minimum broad learning outcome after completion of the Turner course of 02 years duration:

### **A. GENERIC OUTCOME**

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, and statistics and apply knowledge of specific area to perform practical operations.
4. Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.
5. Read and apply engineering drawing for different application in the field of work.
6. 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.
7. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
8. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

### **B. SPECIFIC OUTCOME**

10. Ascertain and select measuring instrument and measure dimension of components and evaluate for accuracy.
11. Plan and organize the work in familiar predictable/routine environment for different types of fitting operations and check for work result.
12. Make choices to carry out routine jobs of marking out the components for filing, drilling, riveting, fitting and allied operations where choices are clear.
13. Understand and explain the constructional features and working principles of lathe and operate the machine to produce simple components as per required dimensions with requisite quality.
14. Demonstrate practical skills by using appropriate tools for different turning operations to produce finished components and check for accuracy without any assistance.
15. Demonstrate mounting of different work holding devices and tool holding devices used on a Turning machines with required alignment.
16. Demonstrate practical skills in aligning/truing the work pieces and cutting tools for different turning operations.
17. Select and apply cutting parameters for different turning operations with different work material and tool material for producing required quality output.
18. Demonstrate grinding of tools required for producing different types of threads, grooves and complex forms with accuracy.

19. Demonstrate the usage of different attachments used on a lathe machine for different machining purposes in producing components as per drawing.
20. Demonstrate practical skills involved in producing different forms of threads.
21. Produce components as per industrial drawings and process plans.
22. Demonstrate the operation of CNC turning machine and producing components as per drawing by preparing part programmes.
23. Perform different complex operations (worm gear cutting, helical groove cutting etc.) on a turning machine being used in the industry.
24. Produce and assemble components by performing different lathe operations with minimum assistance.

***NOTE: Learning outcomes are reflection of total competencies of a trainee. Each learning outcome may include multiple assessment components. However assessment will be carried out as per assessable outcome and assessment criteria.***



## **5. GENERAL INFORMATION**

1. **Qualification** : **TURNER**
2. **N.C.O./NOS Code No.** : **8211.15**
3. **NSQC Level** : Level-IV
4. **Duration of Craftsmen Training** : Two years (Four semesters each of six months duration).
5. **Entry Qualification** : Passed 10<sup>th</sup> Class with Science and Mathematics under 10+2 system of Education or its equivalent
6. **Trainees per unit** :16 (Max. supernumeraries seats: 5)

**Note:**

- (i) Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.
- (ii) Instructor qualification for WCS and E.D, as per the training manual.

**Distribution of training on Hourly basis:**

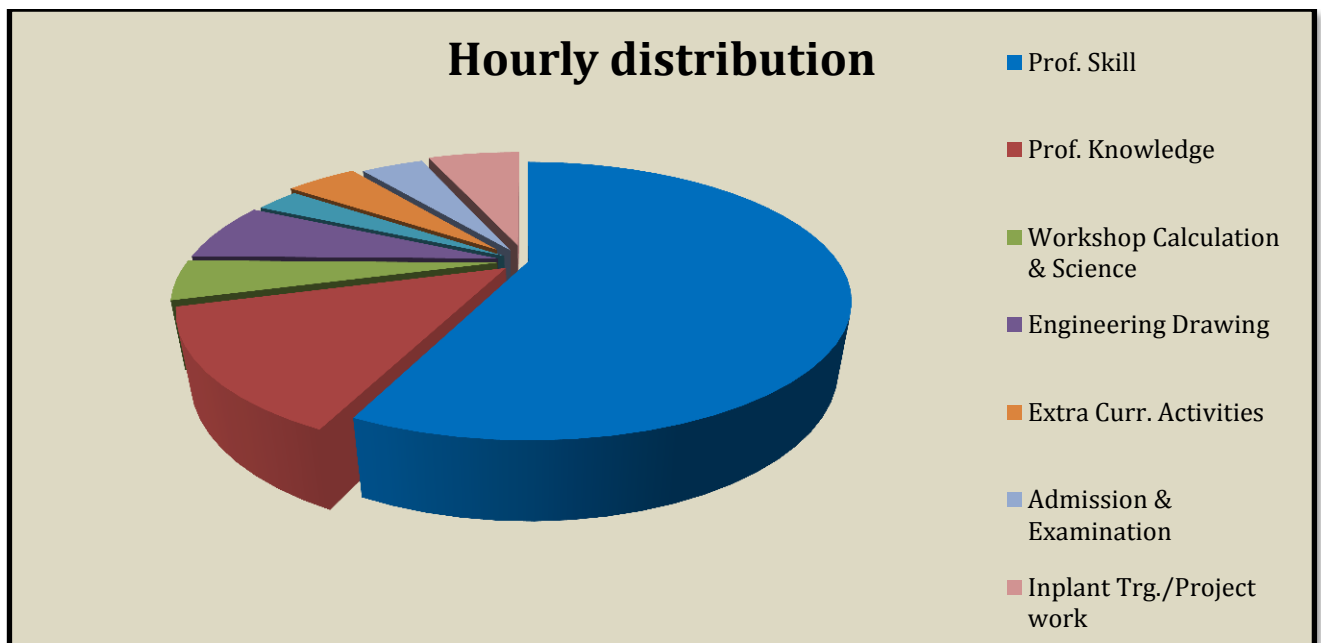
Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

## 6. COURSE STRUCTURE

- 1. Name of the Qualification :- TURNER**
- 2. Total duration of the course: - 24 Months**
- 3. Training duration details :-**

	COURSE ELEMENTS	HOURLY DISTRIBUTION
A	PROFESSIONAL SKILL	2200 HRS
B	PROFESSIONAL KNOWLEDGE	530 HRS
C	WORKSHOP CALCULATION & SCIENCE	180 HRS
D	ENGINEERING DRAWING	265 HRS
E	EMPLOYABILITY SKILLS	110 HRS
F	EXTRA CURRICULAR ACTIVITIES/LIB.	180 HRS
G	INPLANT TRG./PROJECT WORK	240 HRS
H	ADMISSION & EXAMINATION	160 HRS

### PIE-CHART



## **7. General Training Plan, Examination & Pass regulation**

### **General Training Plan**

The skills stated in assessment outcome are to be imparted in accordance with the instructions contained within Section 10 in respect of the content and time structure of the vocational education and training (General Training Plan).

### **Examination**

Each Semester examination is to take place after the end of the six months of training. The each semester examination encompasses such skills as are listed for that period of training (Detail in Section -8) and also includes theoretical knowledge, Core skills & E/S. The E/S will be covered in first two semesters only.

#### **Candidates are to demonstrate that they are able to:**

1. read& interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
2. perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
3. apply professional knowledge, core skills & employability skills while performing the task.
4. check the job as per drawing/assembly for functioning, identify and rectify errors in job/assembly.
5. document the technical parameters related to the task undertaken.

The details of the examination and assessment standard are as per section-11.

### **Pass regulation**

For the purposes of determining the overall result, weighting of 25 percent is applied to each semester examination. The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%.

## **8. ASSESSABLE OUTCOME**

### **Assessable outcome after completion of two years Turner course**

#### **I. Generic**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company and technical communication
4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, and statistics and apply knowledge of specific area to perform practical operations.
5. Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.
6. Read and apply engineering drawing for different application in the field of work.
7. 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.
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

#### **II. Specific**

11. Perform basic fitting operations used in industrial workshop practices and inspection of dimensions
12. Operate lathe machine and identify different parts
13. Mounting of different work holding devices on a lathe machine
14. Grinding of cutting tools used on a lathe machine
15. Produce job using various cutting tools involving different operations.
16. Usage of different attachments used on Lathe machine
17. Produce components using different methods of taper turning.
18. Produce components with different thread forms.
19. Manufacture components having eccentric turning.
20. Manufacture components with specific Form.
21. Produce components with internal taper and match male part
22. Mount grinding wheel on pedestal grinder
23. Maintain functionality of lathe by appropriate maintenance method.
24. Turn crank shaft as per drawing
25. Make job having eccentric boring.
26. Produce the job having multi start thread form for machine tools

27. Turn job having center/axial offset (castings/forgings)
28. Produce components on CNC Lathe involving different operations
29. Manufacture and assemble screw jack.
30. Manufacture components having worm gear cutting.
31. Bore soft jaws for holding components.

## **9. ASSESSABLE OUTCOME WITH ASSESSMENT CRITERIA**

ASSESSABLE OUTCOME ALONGWITH ASSESSMENT CRITERIATO BE ACHIEVED AFTER EACH SEMESTER & COMPLETION OF QUALIFICATION

- i) The training shall be conducted as per syllabus defined in reference no: Section 10.
- ii) The trainee shall demonstrate the competencies which are defined below in assessable outcome and assessment criteria.
- iii) All the assessable outcomes are to be tested during formative assessment, Theory & Practical examinations, various observation and viva-voce.
- iv) Assessable outcome of Employability Skills, Workshop Calculation & Science and Engineering Drawing shall be tested separately and also be applied in Theory and Practical examinations.
- v) These assessable outcomes and assessment criteria will serve as guide lines for Trainers, Paper setters, Moderators and Assessors.

### **GENERIC ASSESSABLE OUTCOME:**

<b>ASSESSABLE OUTCOMES</b>	<b>ASSESSMENT CRITERIA</b>
1. Apply safe working practices	1.1 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.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 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.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.

2. Comply with environmental regulation and housekeeping	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
	2.2 Deploy environmental protection legislation & regulations
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner
	2.4 Avoid waste and dispose waste as per procedure
	2.5 Recognize different components of 5S and apply the same in the working environment.
3. Interpret & use company and technical communication	3.1 Obtain sources of information and recognize information.
	3.2 Use and draw up technical drawings and documents.
	3.3 Use documents and technical regulations and occupationally related provisions.
	3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
	3.5 Present facts and circumstances, possible solutions & use English special terminology.
	3.6 Resolve disputes within the team
	3.7 Conduct written communication.
4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, and statistics and apply knowledge of specific area to perform practical operations.	4.1 Semester examination to test basic skills on arithmetic, algebra, trigonometry and statistics.
	4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
5. Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	5.1 Semester examination to test basic skills on science in the field of study including basic electrical and hydraulics & pneumatics.
	5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
6. Read and apply engineering drawing for different application in the field of work.	6.1 Semester examination to test basic skills on engineering drawing.
	6.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
7. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve	7.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
	7.2 Their applications will also be assessed during execution of assessable outcome.

productivity & quality.	
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	8.1 Semester examination to test knowledge on energy conservation, global warming and pollution. 8.2 Their applications will also be assessed during execution of assessable outcome.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	9.1 Semester examination to test knowledge on personnel finance, entrepreneurship. 9.2 Their applications will also be assessed during execution of assessable outcome.
10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	10.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services. 10.2 Their applications will also be assessed during execution of assessable outcome.

### **SPECIFIC ASSESSABLE OUTCOME:**

#### **Semester-I**

<b>ASSESSABLE OUTCOME</b>	<b>ASSESSMENT CRITERIA</b>
11. Perform basic fitting operations used in industrial workshop practices and inspection of dimensions	11.1 Mark according to drawing by using marking tools on flat and round surfaces.
	11.2 File the job using different methods and perform in accordance with standard specifications and tolerances.
	11.3 Drill on flat and round surfaces.
	11.4 Identify & use hand tools for threading (internal and external) with dies and taps.
	11.5 Measure all dimensions in accordance with standard specifications and tolerances.
12. Operate lathe machine and identify different parts	12.1 Acquaintance of lathe machine operation with its components.
	12.2 Functional application of different levers, stoppers etc.
	12.3 Identify different lubrication points of lathe machine.
	12.4 Identify lubricants and their usage for application in Lathe machine as per machine manual.
13. Mounting of different work holding devices on a	13.1 Identify different work holding devices and acquaint with functional application of each device.
	13.2 Mount the appropriate work holding device and check for its



lathe machine	functional usage to perform turning operations.
	13.3 Observe safety procedure during mounting as per standard norms.
14. Grinding of cutting tools used on a lathe machine	14.1 Identify cutting tool materials used on lathe machine as per the specification and their application.
	14.2 Plan and Grind cutting tools
	14.3 Measure the tool angles with gauge and Bevel protractor as per tool signature.
15. Produce job using various cutting tools involving different operations.	15.1 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	15.2 Plan work in compliance with standard safety norms.
	15.3 Perform turning, step turning, under cut, shouldering, drilling, reaming, boring, knurling in accordance with standard operating procedure using appropriate tools.
	15.4 Plan and perform the job between centers.
	15.5 Check accuracy/ correctness of job as per drawing using appropriate gauges and measuring instruments.

## Semester-II

16. Usage of different attachments used on Lathe machine	16.1 Identify different attachments on a lathe machine as per functional application.
	16.2 Mount appropriate attachment to set up a job for machining.
	16.3 Observe safety/ precaution during mounting the attachment.
	16.4 Check for the alignment of attachment to machine as per standard procedure.
17. Produce components using different methods of taper turning.	17.1 Plan and select appropriate method to produce components with taper turning.
	17.2 Evaluate angles to set up the tool for machining.
	17.3 Demonstrate possible solutions and agree tasks within the team.
	17.4 Produce components as per standard operating procedure.
	17.5 Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement.
18. Produce components with different thread forms.	18.1 Plan and select appropriate method to produce components with thread cutting.
	18.2 Plan and prepare thread cutting tool in compliance to standard thread parameters.
	18.3 Produce components as per drawing.
	18.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement and suit to male /female part.
19. Manufacture components having eccentric turning.	19.1 Analyse eccentricity and plan for counter balance while holding the work piece.
	19.2 Comply with safety rules when performing the above operations.

	19.3 Set up and produce component as standard operating procedure.
	19.4 Measure the dimensions with instruments/gauges as per drawing.

### Semester-III

20. Manufacture components with specific Form.	20.1 Plan and select appropriate method to produce components.
	20.2 Grind form cutting tool.
	20.3 Produce components as per standard operating procedure and as per drawing.
	20.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.
21. Produce components with internal taper and match male part	21.1 Plan and select appropriate method to produce components with internal taper turning.
	21.2 Work out angles to set up the tool for machining.
	21.3 Produce components as per standard operating procedure by using appropriate tools.
	21.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments and match with male part.
22. Mount grinding wheel on pedestal grinder	22.1 Select appropriate grinding wheel for tool grinding.
	22.2 Balance the grinding wheel.
	22.3 Mount grinding wheel.
	22.4 Perform dressing by appropriate dressing tool.
	22.5 Check for desired performance
23. Maintain functionality of lathe by appropriate maintenance method.	23.1 Plan for periodic and preventive maintenance of lathe
	23.2 Select appropriate items and tools for maintenance.
	23.3 Demonstrate possible solutions and agree tasks within the team.
	23.4 Perform maintenance as per schedule of machine manual.
	23.5 check for desired functionality.
24. Turn crank shaft as per drawing	24.1 select appropriate tools and plan for eccentric turning and counter balance while holding the work piece.
	24.2 Comply with safety rules when performing the above operations.
	24.3 Demonstrate possible solutions within the team.
	24.4 Set up and produce component as standard operating procedure.
	24.5 Measure with instruments/gauges as per drawing.
25. Make job having eccentric boring.	25.1 select appropriate tools and plan for eccentric boring and counter balance while holding the work piece.
	25.2 Comply with safety rules when performing the above

	operations.
	25.3 Demonstrate possible solutions within the team.
	26.4 Set job and produce component following the standard operating procedure.
	27.5 Measure with instruments/gauges as per drawing.
	28.6 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
26. Produce the job having multi start thread form for machine tools	26.1 Plan and select appropriate method to produce components with multi start threading.
	26.2 Prepare appropriate tool for generating required thread form.
	26.3 set the job and turn multi start thread (male and female), match them for accurate fitting.
	26.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.

### Semester-IV

27. Turn job having center/axial offset (castings/forgings)	27.1 Plan and assemble the appropriate work holding device and balance the job rotation as per standard safety norms
	27.2 Demonstrate possible solutions and agree tasks within the team.
	27.3 Produce the job with standard operating procedure using appropriate tools.
	27.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.
	27.5 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
28. Produce components on CNC Lathe involving different operations	28.1 Plan and prepare part programme as per drawing, simulate for it's correctness with appropriate software.
	28.2 Prepare tooling layout and select tools as required
	28.3 Set selected tools on to the machine
	28.4 Test/Dry run the part programme on the machine
	28.5 Set up the job and machine the component as per standard operating procedure involving parallel, taper, step, radius, grooving and threading operations.
	28.6 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.
	28.7 Observe safety/ precaution during machining.
29. Manufacture and assemble screw jack.	29.1 Plan and select tools and materials for the part components and make this available for use in a timely manner.
	29.2 produce part components as per drawing
	29.3 Check for accuracy of all the part components and suitability to the higher assembly.

	29.4 Assemble all the part components as per the guide lines given in the drawing.
	29.5 Check for functionality of the screw jack as per standard operating procedure.
	29.6 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
30. Manufacture components having worm gear cutting.	30.1 Plan and select appropriate method to produce components with worm gear cutting.
	30.2 Prepare appropriate tool for producing required worm gear.
	30.3 set the job and turn worm gear, match for accurate fitting with female gauge.
	30.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.
31. Bore soft jaws for holding components	31.1 plan and select appropriate soft jaws and tools as per the component to be held.
	31.2 Mount the jaws on to the chuck for machining
	31.3 Bore the soft jaws as requirement.

## 10. SYLLABUS CONTENT WITH TIME STRUCTURE

### 10.1 SYLLABUS CONTENT FOR PROFESSIONAL SKILL & KNOWLEDGE

## **SYLLABUS FOR THE TRADE OF TURNER**

### **First Semester**

**(Semester Code no. TUR - 01)**

**Duration : Six Month**

### **LEARNING OBJECTIVES OF 1<sup>ST</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Perform basic fitting operations used in industrial workshop practices and inspection of dimensions
5. Operate lathe machine and identify different parts
6. Mounting of different work holding devices on a lathe machine
7. Grinding of cutting tools used on a lathe machine
8. Produce job using various cutting tools involving different operations.

<b>Week No.</b>	<b>Professional Skills</b>	<b>Professional Knowledge</b>
	<b>Trade Practical</b>	<b>Trade Theory</b>
1.	<p>Importance of trade training, List of tools &amp; Machinery used in the trade. Health &amp; Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p><b>Occupational Safety &amp; Health</b> <b>Importance of housekeeping &amp; good shop floor practices.</b> Health, Safety and Environment guidelines, legislations &amp; regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution &amp; personal safety message. Preventive measures for electrical accidents &amp; steps to be taken in such</p>	<p>Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. <b>Soft Skills: its importance and Job area after completion of training.</b> Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept &amp; its application. Response to emergencies eg; power failure, fire, and system failure.</p>

	accidents. Use of Fire extinguishers.	
2.	Identification of tools & equipments as per desired specifications for marking & sawing ( Hand tools , Fitting tools & Measuring tools) Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc., Marking out lines, gripping suitably in vice jaws, hack sawing to given dimensions, sawing different types of metals of different sections. Practice on hammering, marking out, chipping, chisel grinding	Measurement, line standard and end standard, steel rule-different types, graduation and limitation. Hammer and chisel-materials, types and uses. Prick punch and scriber.
3 & 4	Filing practice on plain surfaces, right angle by filing. Use of calipers and scale measurement.	Vice – types and uses, Files-different types of uses, cut, grade, shape, materials etc. Try square-different types, parts, material used etc. Calipers-types and uses (firm joint).
5.	Filing at right angle, marking & hack sawing.	Vee – block, scribing block, straight edge and its uses. Hacksaw-their types & uses.
6	Marking operation on flat & round job. Drilling operation.	Center punch- materials, construction & material uses. Drill machine-different parts. Hacksaw blades- sizes , different Parts. Hacksaw blades-sizes, different pitch for different materials.  Nomenclature of drill.
7.	Threading with the help of taps and dies.	Surface plate its necessity and use. Tap, - different types (Taper 2 <sup>nd</sup> and bottoming) care while tapping. Dies different types and uses. Calculation involved to find Out drill size (Metric and Inch).
8.	Getting to know the lathe with its main components, lever positions and various lubrication points as well.	Definition of machine & machine tool and its classification. History and gradual development of lathe.
9.	Mounting of chuck on machine spindle and unloading in various system – faceplate, 3-jaw chuck, 4-jaw chuck.	Classification of lathe in Function and construction of different parts of Lathe.
10 & 11	Turning of round stock on 4-jaw independent chuck. Use of 3-jaw self centering chuck as well.	Types of lathe drivers, merit and demerit. Description in details-head stock-cone pulley type- all geared type-construction & function. Tumbler gear set.

		Reducing speed-necessary & uses. Back Gear Unit –its construction use.
12	Grinding of R.H. and L.H., side cutting tools, checking of angles with tools angle gauge / bevel protractor.	Lathe cutting tool-different types, shapes and different angles ( clearances and rake), specification of lathe tools
13 & 14	Facing operation to correct length, center drilling operation,. Grinding of “V” tools for threading of Metric 60 degree threads with guage.	Combination drill- appropriate selection of size from chart of combination drill. Drill, chuck- its uses.
15 & 16	Parallel turning, step turning, practice-measurement with scale and outside caliper to 0.5 mm. accuracy.  Measurement with vernier caliper $\pm 0.5$ mm accuracy.	Vernier caliper-its construction, principle graduation and reading, least count etc. Digital vernier caliper.  Outside micrometer –different parts, principle, graduation, reading, construction. Digital micrometer. Cutting speed, feed depth of cut, calculation involved-speed feed R.P.M. etc. recommended for different materials.
17	Step turning practice within $\square 0.5$ mm with SQ, shoulder, U/cut on OD. Drilling on Lathe-step drilling, drill grinding practice.	Different types of micrometer, Outside micrometer. Vernier scale graduation and reading. Sources of error with micrometer & how to avoid them. Use of digital measuring instruments. Lathe accessories, chuck independent, self centering, collet, magnetic etc., its function, construction and uses.
18 & 19	Boring practice-Plain & step, internal recessing. Reaming in lathe using solid and adjustable reamer.	Drills-different parts, types, size etc., different cutting angles, cutting speed for different material. Boring tool. Counter - sinking and Counter boring. Letter and number drill, core drill etc.  Reamers-types and uses. Lubricant and coolant-types, necessity, system of distribution, selection of coolant for different material: Handling and care.
20	Checking alignment of lathe centers. Mounting job in between centers	Driving plate. Face plate & fixed & traveling steadies- construction and use. Transfer caliper-its construction and uses. Lathe centers-types and their uses. Lathe carrier-function, types & uses.
21	Turning practice-between centers on	Knurling meaning, necessity, types, grade,

&22	mandrel (Gear blanks). Fitting of dissimilar materials- M.S. in brass, aluminium, in cast iron etc. Knurling practice in lathe (Diamond, straight, helical & square).	cutting speed for knurling. Lathe mandrel-different types and their uses. Concept of interchangeability, Limit, Fit and tolerance as per BIS: 919-unilateral and bilateral system of limit, Fits- different types, symbols for holes and shafts. Hole basis & shaft basis etc. Representation of Tolerance in drawing.
23-25	<b>Revision</b>	
26	<b>Examination</b>	



**Second Semester**  
**(Semester Code no. TUR - 02)**

**Duration : Six Months**

**LEARNING OBJECTIVES OF 2<sup>ND</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Usage of different attachments used on Lathe machine
5. Produce components using different methods of taper turning.
6. Produce components with different thread forms.
7. Manufacture components having eccentric turning.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1	Male taper turning by compound slide swiveling. Use of sine bar.	Taper – different methods of expressing tapers, different standard tapers. Method of taper turning, important dimensions of taper. Taper turning by swiveling compound slide, its calculation.
2 - 3	Male and female taper turning by taper turning attachment / compound slide practice. Blue matching.	Vernier bevel protractor-its function & reading.
04- 05	Eccentric marking practice. Eccentric turning. Use of Vernier height Gauge and V-block. Eccentric boring.	Vernier height gauge, function, description & uses, templates-its function and construction. Screw thread-definition, purpose & its different elements. Fundamentals of thread cutting on lathe. Combination set-square head. Center head, protractor head-its function construction and uses.
06	Practice square block turning using 4-jaw chuck.	-do-
07 - 08	Screw thread cutting (B.S.W) external R/H & L/H, checking of thread by using screw thread gauge, fitting of male and female parts. Application to be covered.	Different types of screw thread- their forms and elements. Application of each type of thread. Drive train. Chain gear formula calculation.
09	Screw thread cutting (B.S.W) internal R/H & L/H	Different methods of forming threads. Calculation involved in finding core dia., gear train (simple gearing) calculation.
10 - 11	Fitting of male & female threaded components (BSW)	Calculations involving driver-driven, lead screw pitch and thread to be cut. Tread chasing dial function, construction and use.
12	Screw thread cutting ( External ) metric thread-tool grinding	Calculation involving pitch related to ISO profile.
13	Screw thread (Internal) metric & threading tool grinding	Conventional chart for different profiles, metric, B.A., Withworth, pipe etc.
14	Fitting of male and female thread components (Metric)	Calculation involving gear ratios and gearing (Simple & compound gearing)

15 - 16	Tool grinding for Square thread (External), Square threading (External) practice Tool grinding for Square thread (Internal) on pedestal grinder.	Calculation involving tool Thickness, core dia., pitch proportion, depth of cut etc. of sq. thread.
17	Fitting of male and female square threaded components.	Basic process of soldering, welding and brazing.
18 – 19	Acme threads cutting (male & female) & tool grinding.	Calculation involved – depth, core dia., pitch proportion etc. of Acme thread.
20	Fitting of male and female threaded components	Calculation involved depth, core dia., pitch proportion, use of buttress thread.
21	Buttress thread cutting ( male& female ) & tool grinding. Fitting of male & female threaded components.	Buttress thread cutting ( male & female ) & tool grinding
22 -23	<b>In-plant training</b> / Project work (work in a team)	
24-25	<b>Revision</b>	
26	<b>Examination</b>	

**Third Semester**  
**(Semester Code no. TUR - 03)**  
**Duration : Six Month**

**LEARNING OBJECTIVES OF 3<sup>RD</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Manufacture components with specific Form.
5. Produce components with internal taper and match male part
6. Mount grinding wheel on pedestal grinder
7. Maintain functionality of lathe by appropriate maintenance method.
8. Turn crank shaft as per drawing
9. Make job having eccentric boring.
10. Produce the job having multi start thread form for machine tools

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
01	<p>Introduction to various components produced on lathe.</p> <p>Forging practice (lathe tool) of different shapes, heat treatment of tools.</p>	<p>Review of lathe machine, its classification for productivity. Revision of first year topics.</p> <p>Cutting tool material-H.C.S., HSS, Tungsten. Carbide, Ceramic etc, - Constituents and their percentage. Tool life, quality of a cutting material.</p>
02	<p>Form turning practice by hand.</p> <p>Grinding of various shape of chip breaker on tool.</p>	<p>Form tools-function-types and uses, Template-purpose &amp; use. Dial test indicator- construction &amp; uses</p> <p>Calculation involving modified rake and clearance angles of lathe tool at above and below the center height. Subsequent effect of tool setting.</p> <p>Jig and fixture-definition, type and use. Chip breaker on tool-purpose and type</p>
03	<p>Taper turning by taper turning attachment, Morse taper- different number.</p>	<p>Sine bar-construction-types and use. Slip gauges-types., uses and selection.</p>

	Soft jaw boring. Use ring gauge / suitable MT sleeve.	
04	Internal taper turning by taper turning attachment / cross slide. Taper matching exercise (application of Prussian blue, Plug gauge)	Checking of taper with sin bar and roller-calculation involved
05	Turning and boring practice on CI (preferable) or steel & tip brazing on shank.	Method of brazing solder, flux used for tip tools.
06	Turning at high speed using tungsten carbide tools including throw-away tips.	Cutting speed, feed, turning time, depth of cut calculation, cutting speed chart (tungsten carbide tool ) etc. Basic classification of tungsten carbide tips.
07	Practice of negative rake tool on non-ferrous metal.	Tool life, negative top rake-its application and performance with respect to positive top rake
08	Balancing, mounting & dressing of grinding wheel  (Pedestal). Adjustment of tool post.	Lubricant-function, types, sources of lubricant. Method of lubrication. Dial test indicator use for parallelism and concentricity etc. in respect of lathe work Grinding wheel abrasive, grit, grade, bond etc.
09	Periodical lubrication procedure on lathe, testing of accuracy of alignment. Procedure of checking accuracy of lathe. Preventive maintenance of lathe.	Preventive maintenance, its necessity, frequency of lubrication. Preventive maintenance schedule., TPM (Total Productive Maintenance), EHS (Environment, health, Safety)
10	Holding and truing of Crankshaft – single throw (Desirable).	Marking table-construction and function. Angle plate-construction, eccentricity checking.
11	Turning of long shaft using steady (within 0.1 mm).	Roller and revolving steadies, Necessary, construction, uses etc.
12	Cutting metric threads on inch, lead screw and inch threads on Metric Lead Screw.	Calculation involving gear ratios metric threads cutting on inch L/S Lathe and vice-versa.
13	Use of attachments on lathe for different operations. Thread cutting on non-ferrous metals-copper aluminum brass etc.	Different types of attachments used in lathe. Various procedures of thread measurement thread screw pitch gauge.  Screw thread micrometer, tool maker, microscope etc.
14	Advanced eccentric boring (position boring using tool maker's button.)	Tool maker's button and its parts, construction and uses, telescopic gauge its construction and uses.
15	Boring and stepped boring (within +/- 0.05 mm)	Inside micrometer principle, construction graduation, reading, use etc. (Metric & Inch.)
16	Continuation of thread cutting. Fractional odd & even threads.	Calculation involving fractional threads. Odd & even threads.
17	Multiple thread cutting (B.S.W.) external & internal.	Multiple thread function, use, different between pitch & lead, formulate to find out start, pitch,

		lead. Gear ratio etc.
18	Multiple thread cutting 60 deg. (external & internal).	Indexing of start - different methods tool shape for multi-start thread. Setting of a lathe calculation for required change wheel
19	Multi-start thread cutting Acme form (Male & Female)	Calculation involving shape of tool, change wheel, core dia etc.
20	Practice of conventional turning from industrial drawing.	Calculation involving shape, size pitch, core dia. Etc.
21	Multi-start thread cutting, square form (Male & Female) Multiple thread cutting work (External). Cutting of helical grooves in bearing and bushes (Oil groove)	Helix angle, leading angle & following angles. Thread dimensions-tool shape, gear, gear calculation, pitch, depth, lead etc.
22-23	<b>Implant training / Project work (work in a team)</b>	
24-25	<b>Revision</b>	
26	<b>Examination</b>	

**Fourth Semester**  
**(Semester Code no. TUR - 04)**

**Duration : Six Month**

**LEARNING OBJECTIVES OF 4<sup>TH</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Turn job having center/axial offset (castings/forgings)
5. Produce components on CNC Lathe involving different operations
6. Manufacture and assemble screw jack.
7. Manufacture components having worm gear cutting.
8. Bore soft jaws for holding components.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1- 2	Setting and turning operation involving face and angle plate	Accessories used on face plate –their uses. Angle plate-its construction & use. Balancing-its necessity.
3 - 4	Turning & boring of split bearing – (using boring bar and fixture )	Care for holding split bearing. Fixture and its use in turning.
5 - 6	Thread on taper surface (Vee form).	Setting of tool for taper threads-calculation of taper setting and thread depth.
7	Cutting of Helical grooves in bearings and bushes(oil grooves)	Heat treatment – meaning & procedure hardening, tempering, carbonizing etc.
8	Demo of parts of CNC machine – control switches, console buttons and machines specifications Demonstration of CNC lathe parts - bed, spindle motor and drive, chuck, tailstock, tool changer, axes motor and ballscrews, guideways, LM guides, console, electrical, coolant system, hydraulic system, chip conveyor. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.	CNC technology basics: Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Schematic diagram of CNC system. Axes convention. Working of parts explained using multimedia CNC teachware. Parts shown on machine.

9	CNC part programming with simple exercises and various programming codes. Practice on CNC machine simulator.	Programming – sequence, formats, different codes, canned cycles. Absolute and incremental programming. Tool nose radius compensation (G41/42). Cutting tool materials, cutting tool geometry – insert types, holder types, insert cutting edge geometry, ISO nomenclature for turning tools, boring tools, inserts. Cutting parameters - cutting speed, feed rate, depth of cut, constant surface speed, limiting spindle speed. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teachware and CNC machine simulator.
10-11	CNC turning center operation in various modes : jog, single block, auto, MDI, edit, etc. Program entry. Setting of tool offsets, entry of tool nose radius and orientation.	Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing. Concepts taught using multimedia CNC teachware.
12-13	Machining parts on CNC lathe with parallel, taper, step, radius turning, grooving and threading of different pitches. First 60 % of the practice is on CNC machine simulator, followed by 40 % on machine.	Prepare various programs as per drawing. Concepts taught using multimedia CNC teachware.
14-15	Practice of different operations related to trade on CNC machine.	Different types of programming techniques of CNC machine.
16-17	Manufacturing & Assembly of Screw jack/vice/Box nut by performing different lathe operation.	Interchangeability meaning, procedure for adoption, quality control procedure for quality production.
18	Prepare different types of documentation as per industrial need by different methods of recording information.	Importance of Technical English terms used in industry –(in simple definition only) Technical forms, process charts, activity logs in required formats of industry, estimation, cycle time, productivity reports, job cards.
19	Read a part drawing and make a process plan for turning operation.	Terms used in part drawings and interpretation of drawings – tolerances, geometrical symbols - cylindricity, parallelism. etc.
20	Practice of special operations on lathes - worm gear cutting, oil groove internal and external,	Automatic lathe-its main parts, types diff. Tools used-circular tool etc

21	Boring on lathe using soft jaws and dial bore gauge to accuracy of +/- 0.05 mm.	Related theory and calculation. Surface finish symbols used on working blueprints- I.S. system lapping, honing etc.
22-23	<b>Implant training</b> / Project work (work in a team)	
24-25	<b>Revision</b>	
26	<b>Examination</b>	



## 10.2 SYLLABUS CONTENT OF CORE SKILLS

**First Semester**  
**(Semester Code no.TUR - 01)**  
**Duration: Six Month**

### LEARNING OBJECTIVES OF 1<sup>ST</sup> SEMESTER

1. Apply basic arithmetic to derive value of unknown quantity / variable.
2. Understand & apply engineering material, their classification, properties and applications in the day to day technical application.
3. Explain & apply speed, velocity, work, power & energy for application in field of work.
4. Understand & explain importance of engineering drawing, drawing instruments, their standard & uses.
5. Draw lines, geometrical figures, free hand sketches.
6. Understand and apply sizes & layout of drawing sheet, method of presentation of engineering drawing & symbolic representation as per BIS standards

Sl. No.	Professional Knowledge	Professional Knowledge & Skills
	Workshop Calculation and Science	Engineering Drawing
1.	<b><u>Unit</u></b> : Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Engineering Drawing: Introduction and its importance <ul style="list-style-type: none"> <li>- Relationship to other technical drawing types</li> <li>- Conventions</li> <li>- Viewing of engineering drawing sheets.</li> <li>- Method of Folding of printed Drawing Sheet as per BIS SP:46-2003</li> </ul>
2.	<b><u>Fractions</u></b> : 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.	Drawing Instruments : their Standard and uses <ul style="list-style-type: none"> <li>- Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.</li> </ul>
3.	<b><u>Square Root</u></b> : Square and Square Root, method of finding out square roots, Simple problem using calculator.	Lines : <ul style="list-style-type: none"> <li>- Definition, types and applications in Drawing as per BIS SP:46-2003</li> <li>- Classification of lines (Hidden, centre, construction, Extension, Dimension, Section)</li> <li>- Drawing lines of given length (Straight, curved)</li> <li>- Drawing of parallel lines, perpendicular line</li> <li>- Methods of Division of line segment</li> </ul>
4.	<b><u>Ratio &amp; Proportion</u></b> : Simple calculation on related problems.	Drawing of Geometrical Figures: Definition, nomenclature and practice of <ul style="list-style-type: none"> <li>- Angle: Measurement and its types, method of</li> </ul>

		bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	<b>Percentage</b> : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6.	<b>Material Science</b> : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	Dimensioning: - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text
7.	<b>Mass, Weight and Density</b> : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.	Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
8.	<b>Speed and Velocity</b> : Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.	Sizes and Layout of Drawing Sheets - Basic principle of Sheet Size - Designation of sizes - Selection of sizes - Title Block, its position and content - Borders and Frames (Orientation marks and graduations) - Grid Reference - Item Reference on Drawing Sheet (Item List)
9.	<b>Work, Power and Energy</b> : 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.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view
10.	-----	Symbolic Representation (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings

**Second Semester**  
**(Semester Code no.TUR - 02)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 2<sup>ND</sup> SEMESTER**

1. Demonstrate basic algebraic, mensuration, trigonometric facts and formulas to derive value of unknown quantity / variable.
2. Apply the factual knowledge of basic heat & temperature, basic electricity for day to day practical application.
3. Explain & apply principles of simple machine & levers for mechanical advantage, efficiency for practical application.
4. Draw & practice dimensioning, construction of solid figures and projections as per IS specifications.

Sl. No.	Professional Knowledge	Professional Knowledge & Skills
	Workshop Calculation and Science	Engineering Drawing
1.	<b>Algebra</b> :Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Construction of Scales and diagonal scale
2.	<b>Mensuration</b> : 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.	Practice of Lettering and Title Block
3.	<b>Trigonometry</b> : Trigonometrical ratios, measurement of angles.  Trigonometric tables	Dimensioning practice:  - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. - Text of dimension of repeated features, equidistance elements, circumferential objects.
4.	<b>Heat &amp; Temperature</b> : Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	Construction of Geometrical Drawing Figures:  - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. - Conic Sections (Ellipse& Parabola)

5.	<p><b>Basic Electricity:</b> Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy.</p>	<p>Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.</p>
6.	<p><b>Levers and Simple Machines:</b> levers and its types.</p> <p>Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.</p>	<p>Free Hand sketch of hand tools and measuring tools used in respective trades.</p>
7.		<p>Projections:</p> <ul style="list-style-type: none"> <li>- Concept of axes plane and quadrant.</li> <li>- Orthographic projections</li> <li>- Method of first angle and third angle projections (definition and difference)</li> <li>- Symbol of 1<sup>st</sup> angle and 3<sup>rd</sup> angle projection as per IS specification.</li> </ul>
8.		<p>Drawing of Orthographic projection from isometric/3D view of blocks</p>
9.		<p>Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts &amp; Screw)</p>
10.		<p>Drawing details of two simple mating blocks and assembled view.</p>

**Third Semester**  
**(Semester Code no.TUR - 03)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 3<sup>RD</sup> SEMESTER**

1. Demonstrate & apply calculation of area of cut-out regular & irregular surfaces, Volume of geometrical shapes and their cut section in related shop floor problems.
2. Calculate value of unknown sides and angles of geometrical shapes by trigonometrical methods and apply in shop floor problems.
3. Understand & apply concept of forces, stress & strain, factor of safety for practical application.
4. Factual knowledge of thermal conductivity, temperature measuring instruments, average velocity and circular motion for day to day application.
5. Understanding drawing of machined components & related symbols for use in manufacturing purpose.
6. Draw free hand sketches for fasteners, hand tools and components.
7. Prepare simple assembly drawings & their details.

Sl. No.	Professional Knowledge	Professional Knowledge & Skills
	Workshop Calculation and Science	Engineering Drawing
1.	- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle.	- Revision of first year topics.
2.	- Area of cut-out regular surfaces: circle and segment and sector of circle.	- Machined components; concept of fillet & chamfer; surface finish symbols.
3.	- Area of irregular surfaces. - Application related to shop problems.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
4.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.	- Free hand Sketches for bolts, nuts, screws and other screwed members.
5.	- Material weight and cost problems related to trade.	- Free hand Sketching of foundation bolts and types of washers.
6.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.	- Standard rivet forms as per BIS (Six types).
7.	- Finding height and distance by trigonometry.	- Riveted joints-Butt & Lap (Drawing one for each type).
8.	- Application of trigonometry in shop problems. (viz. taper angle calculation).	- Orthogonal views of keys of different types

<b>9.</b>	<ul style="list-style-type: none"> <li>- Forces definition.</li> <li>- Compressive, tensile, shear forces and simple problems.</li> <li>-Stress, strain, ultimate strength, factor of safety.</li> <li>-Basic study of stress-strain curve for MS.</li> </ul>	- Free hand Sketches for simple pipe, unions with simple pipe line drawings.
<b>10.</b>	<ul style="list-style-type: none"> <li>- Temperature measuring instruments.</li> <li>Specific heats of solids &amp; liquids.</li> </ul>	- Concept of preparation of assembly drawing and detailing. Preparation of simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.
<b>11.</b>	<ul style="list-style-type: none"> <li>- Thermal Conductivity, Heat loss and heat gain.</li> </ul>	-Free hand sketch of trade related components / parts (viz., single tool post for the lathe, etc.)
<b>12.</b>	<ul style="list-style-type: none"> <li>- Average Velocity, Acceleration &amp; Retardation.</li> <li>- Related problems.</li> </ul>	- Study of assembled views of Vee-blocks with clamps.
<b>13.</b>	<ul style="list-style-type: none"> <li>- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force</li> </ul>	- Study of assembled views of shaft and pulley.
<b>14.</b>		- Study of assembled views of bush bearing.
<b>15.</b>		- Study of assembled views of a simple coupling.
<b>16.</b>		- Free hand Sketching of different gear wheels and nomenclature.

**Fourth Semester**  
**(Semester Code no.TUR - 04)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 4<sup>TH</sup> SEMESTER**

1. Read & interpret different types graphs.
2. Solve simple statistical problem and apply sampling method for inspection purpose.
3. Factual knowledge of friction, magnetism and their application and affects.
4. Understand the application of electrical insulating materials & concept of earthing.
5. Understand & apply transmission of power, heat treatment & their advantages.
6. Factual knowledge of pressure, its units and measuring system and understand basic concept of pneumatics & hydraulic system.
7. Draw free hand sketches of bench vice and bearing.
8. Understand & identify missing lines, symbols & views.
9. Estimate material required as per drawing.

Sl. No.	Professional Knowledge	Professional Knowledge & Skills
	Workshop Calculation and Science	Engineering Drawing
1.	<p><b><u>Graph:</u></b></p> <ul style="list-style-type: none"> <li>- Read images, graphs, diagrams</li> <li>- bar chart, pie chart.</li> <li>- Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.</li> </ul>	- Free hand Details and assembly of simple bench vice.
2.	<p>Simple problem on Statistics:</p> <ul style="list-style-type: none"> <li>- Frequency distribution table</li> <li>- Calculation of Mean value.</li> <li>- Examples on mass scale productions.</li> <li>-Cumulative frequency</li> <li>-Arithmetic mean</li> </ul>	- Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
3.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	<ul style="list-style-type: none"> <li>- Simple exercises relating missing symbols.</li> <li>- Missing views</li> </ul>
4.	<p>- Friction- co-efficient of friction, application and effects of friction in Workshop practice.</p> <p><b>Centre of gravity</b> and its practical application.</p>	- Simple exercises related to missing section.
5.	<ul style="list-style-type: none"> <li>- Magnetic substances- natural and artificial magnets.</li> <li>- Method of magnetization. Use of magnets.</li> </ul>	-Free hand sketching of different types of bearings and its conventional representation.

<b>6.</b>	<ul style="list-style-type: none"> <li>- Electrical insulating materials.</li> <li>- Basic concept of earthing.</li> </ul>	<ul style="list-style-type: none"> <li>- Free hand sketching of different gear wheels and nomenclature/ Simple duct (for RAC).</li> <li>Free hand sketch of Reciprocating compressor – open type (for RAC)</li> </ul>
<b>7.</b>	<ul style="list-style-type: none"> <li>- Transmission of power by belt, pulleys &amp; gear drive.</li> <li>- Calculation of Transmission of power by belt pulley and gear drive.</li> </ul>	<ul style="list-style-type: none"> <li>- Solution of NCVT test.</li> <li>- Simple exercises related to trade related symbols.</li> <li>- Basic electrical and electronic symbols</li> </ul>
<b>8.</b>	<ul style="list-style-type: none"> <li>- Heat treatment and advantages.</li> </ul>	<ul style="list-style-type: none"> <li>- Study of drawing &amp; Estimation of materials.</li> </ul>
<b>9.</b>	<p>Concept of pressure – units of pressure, atmospheric pressure, absolute pressure, gauge pressure – gauges used for measuring pressure</p>	<ul style="list-style-type: none"> <li>- Solution of NCVT test papers.</li> </ul>
<b>10.</b>	<p>Introduction to pneumatics &amp; hydraulics systems.</p>	



# **11. Employability Skills**

## 11.1 GENERAL INFORMATION

1. **Name of the subject** : **EMPLOYABILITY SKILLS**
2. **Applicability** :
  - CTS- Mandatory for all trades
  - ATS- Mandatory for fresher only
3. **Hours of Instruction** : 110 Hrs.
4. **Examination** : The examination will be held at the end of semesters.
5. **Instructor Qualification** :

**MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes**

**AND**

**Must have studied English/ Communication Skills and Basic Computer at 12<sup>th</sup> / Diploma level and above**

**OR**

**Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes**

6. **Instructor** :
  - One full time instructor is required for 1000 seats and above
  - For seats less than 1000, the instructor may be out sourced/ hired on contract basis.

## 11.2 DISTRIBUTION OF TOPICS BETWEEN SEMESTERS FOR EMPLOYABILITY SKILL

<b>Course Duration</b>	<b>Semester1</b>	<b>Semester2</b>	<b>Examination</b>
	<b>Topics</b>	<b>Topics</b>	
<b>01 Year (Two semesters)</b>	<ol style="list-style-type: none"> <li>1. English Literacy</li> <li>2. I.T. Literacy</li> <li>3. Communication Skills</li> </ol>	<ol style="list-style-type: none"> <li>4. Entrepreneurship Skills</li> <li>5. Productivity</li> <li>6. Occupational safety , Health and Environment Education</li> <li>7. Labour Welfare Legislation</li> <li>8. Quality Tools</li> </ol>	<b>Final examination at the end of second semester</b>
<b>02 Years (Four Semesters)</b>	<ol style="list-style-type: none"> <li>1. English Literacy</li> <li>2. I.T. Literacy</li> <li>3. Communication Skills</li> </ol>	<ol style="list-style-type: none"> <li>4. Entrepreneurship Skills</li> <li>5. Productivity</li> <li>6. Occupational safety , Health and Environment Education</li> <li>7. Labour Welfare Legislation</li> <li>8. Quality Tools</li> </ol>	<b>Final examination at the end of second semester</b>

## 11.3 SYLLABUS CONTENT OF EMPLOYABILITY SKILL

### SEMESTER-I

#### LEARNING OBJECTIVES OF 1<sup>ST</sup> SEMESTER

1. Read, write and communicate in English language for day to day work.
2. Communicate in written and oral and with required clarity ensuring that the information communicated is clear, concise and accurate.
3. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

<b>1. English Literacy</b>	
<b>Hours of Instruction: 20 Hrs.</b>	
<b>Marks Allotted: 09</b>	
<b>Pronunciation</b>	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
<b>Functional Grammar</b>	Transformation of sentences, Voice change, Change of tense, Spellings.
<b>Reading</b>	Reading and understanding simple sentences about self, work and environment
<b>Writing</b>	Construction of simple sentences Writing simple English
<b>Speaking / Spoken English</b>	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. 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.
<b>2. I.T. Literacy</b>	
<b>Hours of Instruction: 20 Hrs.</b>	
<b>Marks Allotted: 09</b>	
<b>Basics of Computer</b>	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
<b>Computer Operating System</b>	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.
<b>Word processing and Worksheet</b>	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

<b>Computer Networking and INTERNET</b>	<p>Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks),</p> <p>Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. 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.</p> <p>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, types of cyber crimes.</p>
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### 3. Communication Skills

**Hour of Instruction: 15 Hrs.Marks Allotted: 07**

Topic	Contents
<b>Introduction to Communication Skills</b>	Communication and its importance
	Principles of Effective communication
	Types of communication – verbal, nonverbal, written, email, talking on phone.
	Nonverbal communication –characteristics, components-Para-language
	Body – language
	Barriers to communication and dealing with barriers.
	Handling nervousness/ discomfort.
<b>Listening Skills</b>	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening – Attitude, Attention & Adjustment.
	Active Listening Skills.
<b>Motivational Training</b>	
	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self-awareness
	Importance of Commitment
	Ethics and Values
<b>Facing Interviews</b>	Ways to Motivate Oneself
	Personal Goal setting and Employability Planning.
<b>Behavioral Skills</b>	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
	Problem Solving
	Confidence Building
	Attitude

## SEMESTER-II

### LEARNING OBJECTIVES OF 2<sup>ND</sup> SEMESTER

1. Knowledge of business activities, ability to interact with consumers for development of businesses.
2. Understand and apply productivity, its benefits and factors affecting the productivity.
3. Follow and maintain procedures to achieve a safe working environment in line with occupational health, safety, environment regulations and Labour welfare legislation and requirements.
4. Understand and apply quality concepts as per ISO and BIS system and its importance.
5. Recognize different components of 5S and apply the same in the working environment.

<b>4. Entrepreneurship skill</b> <b>Hour of Instruction: 15 Hrs.Marks Allotted: 06</b>	
Topic	Content
<b>Business &amp; Consumer:</b>	Types of business in different trades and the importance of skill, Understanding the consumer, market through consumer behavior, market survey, Methods of Marketing, publicity and advertisement
<b>Self Employment:</b>	Need and scope for self-employment, Qualities of a good Entrepreneur (values attitude, motive, etc.), SWOT and Risk Analysis
<b>Govt Institutions :</b>	Role of various Schemes and Institutes for self-employment i.e. DIC, SIDBI, MSME, NSIC, Financial institutions and banks
<b>Initiation Formalities :</b>	Project Formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment Procedure - Loan Procurement - Agencies - banking Process
<b>5. Productivity</b> <b>Hour of Instruction: 10 Hrs.Marks Allotted: 05</b>	
Productivity	Definition, Necessity, Meaning of GDP.
Benefits	Personal / Workman – Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.

Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
<b>6. Occupational Safety, Health &amp; Environment</b> <b>Hour of Instruction: 15 Hrs.Marks Allotted: 06</b>	
<b>Safety &amp; Health :</b>	Introduction to Occupational Safety and Health and its importance at workplace
<b>Occupational Hazards :</b>	Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention
<b>Accident &amp; safety :</b>	Accident prevention techniques- control of accidents and safety measures
<b>First Aid :</b>	Care of injured & Sick at the workplaces, First-aid & Transportation of sick person
<b>Basic Provisions :</b>	Idea of basic provisions of safety, health, welfare under legislation of India
<b>7.Labour Welfare Legislation</b> <b>Hour of Instruction: 05 Hrs.Marks Allotted: 03</b>	
<b>Labour Welfare Legislation</b>	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen" s Compensation Act
<b>8.Quality Tools</b> <b>Hour of Instruction: 10 Hrs.Marks Allotted: 05</b>	
<b>Quality Consciousness :</b>	Meaning of quality, Quality Characteristic
<b>Quality Circles :</b>	Definition, Advantage of small group activity, objectives of Quality Circle, Roles and Functions of Quality Circles in organisation, Operation of Quality Circle, Approaches to Starting Quality Circles, Steps for Continuation Quality Circles
<b>Quality Management System:</b>	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
<b>House Keeping :</b>	Purpose of Housekeeping, Practice of good Housekeeping.5S Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline

## 12. INFRASTRUCTURE

1. INSTRUCTORS' QUALIFICATION : Degree in Mechanical Engineering from recognized Engineering College /university with one year experience in the relevant field.  
OR  
Diploma in Mechanical Engineering from recognized board of technical education with two years experience in the relevant field.  
OR  
10<sup>th</sup> Class Pass + NTC/NAC in the Trade of "Turner" With 3 years post qualification experience in the relevant field.
2. DESIRABLE QUALIFICATION : Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Fitter trade.
3. SPACE NORMS : 110Sq.m
4. POWER NORMS : 18.5 KW
5. TOOLS, EQUIPMENT& GENERAL MACHINERY : (AS PER ANNEXURE-II)

### **Note:**

- (i) Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.
- (ii) Instructor qualification for WCS and E.D, as per the training manual.
- (iii) The list of Tools, Equipment& General Machinery listed in Annexure – II are for a particular trade (TURNER) comprising of four semesters and not for single semester.

## **13. ASSESSMENT STANDARD**

### **13.1 Assessment guideline:**

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- i) Job carried out in labs/workshop
- ii) Record book/ daily diary
- iii) Answer sheet of assessment
- iv) Viva-voce
- v) Progress chart
- vi) Attendance and punctuality
- vii) Assignment
- viii) Project work

Evidence of internal assessment to be preserved until forthcoming semester examination for audit and verification by examination body.

The following marking pattern to be adopted while assessing:

**a)** Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- demonstration of good skill in the use of hand tools, machine tools and workshop equipment
- below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a fairly good level of neatness and consistency in the finish
- occasional support in completing the project/job.

**b)** Weightage in the range of above 75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:



- good skill levels in the use of hand tools, machine tools and workshop equipment
- 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a good level of neatness and consistency in the finish
- little support in completing the project/job

c) Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- above 80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

### 13.2. INTERNAL ASSESSMENTS (FORMATIVE ASSESSMENT)

NO.	ASSESSABLE OUTCOME	INTERNAL ASSESSMENT MARKS
<b>GENERIC</b>		
1.	Apply safe working practices.	
2.	Comply environment regulation and housekeeping	
3.	Interpret & use Company terminology and technical communication	
4.	Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, and statistics and apply knowledge of specific area to perform practical operations.	
5.	Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	
6.	Read and apply engineering drawing for different application in the field of work.	
7.	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.	
8.	Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	
9.	Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	
10.	Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	
<b>SPECIFIC</b>		
11.	Perform basic fitting operations used in industrial workshop practices and inspection of dimensions	
12.	Operate lathe machine and identify different parts	
13.	Mounting of different work holding devices on a lathe machine	
14.	Grinding of cutting tools used on a lathe machine	
15.	Produce job using various cutting tools involving different operations.	
<b>Sub-Total of Internal assessment for Semester- I</b>		<b>100</b>

16.	Usage of different attachments used on Lathe machine	
17.	Produce components using different methods of taper turning.	
18.	Produce components with different thread forms.	
19.	Manufacture components having eccentric turning.	
	<b>Sub-Total of Internal assessment for Semester- II</b>	100
20.	Manufacture components with specific Form.	
21.	Produce components with internal taper and match male part	
22.	Mount grinding wheel on pedestal grinder	
23.	Maintain functionality of lathe by appropriate maintenance method.	
24.	Turn crank shaft as per drawing	
25.	Make job having eccentric boring.	
26.	Produce the job having multi start thread form for machine tools	
	<b>Sub-Total of Internal assessment for Semester- III</b>	100
27.	Turn job having center/axial offset (castings/forgings)	
28.	Produce components on CNC Lathe involving different operations	
29.	Manufacture and assemble screw jack.	
30.	Manufacture components having worm gear cutting.	
31.	Bore soft jaws for holding components.	
	<b>Sub-Total of Internal assessment for Semester- IV</b>	100
	<b>Total of Internal assessment</b>	400

### 13.3 FINAL ASSESSMENT- ALL INDIA TRADE TEST (SUMMATIVE ASSESSMENT)

- a) There will be a single objective type Examination paper for the subjects Engineering drawing and Workshop Calculation & Science.
- b) There will be a single objective type Examination paper for the subjects Trade Theory and Employability Skills.
- c) The two objective type Examination papers as mentioned above will be conducted by National Council for Vocational Training (NCVT), whereas examination for the subject Trade Practical will be conducted by the State Government. NCVT shall supply the Question Paper for the subject Trade Practical.

<b>Marking Pattern</b>		
<b>Sl. No.</b>	<b>Subject for the trade test</b>	<b>Maximum marks for the each subject</b>
a)	Practical	<b>300</b>
b)	Trade Theory	<b>200</b> Objective type Written test of 200 marks (Trade Theory 150 marks & Employability Skills 50 marks)
c)	Employability Skills	
d)	Work shop Calculation and Science.	<b>100</b> Objective Type Written test of 100 marks (Engineering Drawing 50 marks & Work shop Calculation and Science 50 marks)
e)	Engineering Drawing	
f)	Internal assessment	<b>100</b>
<b>TOTAL:</b>		<b>700</b>

## 14. LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Sh/Mr./Ms.	Organization	Mentor Council Designation
<b>Members of Sector Mentor council</b>			
1.	A. D. Shahane, Vice-President, (Corporate Trg.)	Larsen &Tourbo Ltd., Mumbai:400001	Chairman
2.	Dr. P.K.Jain, Professor	IIT, Roorkee, Roorkee-247667, Uttarakhand	Member
3.	N. Ramakrishnan, Professor	IIT Gandhinagar, Gujarat-382424	Member
4.	Dr. P.V.Rao, Professor	IIT Delhi, New Delhi-110016	Member
5.	Dr. Debdas Roy, Asstt. Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
6.	Dr. Anil Kumar Singh, Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
7.	Dr. P.P.Bandyopadhyay Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
8.	Dr. P.K.Ray, Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
9.	S. S. Maity, MD	Central Tool Room & Training Centre (CTTC), Bhubaneswar	Member
10.	Dr. Ramesh Babu N, Professor	IIT Madras, Chennai	Member
11.	R.K. Sridharan, Manager/HRDC	Bharat Heavy Electricals Ltd, Ranipet, Tamil Nadu	Member
12.	N. Krishna Murthy Principal Scientific Officer	CQA(Heavy Vehicles), DGQA, Chennai, Tamil Nadu	Member
13.	Sunil Khodke Training Manager	Bobst India Pvt. Ltd., Pune	Member
14.	Ajay Dhuri	TATA Motors, Pune	Member
15.	UdayApte	TATA Motors, Pune	Member
16.	H B Jagadeesh, Sr. Manager	HMT, Bengaluru	Member
17.	K Venugopal Director & COO	NTTF, Peenya, Bengaluru	Member
18.	B.A.Damahe, Principal L&T Institute of Technology	L&T Institute of Technology, Mumbai	Member
19.	Lakshmanan. R Senior Manager	BOSCH Ltd., Bengaluru	Member
20.	R C Agnihotri Principal	Indo- Swiss Training Centre Chandigarh, 160030	Member

<b>Mentor</b>			
<b>21.</b>	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor
<b>Members of Core Group</b>			
<b>22.</b>	N. Nath. (ADT)	CSTARI, Kolkata	Co-ordinator
<b>23.</b>	H.Charles (TO)	NIMI, Chennai.	Member
<b>24.</b>	Sukhdev Singh (JDT)	ATI Kanpur	Team Leader
<b>25.</b>	Ravi Pandey (V.I)	ATI Kanpur	Member
<b>26.</b>	A.K. Nasakar (T.O)	ATI Kolkata	Member
<b>27.</b>	Samir Sarkar (T.O)	ATI Kolkata	Member
<b>28.</b>	J. Ram EswaraRao (T.O)	RDAT Hyderabad	Member
<b>29.</b>	T.G. Kadam (T.O)	ATI Mumbai	Member
<b>30.</b>	K. Mahendar (DDT)	ATI Chennai	Member
<b>31.</b>	Shrikant S Sonnavane (T.O)	ATI Mumbai	Member
<b>32.</b>	K. Nagasrinivas(DDT)	ATI Hyderabad	Member
<b>33.</b>	G.N. Eswarappa (DDT)	FTI Bangalore	Member
<b>34.</b>	G. Govindan, Sr. Draughtsman	ATI Chennai	Member
<b>35.</b>	M.N.Renukaradhya, Dy.Director/Principal Grade I.,	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
<b>36.</b>	B.V.Venkatesh Reddy. JTO	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
<b>37.</b>	N.M.Kajale, Principal,	Govt. ITI Velhe, Distt: Pune, Maharashtra	Member
<b>38.</b>	SubrataPolley, Instructor	ITI Howrah Homes, West Bengal	Member
<b>39.</b>	VINOD KUMAR.R Sr.Instructor	Govt.ITIDhanuvachapuram Trivandrum, Dist., Kerala	Member
<b>40.</b>	M. Anbalagan, B.E., Assistant Training Officer	Govt. ITI Coimbatore, Tamil Nadu	Member
<b>41.</b>	K. Lakshmi Narayanan, T.O.	DET, Tamil Nadu	Member
<b>42.</b>	L. K. Mukherjee, DDT	CSTARI, Kolkata	Member
<b>43.</b>	R. N. Manna, TO	CSTARI, Kolkata	Member
<b>Other industry representatives</b>			
<b>44.</b>	VenugopalParvatikar	Skill Sonics, Bangalore	Member
<b>45.</b>	VenkataDasari	Skill Sonics, Bangalore	Member
<b>46.</b>	Srihari, D	CADEM Tech. Pvt. Ltd., Bengaluru	Member
<b>47.</b>	Dasarathi.G.V.	CADEM Tech. Pvt. Ltd., Bengaluru	Member
<b>48.</b>	L.R.S.Mani	Ohm Shakti Industries, Bengaluru	Member

## Annexure - I

### TRADE: TURNER

#### LIST OF TOOLS & EQUIPMENTS FOR 12 TRAINEES+1

##### A : TRAINEES TOOL KIT:-

Sl. No.	Description	For Instructor	For Trainees
1	Caliper out side spring joint 150 mm	1 No	12 Nos.
2	Caliper inside spring joint 150 mm	1 No	12Nos.
3	Caliper odd-leg firm joint 150 mm	1 No..	12 Nos.
4	Steel Rule 150 mm	1 No..	12Nos.
5	Scriber 150mm x 3 mm	1 No.	12 Nos.
6.	Hammer ball peen 250 gm with handle	1 no.	12 Nos.
7	Centre punch 100 mm	1 no.	12Nos.
8	Prick punch 100 mm	1 no.	12 Nos.
9	Divider spring joint 150 mm	1 no.	12Nos.
10	Safety goggles clear glass (Good quality)	1 no.	12 Nos.

##### B: TOOLS, EQUIPMENTS AND GENERAL OUTFIT

Sl. No.	Description	For Instructor	For Trainees
11	Surface plate 60 x 60 cm	---	1 no.
12	Work bench 240 x 120x 90cm high	---	1 no.
13	Marking table (CI) 120 x 120 cm	---	1 no
14	Bench vice 125 mm jaw	---	6 nos.
15	Vee-Block 75 and 125 mm with clamp	---	1 pair each
16	Universal Surface gauge 250 mm arm	---	2 nos.

17	Hammer ball peen 750 gm with handle	---	6 nos.
18	Chisel cold flat 20 x 150 mm	---	6 nos.
19	Hammer copper/brass 500 gm with handle	---	12 nos.
20	Hacksaw fixed 200 mm (Pistol grip)	---	6 nos.
21	File flat 300 mm rough	---	6 nos.
22	File flat 250 mm 2 <sup>nd</sup> cut	---	6 nos.
23	File flat 250 mm smooth	---	6 nos.
24	File half round 250 mm 2 <sup>nd</sup> cut	---	6 nos.
25	File round 250 mm smooth	1 no.	6 nos
26	File half round 150 mm smooth	1 no.	2 Sets
27	Knurling tool revolving head (Rough, med, fine) diamond and straight	---	2 Sets
28	Combination set 300 mm (Complete Set)	---	6 Nos.
29	Screw Driver 200 & 300 blade heavy duty	---	2 sets each
30	Spanner double ended 6 mm to 21 mm	1 set	2 Nos
31	Spanner adjustable 200 mm	1 no.	---
32	Pliers flat nose 150 mm side cutting	1 no.	15 nos.
33	Caliper transfer inside 150 mm	---	3 nos.
34	Micrometer Outside 0 to 1" Reading 0.0001"	1 no.	----
35	Micrometer Outside 0 to 25 mm Reading 0.01 mm	1 no.	2 sets
36	Micrometer Outside 25 to 50 mm Reading 0.01 mm	----	2 nos.
37	Micrometer Outside 50to 75 mm Reading 0.01 mm	----	2 sets
38	Micrometer Inside up to 25 mm Reading 0.01 mm	1set	2 nos.
39	Micrometer Inside up to 50 to 150 mm reading 0.01 mm	-----	2 nos.
40	Depth Gauge Micrometer 0 to 150 mm Reading 0.01 mm	-----	2 nos.
41	Vernier Caliper Outside, Inside and Depth 200 mm /8 inches with metric & inch scale	1 No.	6 nos.



42	Dial Vernier Caliper with metric 200 mm reading 0.05 mm	1 No	6 nos.
43	Vernier Bevel Protractor 300 mm blade	-----	6 nos.
44	Vernier Micrometer 0 - 25 mm o/s LC 0.001mm	1 No	2 nos.
45	Vernier Micrometer 25 - 50 mm outside reading 0.001mm	1 No.	2 sets
46	Vernier Micrometer 0 inch to 1 inch. Outside Reading 0.0001 inch	1 No.	2 nos.
47	Feeler Gauge 100 mm blade metric set	---	2 sets
48	Radius Gauge 1 to 7 mm & 7.5 to 15 mm	---	6 Nos
49	Centre Gauge com. 60°, 55° and 29°	---	2 sets
50	Screw Pitch Gauge Whitworth & Metric each	---	2 sets
51	Drill Angle Gauge	---	2 sets
52	Dial Test Indicator 0.01 mm with magnetic base	---	2 sets
53	Vernier Height Gauge with dial 300 mm L.C. 0.01 mm	---	1 set
54	Try Square 150 blade	---	4 nos.
55	Magnifying Glass 75 mm dia.	---	4 nos.
56	Plain Ring and Plug Gauge 12 to 50 mm by 1mm	---	1 set each
57	Wheel Dresser Huntingon-type with star cutter	---	1 No.
58	Wheel Dresser Diamond ( inserted-0.75 or 1 Carat )	---	2 Nos.
59	Screw Thread micrometer interchangeable	1 No.	1 No
60	Morse Taper Plug & Ring Gauge no. 0 to 7 MT	---	1 set
61	Sin Bar with centers 200 mm	---	2 Nos.
62	Slip Gauge metric set ( 87 pieces in a Box )	---	2 Nos.
63	Morse Taper Sleeves No. 0-1, 1-2, 2-3, 3-4, 4-5.	---	1 set
64	Drill Drift	---	1 Set.
65	Twist Drill straight shank 1 to 12 mm by 1 mm	---	1 No.
66	Twist Drill taper shank 10-12 mm by 0.5 mm	---	1 set ( Box )
67	Drill Chuck 12 mm cap with key	---	2 Sets.

68	Tap & Die B.A. No. 0 to 10 in a box	---	2 Nos...
69	Tap & Die metric set up to 25 mm	---	2 Sets
70	Tap & Die B.S.F. up to 1 inch	---	2 Sets.
71	Tap & Die B.S.W. up to 1 inch	---	2 Sets.
72	Reamer machine straight flute 6 to 25 mm	---	1 Set.
73	Reamer Adjustable 10 to 20 mm	---	1 set.
74	Tool Holder RH & straight for mm square tool bit	---	1 No.
75	Parting Tool Holder with H.S.S. blade	---	12 Nos.
76	Tool Bits 12 X 150 mm sq. assorted shaped	---	15 Nos.
77	Boring Tool holder for 6 mm sq. tool bit	---	15 Nos.
78	Steel Rule 300 mm with Metric and Inch	---	15 Nos.
79	Oil Can ½ pint ( pressure feed system )	---	06 Nos.
80	Dog Carrier 235, 50 and 75 mm	---	12 Nos
81	Angle Plate with slots 200 mm	---	04 Nos.
82	Spirit Level 0.05 meter 200 m	---	2 Nos.
83	Tool Maker's button	---	1 set
84	Combination Drill A-2.5 and A-1	---	1 set
85	Oil Stone 12 mm sq. x 100 long fine	---	12 nos.
86	Tap Wrench ( adjustable )	---	09 Nos.
87	Die Handle	---	2 Nos.
88	Tool Bit assorted sizes on holder	---	2 Nos.
89	Machine Vice 100 mm jaw ( For Drill Machine )	---	03 Nos.
90	Chalk Board on mobile stand	---	1 No.
91	Spare Grinding Wheel Ajax type for carbide tool	---	1 No.
92	Almirah-1980x 910 x 480 mm	---	2 No.
93	St. Locker with drawer ( Pigeon holes )	---	.1 No.
94	Desk	---	1 No.

95	Stool	1 No.	4 Nos.
96	Angle Gauge for tool grinding	---	6 Nos
97	Hand Chaser M-12 & M-16 ( External )	---	2 Nos.
98	Hand Chaser M-12 & M-16 (Internal )	---	2 Nos.
99	Revolving Centrer ( to suit Lathe tailstock )	---	6 Nos
100	Tool Cemented carbide assorted shaped (External) for steel turning –set of 12 nos.	---	1 No.
101	Thread Plug Gauge M-20 & M-21	---	1 set
102	Thread Ring Gauge M-20 & M-21	---	1 No.
103	Machine Chase M-12TO m-21 (Std. Series) to suit on	---	1 set
104	Coventry Die head	---	2 Nos
105	Gauge Drill Grinding	---	1 No
106	Magnetic Chuck 150 mm dia.( Circular type )	---	1 set.
107	Lathe Mandrels (Diff. Types)	---	1 No.
108	Conventry Type Die Head ( Self opening )	---	1 No
109	Collapsible Tap with attachment	---	2 Nos
110	Combination Drill	---	4 Nos.each.
111	Fire Extinguisher and buckets	---	02 nos.and 2 nos.
112	Bore dial gauge stems – 12 to 35 mm, 35 to 65 mm., dial gauge indicator of 0.01 accuracy.	1 set each	1 set each

Note : 1. No additional item of the above list are required for a batch of 15 trainees working in second shift except Serial No. 1 to 10 and lockers

2.The specification of the items in the above list has been given in metric units. The items, which are available in the market nearest to specification as mentioned above, should procure.

## C : MACHINERIES AND EQUIPMENTS

Sl. No.	Machinery and Equipment	Quantity	Remarks
1	2	3	4
01.	Lathe S.S. & S.C. ( All geared head stock ) with minimum specification as: 150 mm center height, to admit 750 mm between centers. Machine to be motorized and supplied with coolant installation, 4-jaw Independent chuck 150 mm, 3-jaw self-centering chuck 150 mm, fixed steady, traveling steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric or British threads, live and dead centers with taper attachments.	5 nos.	
02.	Lathe S.S & S.C.(all geared type) with minimum specification as: 150 mm. Center height, 1000 mm between centers, gap bed machine to be motorized and supplied with coolant installation, 4-jaw independent chuck 250 mm , 3-jaw self-centering chuck 200 mm fixed steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric/British threads, live and dead centers with taper attachments.	1 no.	
03.	Lathe tool room S.S. & S.C. (all geared type) with minimum specification as:  150 mm center height, 1000 mm between centers. Machine to be motorized and supplied with coolant installation, 4-jaw independent chuck 250 mm, 3-jaw self-centering chuck 150 mm fixed steady, traveling steady, face plate, driving plate, 1-way tool post, draw in type collets set up to 25 mm, 0.5 mm, relieving attachments.	1 nos.	
04.	Grinding machine pedestal type D.E. 150 mm dia. Wheel with wheel guard and vision.	1 no.	
05.	Drill machine pillar type-motorized up to 12 mm. Cap.	1 no.	
06.	Power saw machine – hydraulic feed system – 400 mm.  Blade size.	1 no.	

**D: List of additional machines, tools & equipment for two units (CNC):**

Sl. No.	Description	Quantity
1. @	CNC turn Centre with minimum specification as: Chuck size:135mm Between centre distance: 250mm Travel in X: 100mm Travel in Z: 200mm No. of tool stations: 8 station turret Spindle power: 3.7kW (continuous rating) preferably with popular control system like Fanuc/Siemens along with motorized coolant system.	1 No.
2. @	a) Multimedia teach ware/courseware for CNC technology and interactive CNC part programming software for turning & milling with virtual machine operation and simulation using popular operation control system such as Fanuc, Siemens, etc. (Web-based or licensed based) (10 trainees + 1 faculty)  b) Desktop Computers compatible to run above simulation software with LAN facility	a) 11 users  b) 11 nos.
3.	Tool holders to suit the CNC machine for turning, threading, grooving (external & internal), parting off operation, boring, under-cutting with 20 inserts of each operation.	2 each
4.	LCD projector / large screen TV	1 no.
5.	Digimatic Electronic Vernier Caliper inch and mm  8"/200 mm. LCM 0.005"/0.001 mm	2 nos.
6.	Digimatic electronic outside Micrometer  (0 to 25 mm & 25 to 50 mm) LC 0.001 mm.	1 no. each

**NOTE: -**

1. No additional items are required to be provided to the batch working in the second and third shift except the items under trainee's Tool kit.
2. Items marked @ are not required to be provided for any additional batches.
3. Institute having computer lab may use the existing infrastructure to impart simulation training & in that case not required to procure item no. 2b.

**GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS**

1. All the questions of the theory paper for the trade will be in objective type format.
2. Due care to be taken for proper & inclusive delivery among the batch. Some of the following method of delivery may be adopted:
  - A) LECTURE
  - B) LESSON
  - C) DEMONSTRATION
  - D) PRACTICE
  - E) GROUP DISCUSSION
  - F) DISCUSSION WITH PEER GROUP
  - G) PROJECT WORK
  - H) INDUSTRIAL VISIT
3. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. May be adopted.
4. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.
5. Questions may be set based on following instructions:-

Sl. No.	Question on different aspect	Weightage in %age	Key Words may be like
1	Information received	25	What, Who, When
2	Knowledge	50	Define, Identify, Recall, State, Write, List & Name
3	Understanding	15	Describe, Distinguish, Explain, Interpret & Summarize
4	Application	10	Apply, Compare, Demonstrate, Examine, Solve & Use

6. Due weightage to be given to all the topics under the syllabus while setting the question paper.