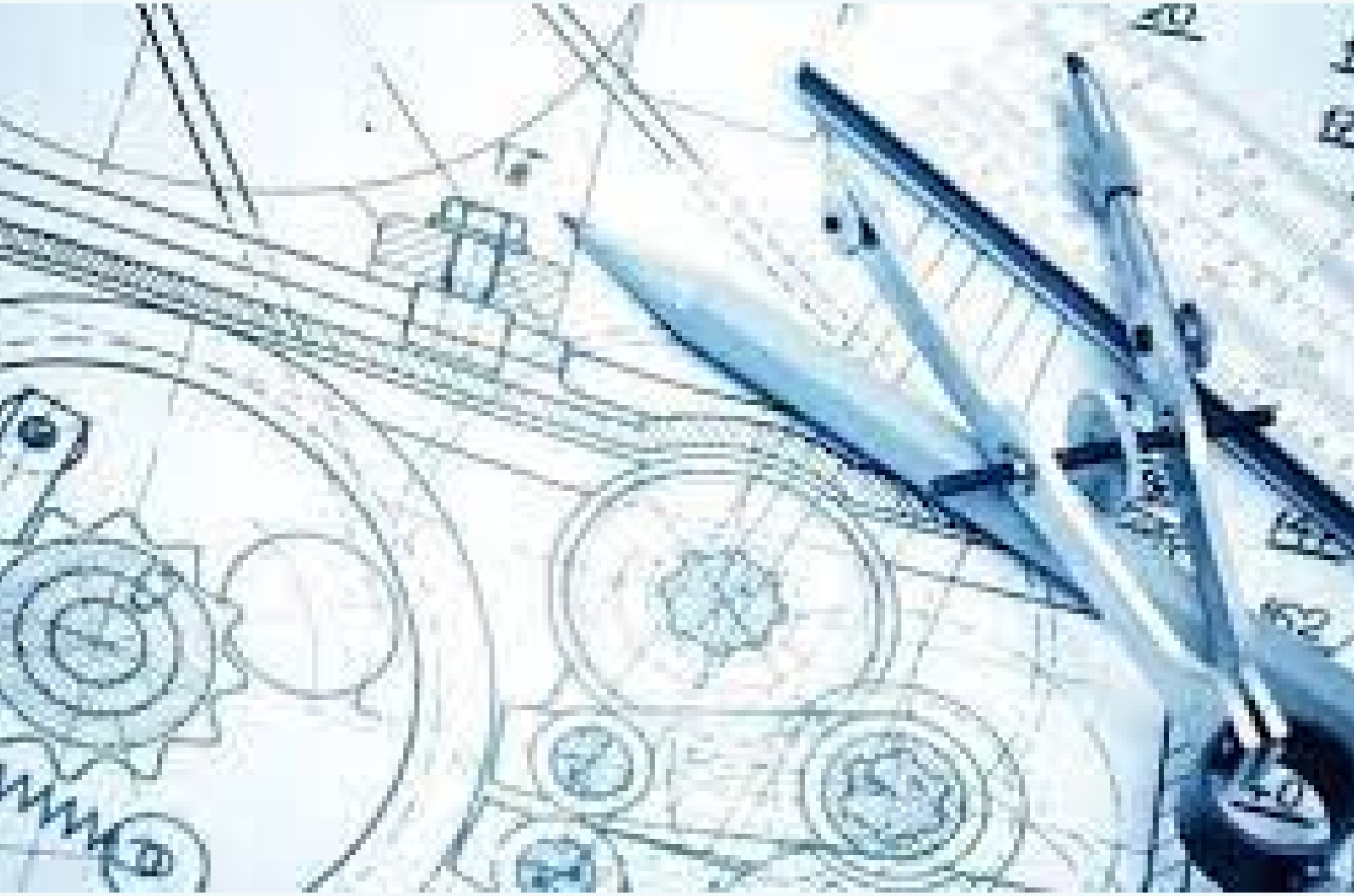
LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: DRAUGHTSMAN (MECHANICAL)

QUALIFICATION PACK: CSC/Q0402



PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

Shyamla Hills, Bhopal- 462 002, M.P., India

http://www.psscive.ac.in

Gandhiji's Talisman

I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test:

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him. Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to Swaraj for the hungry and spiritually starving millions?

Then you will find your doubts and your self melting away.

LEARNING OUTCOME BASED VOCATIONAL CURRICULUM

JOB ROLE: DRAUGHTSMAN MECHANICAL

(QUALIFICATION PACK: Ref. Id. CSC/Q0402)

SECTOR: CAPITAL GOODS

Grades 11 and 12

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION
(a constituent unit of NCERT, under Ministry of Education, Government of India)
Shyamla Hills, Bhopal- 462 002, M.P., India

LEARNING OUTCOME-BASED VOCATIONAL CURRICULUM

Draughtsman Mechanical

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FOREWORD

The Pandit Sunderlal Sharma Central Institute of Vocational Education (PSSCIVE), a constituent of the National Council of Educational Research and Training (NCERT), is spearheading the efforts of developing learning outcome-based curricula and courseware aimed at integrating both vocational and general education to open pathways of career progression for students. The curriculum has been developed for the vocational education programme introduced under the Centrally Sponsored Scheme of *Samagra Shiksha* of the Ministry of Education (erstwhile, Ministry of Human Resource Development) and is aligned to the National Skill Qualification Framework (NSQF). The curricula for vocational courses are being developed under the project approved by the Project Approval Board (PAB) of *'Samagra Shiksha'*, which is an overarching programme for the school education sector extending from pre-school to Grade 12.

It is a matter of great pleasure to introduce this learning outcome-based curriculum as part of the vocational education and training package for the job role/vocational subject of "Draughtsman Mechanical". The curriculum has been developed for the secondary students of Grades 11 and 12 and is aligned to the National Occupation Standards (NOSs) for the job role. The curriculum aims to provide children with employability and vocational skills to support occupational mobility and lifelong learning. It will help them to acquire specific occupational skills that meet employers' immediate skill needs. The teaching-learning is to be done through interactive sessions in classrooms, practical activities in laboratories or workshops, projects, field visits, etc. and professional experience is to be provided through on-the-job training.

The curriculum has been developed and reviewed by a group of experts and their contributions are duly acknowledged. The utility of the curriculum will be adjudged by the qualitative improvement that it brings about in teaching-learning. The feedback and suggestions on the content by the teachers and other stakeholders will be of immense value to us in bringing about further improvement in this document.

DINESH PRASAD SAKLANI
Director
National Council of Education Research and Training

PREFACE

India today stands poised at a very exciting juncture in its saga. The potential for achieving inclusive growth is immense and the possibilities are equally exciting. The world is looking at us to deliver sustainable growth and progress. To meet the growing expectations, India will largely depend upon its young workforce. In order to fulfil the growing aspirations of our youth and the demand for a skilled human resource, the Ministry of Education, Government of India, introduced the revised Centrally Sponsored Scheme of Vocationalisation of School Education under Samagra Shiksha. For spearheading the scheme, the PSS Central Institute of Vocational Education (PSSCIVE), was entrusted with the responsibility to develop learning outcome-based curricula, student textbooks and e-learning materials for the job roles in various sectors.

The PSSCIVE firmly believes that the vocationalisation of education in the nation needs to be established on a strong footing of philosophical, cultural and sociological traditions and it should aptly address the needs and aspirations of the students besides meeting the skill demands of the industry. In order to honour its commitment to the nation, the PSSCIVE is developing learning outcome-based curricula with the involvement of faculty members and leading experts in the field. It is being done through the concerted efforts of leading academicians, professionals, policymakers, partner institutions, Vocational Education and Training (VET) experts, industry representatives, and teachers.

The expert group, through a series of consultations, working group meetings and use of reference materials develops a National curriculum. We extend our gratitude to all the contributors for selflessly sharing their precious knowledge, acclaimed expertise, and valuable time and positively responding to our request for development of curriculum.

The success of this curriculum depends upon its effective implementation, and it is expected that the managers of vocational education programme, vocational educators, vocational teachers/trainers, and other stakeholders will make earnest efforts to provide better facilities, develop linkages with the industry and foster a conducive learning environment for effectively transacting the curriculum and to achieve the learning outcomes as per the content of the curriculum document.

DEEPAK PALIWAL
Joint Director
PSS Central Institute of Vocational Education

ACKNOLEDGEMENTS

On behalf of the team at the PSS Central Institute of Vocational Education (PSSCIVE), we are grateful to the members of the Project Approval Board (PAB) of *Samagra Shiksha* and the officials of the Ministry of Education (MoE), Government of India for the financial support to the project for development of learning outcome-based curricula.

We are grateful to the Director, National Council of Educational Research and Training (NCERT) for his support and guidance. We also acknowledge the contributions of our colleagues at the NCERT, National Council for Vocational Education and Training (NCVET), National Skill Development Corporation (NSDC) and Capital Goods Skill Council for their academic support and cooperation.

We are grateful to Dr. Saurabh Prakash, Head, Department of Engineering and Technology, PSS Central Institute of Vocational Education, Bhopal, for his consistent support. We are also thankful to Dr. Vinod Kumar Yadav, Associate Professor and Course Coordinator, for his untiring efforts and contribution to the development of this learning outcome-based curriculum.

The contributions of the experts and the editorial support provided by Mr. Prateesh Saxena, Assistant Professor in Mechanical Engineering (Contractual) and Mr. Neeraj Bhandari, Assistant Professor in Civil Engineering (Contractual) at PSSCIVE, are appreciated and acknowledged.

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1. COURSE OVERVIEW

COURSE TITLE: DRAUGHTSMAN MECHANICAL

A Mechanical Draughtsman is responsible for creating detailed technical drawings and plans for machinery, mechanical components, and systems. They collaborate closely with engineers to transform conceptual designs into precise blueprints using computer-aided design (CAD) software such as AutoCAD or SolidWorks. Their duties include producing assembly and part drawings, ensuring compliance with industry standards, revising existing designs, and maintaining organized records of all drawings and related documentation. A strong understanding of Mechanical Engineering principles, attention to detail, and proficiency in CAD software are essential for success in this role.

COURSE OBJECTIVES:

On completion of the course, students should be able to:

- Understand the fundamentals and significance of Engineering Drawing.
- Apply various projection methods to represent objects accurately.
- Create precise drawings of various machine components.
- Utilise CAD software to develop accurate 2D drawings.
- Utilise essential CAD commands for effective drafting.
- Develop detailed 2D and assembly drawings using CAD tools.
- Interpret production drawings for accurate manufacturing.
- Implement essential health and safety protocols in Engineering environments.
- Enhance communication skills to address client needs effectively.

COURSE REQUIREMENTS: The learner should be holding a 10th Grade pass certificate.

COURSE DURATION: 600 hrs

Grade 11	: 300 hrs
Grade 12	: 300 hrs
TOTAL	**: 600 hrs**

2. SCHEME OF UNITS AND ASSESMENT

The unit-wise distribution of hours and marks for Grade 11 is as follows:

GRADE 11			
	Units	**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1: Communication Skills-III	25	**10**
	Unit 2: Self-management Skills-III	25	
	Unit 3: Information and Communication Technology Skills-III	20	
	Unit 4: Entrepreneurial Skills-III	25	
	Unit 5: Green Skills-III	15	
	Total	**110**	**10**
Part B	**Vocational Skills**		
	Unit 1: Introduction to Solar PV Installer - Civil	25	**40**
	Unit 2: Basics of Solar Photovoltaic System	55	
	Unit 3: Tools and Tackles used in solar PV Installation	25	
	Unit 4: Fundamentals of Civil Engineering for Solar PV Installer	60	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	**15**	**15**
	Grand Total	**300**	**100**

The unit-wise distribution of hours and marks for Grade12 is as follows:

GRADE 12			
	Units	**No. of Hours for Theory and Practical 300**	**Max. Marks for Theory and Practical 100**
Part A	**Employability Skills**		
	Unit 1: Communication Skills-IV	20	10
	Unit 2: Self-management Skills-IV	10	
	Unit 3: Information and Communication Technology Skills-IV	20	
	Unit 4: Entrepreneurial Skills-IV	15	
	Unit 5: Green Skills-IV	10	
	Total	**75**	**10**
Part B	**Vocational Skills**		
	Unit 1: Site Survey for Solar PV Installation	40	40
	Unit 2: Civil works required for Solar PV Installation	95	
	Unit 3: Health and Safety	25	
	Total	**165**	**40**
Part C	**Practical Work**		
	Practical Examination	06	15
	Written Test	01	10
	Viva Voce	03	10
	Total	**10**	**35**
Part D	**Project Work/Field Visit**		
	Practical File/Student Portfolio	10	10
	Viva Voce	05	05
	Total	**15**	**15**
	Grand Total	**300**	**100**

3. TEACHING/TRAINING ACTIVITIES

The teaching and training activities have to be conducted in classroom, laboratory/ workshops and field visits. Students should be taken to field visits for interaction with experts and to expose them to the various tools, equipment, materials, procedures and operations in the workplace. Special emphasis should be laid on the occupational safety, health and hygiene during the training and field visits.

CLASSROOM ACTIVITIES

Classroom activities are an integral part of this course and interactive lecture sessions, followed by discussions should be conducted by trained vocational teachers. Vocational teachers should make effective use of a variety of instructional aides, such as audio-video materials, colour slides,

charts, diagrams, models, exhibits, hand-outs, online teaching materials, etc. to transmit knowledge and impart training to the students.

PRACTICAL WORK IN LABORATORY/WORKSHOP

Practical work may include but not limited to hands-on-training, simulated training, role play, case-based studies, exercises, etc. Equipment and supplies should be provided to enhance hands-on learning experience of students. Only trained personnel should teach specialized techniques. A training plan that reflects tools, equipment, materials, skills and activities to be performed by the students should be submitted by the vocational teacher to the Head of the Institution.

FIELD VISITS/ EDUCATIONAL TOUR

In field visits, children will go outside the classroom to obtain specific information from experts or to make observations of the activities. A checklist of observations to be made by the students during the field visits should be developed by the Vocational Teachers for systematic collection of information by the students on the various aspects. Principals and Teachers should identify the different opportunities for field visits within a short distance from the school and make necessary arrangements for the visits.

4. ASSESSMENT AND CERTIFICATION

The National Skills Qualifications Framework (NSQF) is based on outcomes referenced to the National Occupation Standards (NOSs), rather than inputs. The NSQF level descriptors, which are the learning outcomes for each level, include the process, professional knowledge, professional skills, core skills and responsibility. The assessment is to be undertaken to verify that individuals have the knowledge and skills needed to perform a particular job and that the learning programme undertaken has delivered education at a given standard. It should be closely linked to certification so that the individual and the employer could come to know the competencies acquired through the vocational subject or course. The assessment should be reliable, valid, flexible, convenient, and cost effective and above all it should be fair and transparent. Standardized assessment tools should be used for assessment of knowledge of students. Necessary arrangements should be made for using technology in assessment of students.

KNOWLEDGE ASSESSMENT (THEORY)

Knowledge Assessment should include two components: one comprising of internal assessment and second an external examination, including theory examination to be conducted by the Board. The assessment tools shall contain components for testing the knowledge and application of knowledge. The knowledge test can be objective paper-based test or short structured questions based on the content of the curriculum.

WRITTEN TEST

It allows candidates to demonstrate that they have the knowledge and understanding of a given topic. Theory question paper for the vocational subject should be prepared by the subject experts comprising group of experts of academicians, experts from existing vocational subject experts/teachers, and subject experts from university/colleges or industry. The respective Sector

Skill Council should be consulted by the Central/State Board for preparing the panel of experts for question paper setting and conducting the examinations. The blue print for the question paper may be as follows:

Duration: 3 hrs **Max. Mark: 40 marks**

S.No.	Typology of Question	No. of Questions			
		Very Short Answer (1 mark)	Short Answer (2 Marks)	Long Answer (3 Marks)	Marks
1.	Remembering – (Knowledge-based simple recall questions, to know specific facts, terms, concepts, principles, or theories; identify, define or recite, information)	**3**	**2**	**2**	**13**
2.	Understanding – (Comprehension – to be familiar with the meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	**2**	**3**	**2**	**14**
3.	Application – (Use abstract information in a concrete situation, to apply knowledge to new situations: Use given content to interpret a situation, private an example, or solve a problem)	**0**	**2**	**1**	**07**
4.	High Order Thinking Skills – (Analysis and Synthesis – Classify, compare, contrast, or differentiate between different pieces of information; Organize and/ or integrate unique pieces of information from a variety of sources)	**0**	**2**	**0**	**04**
5.	Evaluation – (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	**0**	**1**	**0**	**02**
	Total	**5x1=5**	**10x2=20**	**5x3=15**	**40**

SKILL ASSESSMENT (PRACTICAL)

Assessment of skills should be done by the assessors/examiners on the basis of practical demonstration of skills by students, using a competency checklist. The competency checklist should be developed as per the National Occupation Standards (NOSs) given in the Qualification Pack for the Job Role to bring about necessary consistency in the quality of assessment across different sectors and Institutions. The student has to demonstrate competency against the performance criteria defined in the National Occupation Standards and the assessment will indicate that they are 'competent', or are 'not yet competent'. The assessors assessing the skills of the students should possess a current experience in the industry and should have undergone effective training in assessment principles and practices. The Sector Skill Councils should ensure that the assessors are provided with training on the assessment of competencies.

Practical Examination: Practical examination allows candidates to demonstrate the knowledge and understanding of performing a task. This will include the performance of tasks and viva voce. Teachers/Examiner will clearly define the tasks that candidates are required to perform during the practical examination. These tasks should align with the learning objectives of the course. Students are to be evaluated based on their skills, technique, accuracy, and overall performance.
For the practical exam, there should be a team of two evaluators – the subject teacher and the expert from the relevant industry certified by the Board or concerned Sector Skill Council. The same team of examiners will conduct the viva voce. They will assess the candidates' skills, adherence to industry standards, and efficiency in task execution. Special emphasis should be on assessment of the candidate's ability to troubleshoot and solve problems related to the tasks. During the viva voce, focus should be on assessment of candidate's communication skills and understanding of the subject.

Project Work: Project work is a great way to assess the practical skills on a certain period or timeline. Projects should simulate real-world scenarios, allowing students to solve problems or create something tangible using the skills and knowledge they've acquired. Projects should align with the curriculum's learning objectives, ensuring that students are applying relevant concepts and skills. Clear and detailed guidelines, including project objectives, evaluation criteria, and deadlines should be provided by the teachers/assessors. Rubrics, which would include aspects like content, creativity, organization, presentation, and adherence to deadlines, should be used by the Assessors to establish specific criteria for marking or grading.

Field visits can be followed by the submission of reports by the students, based on checklist. Teachers will develop a detailed checklist of items or questions students need to address during the visit. This could include specific observations, data collection, interviews, etc. Teachers will assess the reports based on the completeness of checklist items, depth of observations, analysis, and overall presentation. After the visit, teachers will also encourage students to reflect on their field experience, for example what students learned, how will they apply the knowledge gained through the field visit, etc.

Student Portfolio is a compilation of documents that supports the students' claim of competence. Documents may include reports, articles, and photos of products prepared by students in relation to the unit of competency. Copies of certificates and awards received for academic achievements, extracurricular activities, or competitions may also be included in the portfolio. Student's portfolio may also include personal reflections of the students on their learning journey, challenges faced, and lessons learned.

Viva-voce allows candidates to demonstrate communication skills and content knowledge. Audio or video recording can be done at the time of viva voce. The number of external examiners would be decided as per the existing norms of the Board and these norms should be suitably adopted/adapted as per the specific requirements of the vocational subject. Viva voce should also be conducted to obtain feedback on the student's experiences and learning during the project work/field visits.

5. UNIT CONTENTS

GRADE 11

Part A: Employability Skills

S.No.	Units	Duration (hrs)
1.	Communication Skills-III	25
2.	Self-management Skills-III	25
3.	Information and Communication Technology Skills-III	20
4.	Entrepreneurial Skills-III	25
5.	Green Skills-III	15
	Total	**110**

UNIT 1: COMMUNICATION SKILLS – III			
Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Demonstrate the knowledge of communication.	1. Introduction to the communication process. 2. Importance of communication. 3. Elements of communication. 4. Perspectives in communication. 5. Effective communication.	1. Role-play on the communication process. 2. Group discussion on the importance of communication and factors affecting perspectives in communication. 3. Charts preparation on elements of communication. 4. Classroom discussion on the 7Cs (i.e. Clear, Concise, Concrete, Correct, Coherent, Courteous and Complete) for effective communication.	03
2. Demonstrate verbal communication.	1. Verbal Communication. 2. Public Speaking.	1. Role-play of a phone conversation. 2. Group activity on delivering a speech and practicing public speaking.	02

3. Demonstrate non-verbal communication.	1. Importance of non-verbal communication. 2. Types of non-verbal communication. 3. Visual Communication.	1. Role-play on non-verbal communication. 2. Group exercise and discussion on Do's and Don'ts to avoid body language mistakes. 3. Group activity on methods of communication.	02
4. Demonstrate speech using correct pronunciation.	1. Pronunciation basics. 2. Speaking properly. 3. Phonetics. 4. Types of sounds.	1. Group activities on practicing pronunciation.	01
5. Apply an assertive communication style.	1. Important communication styles. 2. Assertive communication. 3. Advantages of assertive communication. 4. Practicing assertive Communication.	1. Group discussion on communication styles. 2. Group discussion on observing and sharing communication styles.	03
6. Demonstrate the knowledge of saying no.	1. Steps for saying 'No' Connecting words.	1. Group discussion on how to say 'No'?	02
7. Identify and use parts of speech in writing.	1. Capitalization. 2. Punctuation. 3. Basic parts of speech Supporting parts ofspeech.	1. Group activity on identifying parts of speech. 2. Writing a paragraph with punctuation marks. 3. Group activity on constructing sentences. 4. Group activity on identifying parts of speech.	03
8. Write correct sentences and paragraphs.	1. Parts of a sentence. 2. Types of object. 3. Types of sentences Paragraph.	1. Activity on framing sentences. 2. Activity on active and passive voice. 3. Assignment on writing different types of sentences.	02

9. Communicate with people.	1. Greetings Introducing self and others.	1. Role-play on formal and informal greetings. 2. Role-play on introducing someone. 3. Practice and group discussion on how to greet different people.	02
10. Introduce yourself to others and write about oneself.	1. Talking about self Filling a form.	1. Practicing self-introduction and filling up forms. 2. Practicing self-introduction to others.	01
11. Develop questioning skill.	1. Main types of questions. 2. Forming closed and open-ended questions.	1. Practice exercise on forming questions. 2. Group activity on framing questions.	01
12. Communicate information about family to others.	1. Names of relatives Relations.	1. Practice talking aboutfamily. 2. Role-play on talking about family members.	01
13. Describe habitsand routines.	1.Concept of habitsand routines.	1. Group discussion on habits and routines. 2. Group activity on describing routines.	01
14. Ask or give directions to others.	Asking for directions Using landmarks.	1. Role-play on asking and giving directions. 2. Identifying symbols used for giving directions.	01
		Total	**25**

UNIT 2: SELF-MANAGEMENT–III			
Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**

1. Identify and analyse own strengths and weaknesses.	1. Understanding self. 2. Techniques for identifying strengths and weaknesses. 3. Difference between interests and Abilities.	1. Activity on writing aimsin life. 2. Preparing a worksheeton interests and abilities.	03
2. Demonstrate personal grooming skills.	1. Guidelines for dressing and grooming. 2. Preparing a personal grooming checklist.	1. Role-play on dressingand grooming standards. 2. Self-reflection activity on various aspects ofpersonal grooming.	04
3. Maintaining personal hygiene.	1. Importance of personal hygiene. 2. Three steps to personal hygiene. 3. Essential steps of hand washing.	1. Role-play on personalhygiene. 2. Assignment on personalhygiene.	03
4. Demonstrate the knowledge of working in a team and participating in group activities.	1. Describe the benefits of teamwork. 2. Working in a team.	1. Assignment on working in a team. 2. Self-reflection on team work.	03
5. Develop networking skills.	1. Benefits of networking skills. 2. Steps to build networking skills.	1. Group activity on networking in action. 2. Assignment on networking skills.	03
6. Describe the meaning and importance of self-motivation.	1. Meaning of self-motivation. 2. Types of motivation Steps to building self-motivation.	1. Activity on staying motivated. Assignment on reasons hindering motivation.	03
7. Set goals.	1. Meaning of goals and purpose of goal-setting Setting SMART goals.	1. Assignment on setting SMART goals. 2. Activity on developinglong-term and short- term goals using SMART method.	03

8. Apply time management strategies and techniques.	1. Meaning and importance of time management Steps for effective time management.	1. Preparing a checklist ofdaily activities.	03
		Total	**25**

UNIT 3: INFORMATION AND COMMUNICATION TECHNOLOGY-III			
Learning Outcome	**Theory (08 hrs)**	**Practical (12 hrs)**	**Duration (20 hrs)**
1. Create a document on the word processor.	1. Introduction to ICT. 2. Advantages of using a word processor. 3. Work with Libre Office Writer.	1. Demonstration and practice of the following: • Creating a new document • Typing text • Saving the text • Opening and saving afile on Microsoft Word/Libre Office Writer.	02
2.Identify icons on the toolbar.	1. Status bar. 2. Menu bar. 3. Icons on the Menu bar. 4. Multiple ways to perform a function.	1. Group activity on usingbasic user interface of LibreOffice writer. 2. Group activity on working with Microsoft Word.	02
3. Save, close, open and print document.	1. Save a word document. 2. Close a word document. 3. Open an existing document. 4. Print.	1. Group activity on performing the functionsfor saving, closing and printing documents in LibreOffice Writer. 2. Group activity on performing the functions. 3. for saving, closing and printing documents in	02

		Microsoft Word.	
4.Format text in a word document.	1. Change style and size of text. 2. Align text. 3. Cut, Copy, and Paste, Find and replace.	1. Group activity on formatting text in LibreOffice Writer. 2. Group activity on formatting text in Microsoft Word.	02
5. Check spelling and grammar in a word document.	1. Use of spell checker Autocorrect.	1. Group activity on checking spellings andgrammar using LibreOffice Writer. 2. Group activity on checking spellings andgrammar using Microsoft Word.	02
6. Insert lists, tables, pictures, and shapes in a word document.	1. Insert bullet list. 2. Number list. 3. Tables. 4. Pictures Shapes.	1. Practical exercise of inserting lists and tables using LibreOffice Writer.	03
7. Insert header, footerand page number in a word document.	1. Insert header. 2. Insert footer. 3. Insert pagenumber Page count.	1. Practical exercise of inserting header, footerand page numbers in LibreOffice Writer. 2. Practical exercise of inserting header, footerand page numbers in Microsoft Word.	03
8. Make changes by using the track change option in aword document.	1. Tracking option. 2. Manage option Compare documents.	1. Group activity on performing track changes in LibreOfficeWriter. 2. Group activity on performing track changes in Microsoft Word.	04
		Total	**25**

4: ENTREPRENEURSHIP SKILLS – III			
Learning Outcome	**Theory (10 hrs)**	**Practical(15 hrs)**	**Duration (25 hrs)**
1. Differentiate between differentkinds of businesses.	1. Introduction to entrepreneurship. 2. Types of business Activities.	1. Role-play on differentkinds of businesses around us.	03
2. Describe the significance of entrepreneurialvalues.	1. Meaning ofvalue. 2. Values of anEntrepreneur. 3. Case study onqualities of an entrepreneur.	1. Role-play on qualitiesof an entrepreneur.	03
3. Demonstrate the attitudinal changes required to becomean entrepreneur.	1. Difference between the attitude of entrepreneur and employee.	1. Interviewing employees and entrepreneurs.	03
4. Develop thinkingskills like an entrepreneur.	1. Problems of entrepreneurs. 2. Problem-solving Ways to think likean entrepreneur.	1. Group activity on identifying and solvingproblems.	04
5. Generate businessideas.	1. The business cycles. 2. Principles of ideacreation. 3. Generating abusiness idea Case studies.	1. Brainstorming on generating business ideas.	04
6. Describe customerneeds and the importance of conducting a customer survey.	1. Understanding customer needs. 2. Conducting a customer survey.	1. Group activity to conduct a customer survey.	04
7. Create a businessplan	1. Importance of business planning. 2. Preparing a business plan. 3. Principles tofollow for growing a business Case studies.	1. Group activity on developing a businessplan.	04
		Total	**25**

UNIT 5: GREEN SKILLS – III			
Learning Outcome	**Theory (07 hrs)**	**Practical (08 hrs)**	**Duration (15 hrs)**
1. Describe the importance of themain sector of the green economy.	1. Meaning of ecosystem, food chain and sustainable development. 2. Main sectors of the green	1. Group discussion on sectors of green economy. 2. Poster making on	06

	economy- E-waste management, green transportation, renewal energy, green construction, and water management.	various sectors for promoting green economy.	
2. Describe the main recommendationsof policies for the green economy.	1. Policies for a green Economy.	1. Group discussion on initiatives for promoting the green economy. 2. Writing an essay or a short note on the important initiatives for promoting green economy.	03
3. Describe the major green sectors/ areas and the role of various stakeholders in the green economy.	1. Stakeholders in the green economy.	1. Group discussion on the role of stakeholders in the green economy. 2. Making solar bulbs.	03
4. Identify the role of government and private agencies in the green economy.	1. Role of the government in promoting a green economy. 2. Role of private agencies in promoting green economy.	1. Group discussion on the role of Government and Private Agencies in promoting a green economy. 2. Poster-making on green sectors.	03
		Total	**15**

Part B: Vocational Skills

S. No.	Units	Duration(Hrs.)
1.	Unit 1: Introduction to Engineering drawing	32
2.	Unit 2: Theory of projections	53
3.	Unit 3: Drawing of different Machine Parts	32
4.	Unit 4: Introduction to CAD and 2D drawing	28
5.	Unit 5: Health and safety	20
	Total	**165 hrs**

UNIT 1: INTRODUCTION TO ENGINEERING DRAWING			
Learning Outcome	**Theory** ***(20 Hrs.)***	**Practical** ***(40 Hrs.)***	**Duration** ***(60 Hrs)***
1. Understand Engineering drawing and drawing sheet.	1. Introduction to Engineering drawing. 2. Classification of Drawings (Engineering Drawing, Geometrical drawing, Machine drawing etc.). 3. Drawing sheet and its specifications. 4. Numbering the sheet, Fixing the Sheet on the drawing board and Preparation of Drawing. 5. Describe margin, Borderline, Title block and orientation marks. 6. Folding of prints for filing Cabinets or binding as per SP: 46-2003.	1. Fix the Sheet on the drawing Board 2. Numbering the sheet 3. Prepare the sheet by drawing Margins, Borderline, Title Block and orientation marks.	04
2. Demonstrate working on Drawing instrument.	1. Describe different Drawing instruments: Drawing Boards, drawing pencils, Pencil Sharpener, Eraser, erasing shield, Scales, Roller scales, set squares, Small Bow Compass and Small size Divider and Protractor etc. 2. Describe Drafting machine (Mini drafter) and fix the mini drafter on the drawing board and explain its applications. 3. Use of Drawing Pins, Cello Tape, Duster and Sandpaper block etc.	1. Identify different drawing instruments. 2. Make simple drawings in drawing sheet with the help of different drawing instruments using different pencils. 3. Draw straight lines of given length with the help of Scales. 4. Draw parallel lines of given length and distance with the help of Roller scales. 5. Draw parallel and Perpendicular lines with the help of set squares and compass.	12

		6. Draw different angles with help of protractor.	
3. Describe types of lines and the ways of drawing Letters and Numbers.	1. Types of Lines and their applications. 2. Introduction to Lettering. 3. Discuss the composition of letter, Spacing of letters, Size of letters and Guide lines. 4. Introduction to Dimensioning. 5. Discuss Notation Theory, Systems of Placing Dimensions, Units of Dimensions, and Their Rules.	1. Draw different types of lines and write their uses in Engineering drawing. 2. Write Block letters & numerals in single stroke of ratio 7:4 and 5:4 in drawing sheet. 3. Write Block letters & numerals in double stroke of ratio 7:4 and 5:4 in drawing sheet. 4. Prepare the drawing of the objects and place its dimensions in an aligned and unidirectional system 5. Practice different types of dimensioning systems like parallel, chain etc.	10
4. Construct plain scale and diagonal scale. (Mapped with NOS: CSC/NO402)	1. Knowledge of Plain scale and Principle of R.F. 2. Diagonal scale and Scale of chord.	1. Draw Plain Scales Using Representative Fraction (RF). 2. Draw Diagonal Scales Using Representative Fraction (RF) and Scale of Chords.	6
		Total	**32**
UNIT 2: THEORY OF PROJECTION			
1. Construct different Geometrical figures using drawing Instruments while following safety	1. Discuss the importance of safety and general precautions during the use of drawing instruments.	Perform the following assignments using drawing instruments:	8

precautions. (Mapped NOS: CSC/NO402).	2. Care and maintenance of drawing instruments. 2. Definition of ellipse, parabola, hyperbola, eccentricity and general methods of their construction.	1. Draw inscribed and circumscribed circles on polygon. 2. Construct regular polygons (up to 8 sides) on equal base. 3. Divide a line into equal divisions.	
2. Discuss Methods of Orthographic Projection with Proper Dimensioning, Title Block, Appropriate Line Types, and Scale. (Mapped NOS: CSC/NO402)	1.Concept of Quadrants (First, Second, Third, and Fourth quadrant). 2. Type of projection planes (Horizontal, Vertical, and Auxiliary plane). 3. Define Object, Observer, Reference line and projector rotation of plane. 4. Discuss First, Second, Third and Fourth angle projection. 5. Discuss top view, front view and side view.	1. Draw Quadrants 2. Draw projection of point in different quadrant and practice rotation of plane. 3. Draw projection of line in different position in First and Third quadrant. 4. Draw projection of plane in First and Third quadrant.	8
3. Principle of orthographic projection.	1. Principle of orthographic projection. 2. Projection of solids like cylinder, prisms, cones, pyramids and their frustums.	1. Draw orthographic projection of solids- cylinders, prisms, cones and pyramids. 2. Draw orthographic projection of cut section/ frustums of solids- cylinders, prism etc. 3. Draw orthographic projection of cut sections/ frustums of cones, pyramids etc.	10

4. Construct free hand sketches of simple machine parts with correct proportions. (Mapped with NOS: CSC/NO402)	1. Methods of free hand sketching for machine parts. 2. Discuss V threads and Square threads. 3. Hexagonal headed and Square headed bolt, Stud, Washer and nut symbols of machine components.	1. Free hand sketch (in proper proportion) of the Sharp V thread, Square thread etc. 2. Free hand sketch (in proper proportion) of Hexagonal headed and Square headed bolt, Stud, Washer and nut. 3. Free hand Sketching of Conventional signs, symbols and abbreviations for different materials as per SP-46:2003	10
5. Construct plain scale, and diagonal scale. (Mapped with NOS: CSC/NO402)	1. Knowledge of Plain scale Principle of R.F, Diagonal scale, and Scale of chord.	1. Draw plain scales using of representative fraction diagonal scales and using of representative fraction.	6
6. Draw Sectional views of orthographic projections. (Mapped with NOS: CSC/NO402)	1. Knowledge of cutting plane and its representation. 2. Solid Sections: Types of Sectional Views - Discuss Full Section and Half Section and their uses. 3. Hatching for different materials.	1. Draw the sectional view of machine block from front, top, and side. 2. Draw different material hatching symbols.	5
7. Draw orthographic projections from isometric views (and vice-versa). (Mapped NOS: CSC/NO402)	1. Principle of isometric projection, Isometric drawing and Isometric scale. 2. Differentiate between isometric view and isometric projections. 2. Methods of isometric projections and dimensioning.	1. Draw the isometric scales. 2. Draw an isometric view of a circle and polygon. 3. Draw the isometric projection of cylinder, hexagonal prism, Cone and pentagonal pyramid. 4. Draw the orthographic views	6

		from isometric solid geometrical figures with dimensions and vice versa.	
		Total	**53**
UNIT 3: DRAWING OF DIFFERENT MACHINE PARTS			
1. Describe and draw different types of locking devices.	1. Discuss Different types of locking devices. 2. Methods of Locking: Lock Nut, Split Pin, Spring Washer, and Castle Nut.	1. Draw different locking arrangements of nuts, machine screws, caps screws, set screws etc. as per drawing convention. 2. Draw Locking Mechanisms Using Spring Washer and Castle Nut.	12
2. Describe and Draw different types of Screws.	1. Discuss Different types of machine screws, cap screws, set screws as per specifications.	1. Draw Different Types of Machine Screws, Cap Screws, Set Screws, and Snap Head as per Specifications. Marking Straight Lines for Panel Placement Using Marking Thread	1
3. Describe and Draw different types of foundation bolts.	1. Discuss Different types of foundation bolts and their uses.	1. Draw Eye foundation bolt, Square foundation bolt on drawing sheet.	1
4. Describe and Draw different types of welded joints.	1. Description of Welded Joints and their representation (Actual and Symbolic).	1. Draw Welding Symbol on drawing sheet as per SP-46.	1
5. Describe and Draw different type of keys, cotter joints, splined shaft, pins and circlips.	1. Different types of keys. 2. Calculation of sizes and proportions of keys.	1. Draw different types of Keys (Flat saddle hollow saddle and sunk key etc.).	5

6. Describe and Draw different types of rivets.	1. Types of rivets, their size proportions and uses. 2. Types of riveted joints and proportions of riveted joints. 3. Conventional representation. 4. Relation between rivet size and thickness of plates and calculation for arrangement of rivets position.	1. Draw the different types of rivet heads indicating the dimensions related to diameter of the rivet as per convention (Snap head, Conehead, Pan head etc.). 2. Draw riveted joints: lap joint and butt joint with single or double cover plate in chain and zig-zag orientation.	12
		Total	**32**
UNIT 4: INTRODUCTION TO CAD AND 2D DRAWING			
1. Introduction to CAD and 2D drawing.	1. Describe computer aided drafting. 2. Describe 2D drawing and its importance. 3. Basics difference between drafting and design. 4. Introduction to AutoCAD and its interface. 5. Identify Quick Access Toolbar, Title Bar, Command Line, Status Bar, Ribbon/Drawing Area, and User Coordinate System. 6. Describe the advantages and importance of CAD	1. Learn how to open AutoCAD. 2. Learn how to create, open and save file in AutoCAD. 3. Use buttons of the mouse for pan, zoom in and zoom out. 4. Create a drawing Sheet layout in AutoCAD.	7
2. Describe Main Menu, Toolbar, and Ribbon in CAD.	1. Discuss main menu, Application button, Search bar, toolbar and other items of CAD. 2. Type the command at the command prompt. 3. Use functional keys to access certain commands. 4. Use commands from icons in the ribbon, from the menu bar and from the floating toolbar.	1. Create a drawing in CAD software.	7

3. Describe and use the commands of CAD.	1. Introduction to basic drawing tools, and editing tools. 2. Information about UCS Page setup (units and limits). 3. Drawing line commands using Absolute coordinate System. 4. Draw lines commands using relative coordinate system.	1. Practice of Line command using All coordinate system. 2. Practice Drawing Circles using different techniques. 3. Practice arc using different techniques. 4. Practice of polar coordinate and Direct method.	14
		Total	**28**
UNIT 5: HEALTH AND SAFETY			
1. Maintain personal health and safety.	1. Modes of Infection Transmission. 2. Importance of Hygiene in Infection Prevention. 3. Risk Assessment and Workplace Safety Measures. 4. Personal Protective Equipment (PPE) Selection 5. Safe Handling of Machines and Tools. 6. Consequences of Inadequate Training and Improper Handling.	1. Practice the use of hand sanitizer frequently, especially after touching shared surfaces. 2. Practice wearing a face mask in high-risk environments or crowded places. 3. Practice maintaining physical distance and avoid unnecessary contact. 4. Inspect work areas daily to identify potential risks. 5. Report unsafe conditions to the supervisor and take corrective actions. 6. Follow signage and safety protocols.	4

2. Assist in hazard management.	1. Understanding various hazards. 2. Physical hazard that include machinery and poor lighting. 3. Chemical hazards that include fumes, chemicals and biological items that may have bacteria and viruses. 4. Coordinating with Supervisors. 5. Reporting hazards and unsafe practices. 6. Collaborative approach for hazard minimization. 7. Handling Hazardous Materials. 8. Use of PPE (Personal Protective Equipment). 9. Procedures for handling and storing.	Activity 1: Walk through the workplace to identify hazards (physical, chemical, biological, ergonomic, psychosocial). Activity 2: Conduct a risk assessment using a risk matrix. Activity 3: Prioritize hazards and propose control measures. Activity 4: Write a report on identified hazards, risks, and proposed solutions. Activity 5: Role-play safety meeting.	**5**
3. Understanding first aid box, firefighting, and safety equipment.	1. Understanding the First Aid Box and Its Purpose in Workplace Safety. 2. Essential Supplies: Bandages, antiseptic wipes, gauze pads. Adhesive tape, burn cream, scissors, tweezers, Pain relievers, gloves, and specific medications (e.g., epinephrine). 3. Importance of expiry dates. 4. Replenishing Supplies.	Activity 1: Visual Inspection of first aid box and prepare a list of items that are available in the box. Activity 2: Replace Expired Items from the first aid box.	**4**
4. Assist in waste management.	1. Explain the Types of Waste: Hazardous (chemicals, sharps), recyclable, and general waste. 2. Segregation: Learn to separate waste materials for	Activity 1: Waste Segregation. Activity 2: Safe Disposal.	**2**

	proper disposal. 3. Safe Disposal: Understand the safe disposal of hazardous materials, ensuring proper labeling and containers. 4. Environmental Compliance: Follow regulations regarding waste management to avoid environmental hazards.	Activity 3: Regular Cleaning.	
5. Follow the fire safety guidelines.	1. Fire Fighting in Workplace & Precautions. 2. Fire safety principles, fire hazards, and prevention measures. 3. Fire Extinguishers & its Types. 4. Applications of fire extinguishers.	1. Demonstrate the use of fire extinguishers and conduct fire safety drills 2. Identify and use appropriate fire extinguishers for different fire types.	**2**
6. Follow emergency and first aid procedure.	Understanding of the following processes: 1. Assess the Situation: Ensure safety and check the victim's condition. 2. Call for Help: Contact emergency services with detailed information. 3. Provide First Aid: Perform necessary first-aid measures based on the injury (bleeding, burns, fractures, etc.). 4. Stay Calm and Reassure the Victim: Offer comfort and monitor vital signs. 5. Follow Emergency Procedures: Evacuate if necessary and assist others in need. 6. Post-Emergency Actions: Report the incident, ensure follow-up care, and review the response.	Emergency and First-Aid Procedures: Assessment, Response, and Reporting: 1. Follow the emergency and first-aid procedures by assessing the situation for safety, calling for help, providing appropriate first aid, reassuring the victim, following evacuation procedures if necessary, and completing an incident report afterward.	**1**

7. Carry out relevant documentation and review.	1. Maintain work-related notes and records. 2. Communicate clearly and politely with co-workers and clients. 3. Read the relevant literature to get the latest updates about the field of work. 4. Listen attentively to understand the information being shared. 5. Plan and priorities tasks to ensure timely completion. 6. Take quick decisions to deal with workplace emergencies and accidents. 7. Identify possible disruptions to work and take appropriate preventive measures	1. Maintain Work-Related Notes and Records. 2. Communicate Clearly and Politely with Co-Workers and Clients. 3. Read the Relevant Literature to Get the Latest Updates About the Field of Work. 4. Listen Attentively to Understand the Information Being Shared.	**2**
		Total	**20**

GRADE XII

Part A: Employability Skills

S.No.	Units	Duration (hrs)
1.	Communication Skills- IV	25
2.	Self-management Skills - IV	25
3.	Information and Communication Technology Skills - IV	20
4.	Entrepreneurial Skills – IV	25
5.	Green Skills – IV	15
	Total	**110**

UNIT 1: COMMUNICATION SKILLS - IV			
Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Demonstrate	1. Active listening -	1. Group	

active listening skills.	listening skill, stages of active listening. 2. Overcoming barriers to active listening.	discussion on factors. affecting active listening. 2.Poster making on steps for active listening. 3.Role-play on negative effects of not listening actively.	10
2. Identify the parts of speech.	1. Parts of speech – using capitals, punctuation, basic parts of speech, Supporting parts of speech.	1. Group practice on identifying parts of speech. 2. Group practice on constructing sentences.	10
3. Write sentences.	1. Writing skills to practice the following: • Simple sentence • Complex sentence • Types of object. 2. Identify the types of sentences • Active and Passive sentences • Statement/ • Declarative sentence • Question/ • Interrogative sentence - Emotion/ Reaction or Exclamatory	1. Group activity on writing sentences and paragraphs. 2. Group activity on practicing writing sentences in active or passive voice. 3. Group activity on writing different types of sentences (i.e., declarative, exclamatory, interrogative and imperative).	05

	sentence. - Order or Imperative sentence. - Paragraph writing.		
		Total	**25**

UNIT 2: SELF-MANAGEMENT SKILLS – IV			
Learning Outcome	**Theory (10 hrs)**	**Practical (15 hrs)**	**Duration (25 hrs)**
1. Describe the various factors influencing motivation and positive attitude.	1. Motivation and positive attitude. 2. Intrinsic and extrinsic motivation. 3. Positive attitude – ways to maintain positive attitude. 4. Stress and stress management - ways to manage stress.	1. Role-play on avoiding stressful situations. 2. Activity on listing negative situations and ways to turn it positive.	10
2. Describe how to become result oriented.	1. How to become result oriented? 2. Goal setting – examples of result-oriented goals.	1. Group activity on listing aim in life.	05
3. Describe the importance of self-awareness and the basic personality traits, types and disorders.	1. Steps towards self-awareness. 2. Personality and basic personality traits. 3. Common personality disorders- • Suspicious • Emotional and impulsive • Anxious. 4. Steps to overcome personality disorders.	1. Group discussion on self-awareness. 2. Group discussion on common personality disorders. 3. Brainstorming steps to overcome personality disorder.	10
		Total	**25**

UNIT 3: INFORMATION AND COMMUNICATION TECHNOLOGY SKILLS – IV

Learning Outcome	Theory (06 hrs)	Practical (14 hrs)	Duration (20 hrs)
1. Identify the components of a spreadsheet application.	1. Getting started with spreadsheet - types of a spreadsheet, steps to start LibreOffice Calc., components of a worksheet.	1. Group activity on identifying components of spreadsheet in LibreOffice Calc.	02
2. Perform basic operations in a spreadsheet.	1. Opening workbook and entering data – types of data, steps to enter data, editing and deleting data in a cell. 2. Selecting multiple cells. 3. Saving the spreadsheet in various formats. 4. Closing the spreadsheet. 5. Opening the spreadsheet. 6. Printing the spreadsheet.	1. Group activity on working with data on LibreOffice Calc.	03
3. Demonstrate the knowledge of working with data and formatting text.	1. Using a spreadsheet for addition – adding value directly, adding by using cell address, using a mouse to select values in a formula, using sum function, copying and moving formula. 2. Need to format cell and content. 3. Changing text style and font size. 4. Align text in a cell. 5. Highlight text.	1. Group activity on formatting a spreadsheet in LibreOffice Calc 2. Group activity on performing basic calculations in LibreOffice Calc.	02
4. Demonstrate the knowledge of using advanced features in spreadsheet.	1. Sorting data. 2. Filtering data. 3. Protecting spreadsheet with password.	1. Group activity on sorting data in LibreOffice Calc.	03

5. Make use of the software used for making slide presentations.	1. Presentation software available. 2. Stapes to start LibreOffice Impress. 3. Adding text to a presentation.	1. Group practice on working with LibreOffice Impress tools.	02
6. Demonstrate the knowledge to open, close and save slide presentations.	1. Open, Close, Save and Print a slide presentation.	1. Group activity on saving, closing and opening a presentation in LibreOffice Impress.	01
7. Demonstrate the operations related to slides and texts in the presentation.	1. Working with slides and text in a presentation- adding slides to a presentation, deleting slides, adding and formatting text, highlighting text, aligning text, changing text colour.	1. Group activity on working with font styles in LibreOffice Impress.	04
8. Demonstrate the use of advanced features in a presentation.	1. Advanced features used in a presentation. 2. Inserting shapes in the presentation. 3. Inserting clipart and images in a presentation. 4. Changing slide layout.	1. Group activity on changing slide layout on LibreOffice Impress.	03
		Total	**20**

UNIT 4: ENTREPRENEURIAL SKILLS-IV

Learning Outcome	Theory (10 hrs)	Practical (15 hrs)	Duration (25 hrs)
1. Describe the concept of entrepreneurship and the types and roles and functions entrepreneur.	1. Entrepreneurship and entrepreneur. 2. Characteristics of entrepreneurship. 3. Entrepreneurship-art and science. 4. Qualities of a successful entrepreneur. 5. Types of entrepreneurs. 6. Roles and functions of an entrepreneur.	1. Group discussion on the topic "An entrepreneur is not born but created". 2. Conducting a classroom quiz on various aspects of entrepreneurship. 3. Chart preparation on types of entrepreneurs. 4. Brainstorming activity	10

	7. What motivates an entrepreneur. 8. Identifying opportunities and risk-taking. 9. Startups.	on What motivates an entrepreneur.	
2. Identify the barriers to entrepreneurship.	1. Barriers to entrepreneurship. 2. Environmental barriers. 3. No or faulty business plan. 4. Personal barriers.	1. Group discussion about "What we fear about entrepreneurship". 2. Activity on taking an interview of an entrepreneur.	05
3. Identify the attitude that make an entrepreneur successful.	1. Entrepreneurial attitude.	1. Group activity on identifying entrepreneurial attitude.	05
4. Demonstrate the knowledge of entrepreneurial attitude and competencies.	1. Entrepreneurial competencies. 2. Decisiveness. 3. Initiative. 4. Interpersonal skills-positive attitude, stress management. 5. Perseverance. 6. Organizational skills-time management, goal setting, efficiency, managing quality.	1. Playing games, such as "Who am I". 2. Brainstorming a business idea. 3. Group practice on "Best out of Waste". 4. Group discussion on the topic of "Let's grow together". 5. Group activity on listing stress and methods to deal with it like Yoga, deep breathing exercises, etc. 6. Group activity on time management.	05
		Total	**25**

UNIT 5: GREEN SKILLS-IV

Learning Outcome	Theory (05 hrs)	Practical (10 hrs)	Duration (15 hrs)
1. Identify the benefits of the green jobs.	1. Green jobs. 2. Benefits of green jobs. 3. Green jobs in different sectors: • Agriculture • Transportation • Water conservation	1. Group discussion on the importance of green job. 2. Chart preparation on green jobs in different sectors.	08

	• Solar and wind energy • Eco-tourism • Building and construction • Solid waste management • Appropriate technology.		
3. State the importance of green jobs.	1. Importance of green jobs in • Limiting greenhouse gas emissions • Minimizing waste and pollution • Protecting and restoring ecosystems • Adapting to the effects of climate change	1. Preparing posters on green jobs. 2. Group activity on tree plantation. 3. Brainstorming different ways of minimizing waste and pollution.	07
		Total	**15**

Part B: Vocational Skills

S. No.	Units	Duration
1	Unit 1: Introduction to CAD	**33**
2	Unit 2: Learning commands in CAD	**62**
3	Unit 3: Create 2D drawing and Assembly drawing in CAD	**39**
4	Unit 4: Read Production drawing	**11**
5	Unit 5: Customer services	**20**
	Total	**165**

UNIT 1: INTRODUCTION CAD

Learning Outcome	Theory *(30 Hrs.)*	Practical *(30 Hrs.)*	Duration (60 Hrs.)
1. Discuss computer application and Create 2D objects on CAD drawing space using commands from ribbon, menu bar, toolbars and by	1. Introduction to computers, Windows operating system and file management system.	1. Perform the following computer operation: i) create new folder	10

typing in command prompt. (Mapped NOS: CSC/NO402)	2. Describe Computer hardware and software specifications. 3. Knowledge of installation of application software.	ii) add subfolders, iii) create application files iv) change appearance of windows v) search for files, vi) sort files vii) copy files viii) create shortcut folder ix) create shortcut icon in desktop and taskbar. x) move files to and from removable disk/ flash drives.	
2. Discuss the importance of CAD in mechanical engineering field.	1. Introduction to CAD and its importance in mechanical engineering. 2. Advantages of using CAD. 3. Describing CAD main Menu, screen menu, command line, model space, layout space, drawing layouts, toolbars, File creation, Save, Open existing drawings, creation of Drawing Sheet as per ISO. 4. Use commands from icons in the ribbon, from	1. Perform the following applications in CAD: i) Change the Workspace dropdown menu in the CAD screen and follow the ribbon and toolbar settings. ii) Locate origin and the graphical limit of drawing space from coordinate display.	6

	menu bar and from floating toolbar. vi) Drag and drop figures from tool palettes. vii) Type the command at the command prompt.	iii) Use buttons of the mouse for pan, zoom in and zoom out. iv) Use functional keys to access certain commands. v) Use commands from icons in the ribbon, from menu bar and from floating toolbar. vi) Drag and drop figures.	8
3. Describing Coordinate system in CAD.	1 Discuss Absolute Coordinate system, Polar Coordinate System and Relative Coordinate System. 2 Discuss Line, Erase, Undo.	1. Create 2D objects using the Absolute Coordinate system, Polar Coordinate System and Relative Coordinate System. 2. Create geometrical figures using draw tools.	9
		TOTAL	**33**
UNIT 2: LEARNING COMMAND IN CAD			
1. Introduction to basic drawing commands.	1. Understanding Line, ray and polyline command, Circle, Arc, Ellipse. Rectangle, Polygon etc.	1. Creating object using Line and Polyline command and use of Ray command.	11

		2. Practice of Circle command. 3. Practice of arc and Ellipse command. 4.Create figure with the help of polygon command.	
2. Introduction to Drafting setting in CAD.	1. Understanding Ortho mode, Object snap, Object Snap Tracking, Polar Tracking, Dynamic Input Grid. 2. Understanding Selection Cycling and Quick Properties.	1. Practice with Ortho mode in Drawing and Create Object Snap setting On. 2. Create a Drawing with Object Snap Tracking on. 3.Create object with Polar Tracking Dynamic input.	6
3. Introduction to Utilities and properties Commands.	1. Description of CAD Commands: Distance, Radius, Angle, Area, ID Point, Point, Point Style, Color, List, Line Type, Line Type Scale, Line Weight, and Match Properties."	1. Create 2D Drawing and measure distance, radius, angle, area of drawing. 2. Create a drawing and mark ID point in it and use point command and change point style. 3. Create a drawing and change its color and draw different types	14

		of lines in it and change Line type scales and Line Weight. 4. Create a drawing and change its color and put different Line types in it and change Line type scales and Line Weight.	
4. Understand the Annotation, Dimensions and Text.	1 Discuss about Text which include Single Line Text, Text Style, Multiline Text, Text Edit, Mirror Text, Scale Text. 2. Describe Linear dimension, Angular dimension, Arc length, Radius, Diameter, Ordinate, Baseline, Continue, Break, Center Mark.	1. Create a Drawing with Text: Editing Scale, Adding Single-Line Text, and Multiline Text. 2 Create a drawing and measure it Dimension including all.	6
5. Introduction to Layer commands.	1. Activating and Deactivating Layers, Merging Layers, and Deleting Layers in CAD.	1. 3 Create a drawing and add Layers to it.	3
6. Introduction to Block and Attributes commands.	1. Overview of Tool Palettes, Divide Command, Block Command, Insert Block, Create Block, and Block Editor. 2 Define Attribute and Edit Attribute, Attribute Display and Block Attribute Manager.	1 Create a drawing and add tool palettes and use divide command. 2 Create a drawing and convert it into block. 3 Create a drawing and	9

		add Attributes to it.	
7. Describe Modify commands foundation and mounting structures.	1. Describing commands like Trim, Offset, Fillet, Chamfer etc. 2. Discuss modify commands: Move, Copy, Array, Scale, Rotate, Break, Erase and Hatch etc. 3. Create and Insert templates in drawing Layers and Modifying Layers.	1.CAD: Modify 2D objects using Trim, Offset, Fillet, Chamfer Commands. 2. Manage 2D objects using Move, Copy, Array, Insert Block, Make Block, Scale, and Rotate. 3. Use Break, Erase, and Hatch setting commands in drawing. 4. Create templates, Insert drawings. 5. Create objects in different Layers and Modify Layer properties.	13
		Total	**62**
UNIT 3: CREATE 2D DRAWING AND ASSEMBLY DRAWING IN CAD			
1. Draw Line, Polygon, Ellipse, Parabola, Hyperbola, Arc etc. using CAD software. 2. Draw inscribed and circumscribed circle of triangle, pentagon, polygon and hexagon.	1. Describe line, polygon, ellipse, parabola, hyperbola, arc and learn to use them in different drawings. 2. Describe inscribed and circumscribed polygon drawings.	1. Construct different types of lines. 2. Draw different types of polygons, ellipse, parabola,	12

3. Draw top view, front view, side view of circle, sphere, prism, pyramids, frustum of cone.	3. Describe sphere, prism, pyramids, and frustum of cone.	hyperbola, arc etc. 3. Draw inscribed and circumscribed circles of triangle, pentagon, polygon and hexagon. 4. Draw top view, front view, and side views of circle, sphere, prism, pyramids, and frustum of cone. 5. Draw Angle spacer, Base plate, T clip, channel plate, slider block etc.	
4. Understand and Draw different pipe fittings.	1. Knowledge of different pipe materials and specifications of Steel, W.I. & PVC pipes. 2. Brief description of different types of pipe joints. 3. Pipe fittings (threaded, welded and pressed). 4. Specifications of pipe fittings and Different types of valves. 5. Hazard sign board ● Electrical hazard signboards, ● Precaution signboard, ● Safety measures	1. Draw pipe fittings: tee, elbow (90° & 45°), flange, union and valve. 2. Draw conventional symbols of different types of valves and joints used in pipe line diagrams. 3. Draw sectional views of different types of pipe joints using CAD.	14

	Signboard. • Emergency signboard 4. Hazard identification a. Fire hazard (Types and use of fire extinguishers) b. fire exit plan. 5. Work at height hazard - use of safety harness.		
5. Construct drawing of engine parts with detail and assembly in template layout applying quality concepts in CAD. (Mapped NOS: CSC/NO402)	1. Learn Knowledge of engine mechanisms. Transmission of motion from reciprocating to circular through eccentric, crank and connecting rod. 2. Knowledge of fuel injection systems in petrol and diesel engines.	1. Construct detailed and assembly drawing (using CAD) of: i) Stuffing box ii) Eccentrics iii) Piston assembly of a petrol engine, iv) IC engine connecting rod.	13
		Total	**39**
UNIT 4: READ PRODUCTION DRAWING			
1. Describe Geometric dimensioning and tolerancing (GD&T).	1. Geometric dimensioning and tolerancing. 2. Feature control frame in GD&T and manufacturing 3. Types of Tolerance and their symbol (Straightness, Flatness, Circularity, Cylindricity etc.	1. Draw Geometric dimensions and tolerances in drawings using CAD.	11

	4. Profile (Profile of a line, Profile of a Surface), orientation (Angularity, Perpendicularity, Parallelism) Runout (Total runout and circular runout) Location (Position, Concentricity, and Symmetry). 4. Datum and its representation, Datum modifiers and Feature modifiers Limits, fits etc. 5. Tolerance and its symbols.		
		Total	**11**
UNIT 5: CUSTOMER SERVICE			
1. Work effectively with co-workers.	Explain the ways of the following: 1. Plan daily tasks efficiently using to-do lists or digital tools to ensure timely completion. 2. Adhere to assigned responsibilities and follow supervisor instructions to maintain quality and deadlines. 3. Collaborate with co-workers for smooth workflow and effective teamwork. 4. Prepare clear and structured reports as per the supervisor's instructions. 5. Seek guidance from supervisors for tasks beyond authority and escalate concerns appropriately.	1. Create a daily work schedule using a planner or digital tools like Trello or Google Calendar to prioritize tasks. 2. Review job responsibilities regularly and ensure tasks are completed within the assigned authority limits. 3. Conduct team meetings or use collaboration tools like Microsoft Teams or Slack to coordinate with co-workers. 4. Use templates or structured formats for preparing reports and documents as	5

	6. Mentor and assist subordinates to enhance their skills and productivity. 6. Identify potential disruptions and coordinate with stakeholders to implement preventive measures.	per supervisor instructions. 5. Communicate with supervisors through emails or scheduled meetings for guidance on tasks beyond authority. 6. Organize training sessions or mentoring programs to assist subordinates in developing their skills.	
2. Communicate effectively with co-workers.	1. Adhering to Organizational Policy: Familiarize yourself with the organization's communication policies, including the preferred channels (email, internal portals, messaging apps, etc.). 2. Ensure that only authorized personnel receive confidential or sensitive information. 3. Follow established guidelines for urgency, priority, and frequency of communication. 4. Effective and Polite Communication. 5. Use clear, concise, and professional language in verbal and written communication. 6. Maintain a respectful and courteous tone in all interactions.	1. Use company-approved communication channels (e.g., official email, project management tools). 2. Mark urgent messages appropriately (e.g., using subject line tags like "Urgent" or "Action Required"). 3. Confirm receipt of important messages from recipients. 4. Keep records of all official communication for future reference. 5. Use polite phrases like “Please,” “Thank you,” “Could you kindly” in conversations. 6. Keep emails and messages structured with a clear subject,	5

	7. Avoid jargon, slang, or ambiguous terms that could lead to misinterpretation. 8. Acknowledge messages promptly to confirm receipt and understanding. 9. Active Listening Techniques.	introduction, main point, and closing. 7. When speaking, modulate your tone to sound professional and approachable. 8. Avoid aggressive, rude, or dismissive language. 9. Maintain eye contact and nod to show engagement in face-to-face interactions. 10. Repeat or paraphrase key points.	
3. Practice inclusion at work.	1. Empathizing with Persons with Disabilities (PwD). 2. PwDs face physical, communication, social, and psychological challenges in the workplace. 3. Empathy means treating PwDs with dignity, not sympathy or pity. 4. Workplaces should be accessible and inclusive for PwDs. 5. Clear and respectful communication is essential for effective interaction. 6. Legal and ethical considerations ensure equal rights and opportunities for PwDs.	1. Use accessible communication (Braille, captions, sign language, large print). 2. Help only when needed-respect independence. 3. Ensure workplace accessibility (ramps, elevators, assistive technologies). 4. Include PwDs in team discussions, decision-making, and leadership roles. 5. Conduct disability sensitivity training for employees.	5
4. Practice inclusion at work.	1. Empathizing with Persons with Disabilities (PwD). 2. Challenges Faced by PwDs in the Workplace – Physical, communication,	1. Accessible Communication Methods – Braille, captions, sign	5

	social, and psychological barriers. 3. Importance of Dignity and Respect – Treating PwDs with empathy, not sympathy or pity. 4. Creating an Accessible and Inclusive Workplace 5. Effective and Respectful Communication with PwDs. 6. Legal and Ethical Considerations for Equal Rights and Opportunities. 7. Adopting Gender-Neutral Behavior at Work. 8. Promoting Gender Equality and Preventing Discrimination. 9. Eliminating Unconscious Biases and Stereotypes. 10. Ensuring Equal Opportunities for All Genders. 11. Using Inclusive and Respectful Language 12. Implementing Gender-Neutral Policies for Diversity and Fairness.	language, large print. 2. Respecting Independence - help only when needed. 3. Ensuring Workplace Accessibility – Ramps, elevators, assistive technologies. 4. Inclusive Participation – Involving PwDs in discussions, decision-making, and leadership. 5. Disability Sensitivity Training for Employees. 6. Using Gender-Inclusive Language – e.g., "team" instead of "guys," "they" instead of "he/she." 7. Avoiding Gender-Based Task Assignments. 8. Respecting Pronouns and Identities. 9. Ensuring Equal Pay, Promotions, and Growth Opportunities 10. Implementing Gender-Neutral HR Policies – Hiring, benefits, workplace conduct.	
		Total	**20**

6. ORGANISATION OF FIELD VISITS

In a year, at least 3 field visits/educational tours should be organized for the students to expose them to the activities in the workplace. Visit a Solar PV Station site and observe the following:

1. Location: Describe the location and accessibility of the site.
2. Site: Note the layout and size of the area designated for the Solar PV installation.
3. Construction Site: Observe and describe ongoing construction activities.
4. Foundation and Footing: Observe the type of foundation (e.g., concrete or pile) and its depth for stability.
5. Mounting Structures: Identify the type of structure supporting the panels.
6. Solar Panels: Note the type of panels (monocrystalline, polycrystalline, or thin-film) and their efficiency.
7. Panel Arrangement: Check the orientation (landscape/portrait) and spacing between rows to minimize shading.
8. Electrical Infrastructure: Look for the types of cables used (AC/DC) and how they are routed (underground/overhead).
9. Inverter System: Identify the type of inverter (string, central, or micro) and its location on-site.
10. Energy Storage: Examine the presence and capacity of battery systems for storing electricity.
11. Grounding System: Verify the grounding system used to prevent electrical hazards.
12. Site Conditions: Observe soil type and site preparation activities like leveling and clearing.

In addition to the technical and detailed observations mentioned earlier, some key additional observations to include are:

1. Type of project (Residential/Commercial)
2. Technology adopted for Solar PV installation
3. Manpower engaged (Number and roles)
4. Total expenditure of the project
5. Expected total annual income from the installation

7. LIST OF EQUIPMENTS AND MATERIALS

The list given below is suggestive and an exhaustive list should be prepared by the vocational teacher. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience in drawing. Following are the basic list of equipment and materials required:

S.No.	Equipment & Materials	Quantity
1.	Drawing paper	10
2.	Masking tape	1
3.	Pencil sharpener	1
4.	Eraser	1
5.	Drawing pencils	5
6.	Triangular scales	1 set
7.	Erasing shield	1
8.	T-square	1
9.	Triangles (30°-60° and 45°)	1
10.	Compass	1
11.	Divider	1
12.	Protractor	1
13.	Templates	1
14.	Portable drafting board	1
15.	Drafting table	1
16.	Drafting stool	1
17.	Drafting machine	1
18.	Blueprint machine	1
19.	French curve	1 set
20.	Ruling pen	1
21.	Drawing ink	1
22.	Watercolor	1
23.	Tracing paper	1
24.	Drafting tape	1
25.	Speedball pens	1
26.	AutoCAD software	As per users

Note: This list provides a general idea of basic quantities required.

8. VOCATIONAL TEACHER'S AND TRAINERS' QUALIFICATION AND GUIDELINES

Qualification and other requirements for appointment of vocational teachers/trainers on contractual basis should be decided by the State/UT. The suggestive qualifications and minimum competencies for the vocational teacher should be as follows:

Qualification	Minimum Competencies	Age Limit
Graduation in Mechanical Engineering from a recognized Institute /University, with at least 1-year work / teaching experience	Effective communication skills (oral and written)	18-37 years (as on Jan. 01 (mention the year))

OR Diploma in Mechanical Engineering with 2-year work / teaching experience **OR** B.Voc in Mechanical Engineering / Draughtsman field with at least 1 year work / teaching experience.	Basic computing skills.	Age relaxation to be provided as per Govt. rules.

These guidelines have been prepared with the aim of helping and guiding the States in engaging qualified Vocational Teachers/Trainers in schools. Various parameters that need to be considered while engaging Vocational Teachers/Trainers include the mode and procedure of selection, educational qualifications, industry experience, and certification/accreditation.
The State may engage Vocational Teachers/Trainers in schools approved under the component of Vocationalisation of Secondary and Higher Secondary Education under Samagra Shiksha in the following ways:
directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education (PSSCIVE), NCERT or the respective Sector Skill Council (SSC)
OR
Through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

* The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteria which the different organizations involved in education and training must meet in order to be accredited by competent bodies to provide government-funded education and training/skills activities. This is applicable to all organizations offering NSQF-compliant qualifications.
The educational qualifications required for being a Vocational Teacher/Trainer for a particular job role are clearly mentioned in the curriculum for the particular NSQF compliant job role. The State should ensure that teachers / trainers deployed in the schools have relevant technical competencies for the NSQF qualification being delivered. The Vocational Teachers/Trainers preferably should be certified by the concerned Sector Skill Council for the particular Qualification Pack/Job role which he will be teaching. Copies of relevant certificates and/or record of experience of the teacher/trainer in the industry should be kept as record.

To ensure the quality of the Vocational Teachers/Trainers, the State should ensure that a standardized procedure for selection of Vocational Teachers/Trainers is followed. The selection procedure should consist of the following:

i. Written test for the technical/domain specific knowledge related to the sector;
ii. Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
iii. Practical test/mock test in classroom/workshop/laboratory.

In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP.

The State should ensure that the Vocational Teachers/ Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools.

In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP.

The State should ensure that the Vocational Teachers/ Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools.
The State should ensure that the existing trainers undergo in-service training of 5 days every year to make them aware of the relevant and new techniques/approaches in their sector and understand the latest trends and policy reforms in vocational education.

The Head Master/Principal of the school where the scheme is being implemented should facilitate and ensure that the Vocational Teachers/Trainers:

i. Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
ii. Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
iii. Make effective use of learning aids and ICT tools during the classroom sessions;
iv. Engage students in learning activities, which include a mix of different methodologies, such as project-based work, team work, practical and simulation-based learning experiences;
v. Work with the institution's management to organize skill demonstrations, site visits, on- job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
vi. Identify the weaknesses of students and assist them in up-gradation of competency;
vii. Cater to different learning styles and level of ability of students;
viii. Assess the learning needs and abilities, when working with students with different abilities
ix. Identify any additional support the student may need and help to make special arrangements for that support;
x. Provide placement assistance

Assessment and evaluation of Vocational Teachers/Trainers is very critical for making them aware of their performance and for suggesting corrective actions. The States/UTs should ensure that the performance of the Vocational Teachers/Trainers is appraised annually. Performance based appraisal in relation to certain pre-established criteria and objectives should be done periodically to ensure the quality of the Vocational Teachers/Trainers. Following parameters may be considered during the appraisal process:

1. Participation in guidance and counseling activities conducted at Institutional, District and State level;
2. Adoption of innovative teaching and training methods;

3. Improvement in result of vocational students of Class X or Class XII;
4. Continuous up-gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
5. Membership of professional society at District, State, Regional, National and International level;
6. Development of teaching-learning materials in the subject area;
7. Efforts made in developing linkages with the Industry/Establishments;
8. Efforts made towards involving the local community in Vocational Education
9. Publication of papers in National and International Journals;
10. Organization of activities for promotion of vocational subjects;
11. Involvement in placement of students/student support services.

9. LIST OF CONTRIBUTORS

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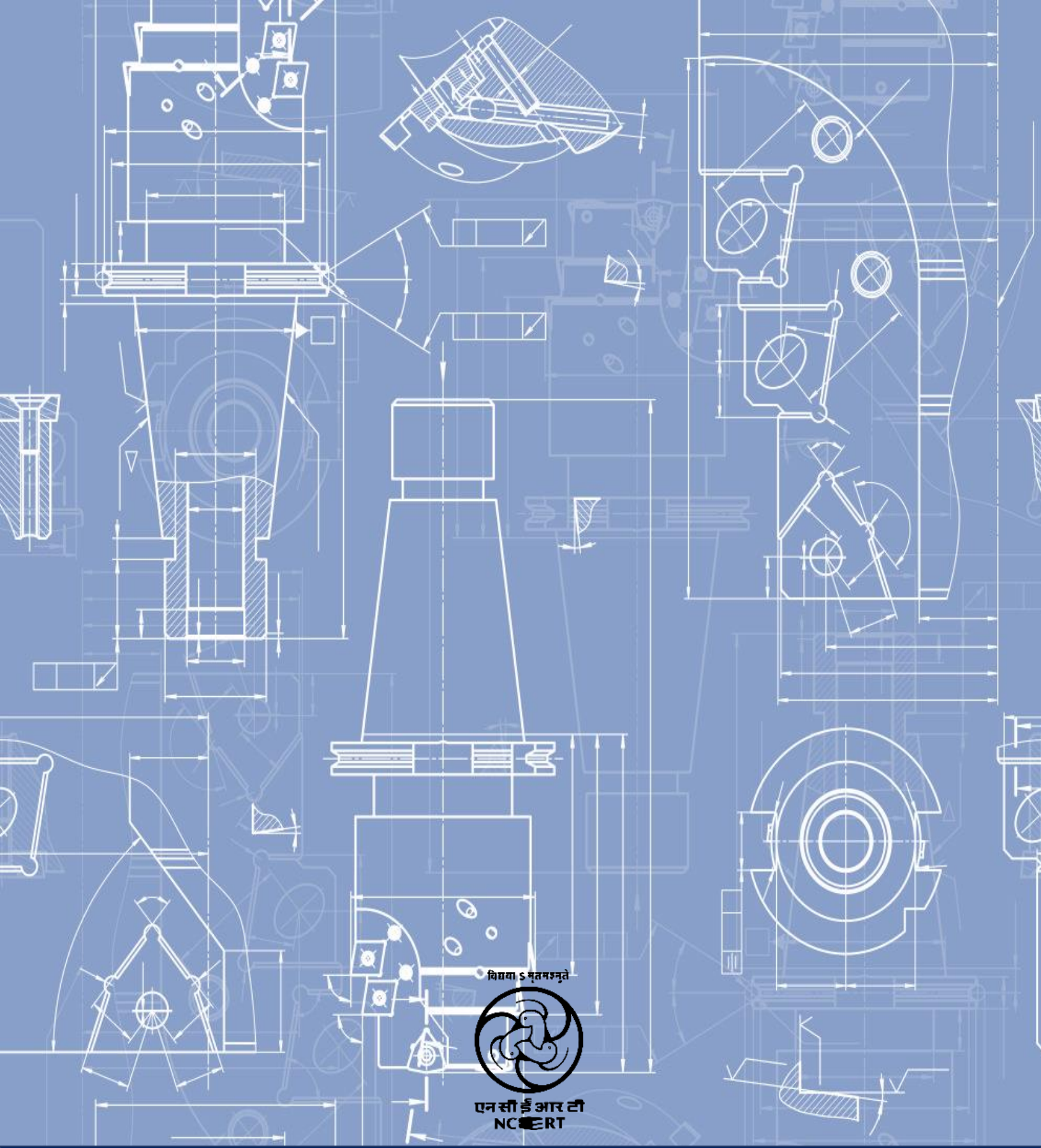

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