

Revised Syllabus

For

ITI “FITTER”

(Craftsmen Training Scheme (CTS))



**LAL BAHADUR SHASTRI PARAMEDICAL SKILL
AND TRAINING COUNCIL, INDIA**

**लाल बहादुर शास्त्री पैरामेडिकल कौशल और प्रशिक्षण
परिषद, भारत**

मुख्य कार्यालय : 4वीं मंजिल, प्राइम प्लाजा, इंदरा नगर, लखनऊ

प्रशासनिक कार्यालय : द्वितीय तल, सुनील कम्पलेक्स, वेस्टर्न कचेरी रोड, मेरठ

वेबसाइट – www.lbspstc.in संपर्क सूत्र –121-4349311

Exam Type: Semester Wise
(To be implemented from 2026-27 session)



Syllabus Of ITI Fitter

FIRST YEAR (1ST)

Syllabus Of ITI Fitter

FIRST YEAR (1ST YEAR)

<u>S.NO</u>	<u>Subject</u>	<u>Distribution Of Mark</u>	<u>Distribution Of Mark</u>	<u>Distribution Of Mark</u>	<u>Distribution Of Mark</u>
<u>S.NO</u>	<u>Subject</u>	<u>TH</u>	<u>PR</u>	<u>Viva - Voce</u>	<u>Total</u>
<u>FT-1</u>	<u>Trade Theory</u>	<u>100</u>	=	=	<u>100</u>
<u>FT-2</u>	<u>Workshop Calculation & Science</u>	<u>100</u>	=	=	<u>100</u>
<u>FT-3</u>	<u>Engineering Drawing</u>	<u>100</u>	=	=	<u>100</u>
<u>FT-4</u>	<u>Employability Skills</u>	<u>100</u>	=	=	<u>100</u>
<u>FT-5</u>	<u>Trade Practical / Workshop Practice</u>	<u>100</u>	<u>75</u>	<u>25</u>	<u>200</u>
<u>FT- PRS</u>	<u>Sessional Assessment (PRS)</u>	<u>100</u>	=	=	<u>100</u>
	<u>Total</u>	<u>600</u>	<u>75</u>	<u>25</u>	<u>700</u>

FIRST YEAR (1ST YEAR)- ITI FITTER RATIONALE

The study of Trade Theory, Workshop Calculation, Engineering Drawing and Trade Practical provides the fundamental knowledge and practical skill required for safe and productive fitting work. A fitter must be able to mark, measure, cut, file, drill, tap, assemble and maintain components with the required dimensional accuracy. The first year develops the trainee from basic bench work to machine-supported operations while building proper habits of safety, discipline, tool care and quality control.

This year also enables students to understand workshop mathematics, drawing interpretation, materials, measurements, welding support operations and elementary maintenance practices. The knowledge acquired through this course forms the base for advanced fitting, gauge king,

pipe work, production work, power transmission, pneumatics and machine maintenance in the second year.

FT-1001: Workshop Calculation and Science

Introduction

Workshop Calculation and Science is one of the core subjects of the ITI Fitter trade. It provides trainees with the mathematical, scientific, and engineering knowledge required to perform workshop operations accurately and efficiently. Every fitting operation, whether measuring, marking, cutting, drilling, assembling, or inspecting, involves calculations and scientific principles. Therefore, a fitter must possess a sound understanding of basic mathematics, engineering science, and their practical applications in industry.

This subject develops the ability to perform calculations related to dimensions, area, volume, weight, speed, power, force, pressure, temperature, and mechanical work. It also explains the scientific principles behind engineering materials, heat treatment, electricity, magnetism, mechanics, and simple machines. The knowledge gained from this subject enables trainees to interpret engineering drawings, use measuring instruments correctly, maintain dimensional accuracy, and perform industrial jobs according to engineering standards.

Workshop Calculation and Science emphasizes practical applications rather than theoretical concepts alone. Through numerical problems, industrial examples, and workshop exercises, trainees develop analytical thinking, logical reasoning, and problem-solving skills required in modern manufacturing and maintenance industries.

Contents

1. Basic Mathematics

Introduction

Basic Mathematics forms the foundation of all engineering calculations. It enables trainees to solve numerical problems encountered during measuring, marking, machining, fabrication, inspection, and assembly work. A sound knowledge of mathematics helps fitters perform calculations quickly and accurately while maintaining precision in workshop operations.

Topics Covered:

- Number System
- Fractions and Decimals
- Percentage
- Ratio and Proportion
- Profit and Loss
- Average
- Unitary Method
- Simple and Compound Interest
- Square and Cube
- Square Root and Cube Root

2. Units and Measurements

Introduction

Engineering measurements are essential for producing accurate machine components. This topic introduces the International System of Units (SI), unit conversion, precision, accuracy, and measurement standards used in engineering workshops.

Topics Covered:

- SI Units
- Fundamental and Derived Units
- Metric System
- Unit Conversion
- Precision and Accuracy

- Least Count
- Measurement

3. Algebra

Introduction

Algebra provides mathematical methods for solving engineering equations and formulas. It helps trainees calculate unknown values required in engineering design, production, and maintenance.

Topics Covered:

- Algebraic Expressions
- Linear Equations
- Formula Transposition
- Simple Engineering Formulae

4. Geometry

Introduction

Geometry deals with the study of shapes, lines, angles, and figures. It is widely used in engineering drawing, layout work, marking, fabrication, and machine component design.

Topics Covered:

- Lines and Angles
- Triangles
- Quadrilaterals
- Circles
- Polygons
- Geometrical Constructions

5. Mensuration

Introduction

Mensuration involves calculating the area, perimeter, surface area, and volume of geometrical figures. These calculations are essential for estimating material requirements and machining operations.

Topics Covered:

- Area of Plane Figures
- Perimeter
- Surface Area
- Volume of Solids
- Weight Calculation

6. Trigonometry

Introduction

Trigonometry studies the relationship between angles and sides of triangles. It is useful in engineering drawing, machine setup, alignment, fabrication, and layout work.

Topics Covered:

- Trigonometric Ratios
- Right-Angled Triangle
- Sine, Cosine, Tangent
- Angle Calculations
- Height and Distance Problems

7. Mechanics

Introduction

Mechanics explains the behaviour of forces acting on bodies. It helps trainees understand machine operations, motion, equilibrium, lifting devices, and mechanical systems used in industries.

Topics Covered:

- Force
- Motion
- Velocity
- Acceleration
- Work
- Power
- Energy
- Friction
- Centre of Gravity

8. Heat and Temperature**Introduction**

Heat and temperature play an important role in welding, heat treatment, forging, machining, and thermal expansion of engineering materials.

Topics Covered:

- Heat
- Temperature
- Thermal Expansion
- Heat Transfer
- Specific Heat
- Temperature Measurement

9. Engineering Materials**Introduction**

Engineering materials are the foundation of manufacturing and mechanical engineering. This topic explains the properties, classification, and applications of various materials used in engineering industries.

Topics Covered:

- Ferrous Metals
- Non-Ferrous Metals
- Alloys
- Plastics
- Rubber
- Ceramics
- Composite Materials
- Material Properties

10. Electricity and Magnetism**Introduction**

Basic electrical knowledge helps fitters understand electrically operated machines, workshop equipment, and industrial maintenance systems.

Topics Covered:

- Electric Current
- Voltage
- Resistance
- Ohm's Law
- Magnetism
- Electromagnets
- Electrical Safety

11. Simple Machines

Introduction

Simple machines reduce human effort and increase work efficiency. Understanding their principles helps trainees operate lifting equipment and mechanical devices safely and effectively.

Topics Covered:

- Lever
- Pulley
- Wheel and Axle
- Inclined Plane
- Screw
- Mechanical Advantage
- Velocity Ratio
- Efficiency

12. Engineering Calculations

Introduction

Engineering calculations enable trainees to solve practical workshop problems related to machining, fitting, material estimation, and production planning.

Topics Covered:

- Material Estimation
- Weight Calculation
- Speed Calculation
- Feed Calculation
- Cutting Speed
- Time Calculation
- Power Calculation
- Efficiency Calculation

Learning Outcomes

After completing **Workshop Calculation and Science**, the trainee will be able to:

- Apply basic mathematical concepts in workshop practice.
- Perform engineering calculations accurately.
- Calculate area, volume, weight, speed, power, and material requirements.
- Apply scientific principles in fitting operations.
- Understand engineering materials and their properties.
- Solve practical workshop problems using mathematics and science.
- Follow engineering standards while performing industrial operations.
- Develop analytical thinking and problem-solving skills required in modern manufacturing industries.

FT-1002: Engineering Drawing

Introduction

Engineering Drawing is one of the most important subjects in the ITI Fitter trade. It is the universal language of engineering used to communicate technical ideas, manufacturing details, dimensions, tolerances, and assembly information through standardized graphical representations. Every fitter, machinist, technician, and engineer must be able to read, interpret, and prepare engineering drawings accurately to manufacture and assemble machine components according to design specifications.

Engineering drawing enables trainees to visualize the shape, size, position, and relationship of various machine parts before they are manufactured. It develops the ability to understand orthographic views, sectional views, dimensions, symbols, tolerances, limits, surface finish, and assembly drawings used in modern industries. A fitter relies on engineering drawings for marking, measuring, fitting, machining, inspection, and maintenance activities.

The subject also familiarizes trainees with Bureau of Indian Standards (BIS), ISO drawing standards, conventional symbols, scales, and projection methods used in engineering workshops. Practical drawing exercises help trainees improve visualization skills, drawing accuracy, and technical communication.

Upon successful completion of this subject, trainees will be able to read, interpret, and prepare engineering drawings accurately, ensuring precision, quality, and standardization in manufacturing and maintenance operations.

Contents

1. Introduction to Engineering Drawing

Introduction

Engineering Drawing is a systematic method of representing engineering objects and machine components using lines, symbols, dimensions, and standardized drawing practices. It serves as a communication tool between designers, engineers, technicians, and workshop personnel.

Topics Covered:

- Definition of Engineering Drawing
- Importance of Engineering Drawing
- Applications in Industry
- Drawing Standards
- Types of Engineering Drawings

2. Drawing Instruments and Materials

Introduction

Drawing instruments are essential tools used for preparing neat, accurate, and standardized engineering drawings. Proper use and maintenance of these instruments ensure precision in technical drawings.

Topics Covered:

- Drawing Board
- Mini Drafter
- T-Square
- Set Squares
- Protractor
- Compass
- Divider
- Scale
- Pencils and Grades
- Eraser
- Drawing Sheets

3. Lines, Lettering and Dimensioning

Introduction

Engineering drawings use different types of lines, lettering styles, and dimensioning methods to convey technical information clearly and accurately according to BIS and ISO standards.

Topics Covered:

- Types of Lines
- Line Thickness
- Lettering Styles
- Dimension Lines
- Extension Lines
- Arrowheads
- Dimensioning Rules
- Notes and Symbols

4. Geometrical Construction

Introduction

Geometrical construction is the process of creating basic geometric figures accurately using drawing instruments. It forms the foundation of engineering drawing and layout work.

Topics Covered:

- Bisecting Lines
- Bisecting Angles
- Drawing Parallel Lines
- Drawing Perpendicular Lines
- Construction of Triangles
- Construction of Polygons
- Construction of Circles
- Tangents

5. Scale and Measurement

Introduction

Scales are used to represent large or small objects proportionally on drawing sheets. Proper use of scales ensures accurate interpretation of engineering drawings.

Topics Covered:

- Full Scale
- Reduced Scale
- Enlarged Scale
- Plain Scale
- Diagonal Scale
- Representative Fraction (R.F.)

6. Orthographic Projection

Introduction

Orthographic projection is the standard method of representing three-dimensional objects using two-dimensional views. It enables accurate visualization and manufacturing of machine components.

Topics Covered:

- Principles of Projection
- First Angle Projection
- Third Angle Projection
- Front View
- Top View
- Side View
- Projection Symbols

7. Isometric Drawing

Introduction

Isometric drawing provides a pictorial representation of an object where all three dimensions are shown in a single view. It helps trainees visualize machine parts easily.

Topics Covered:

- Isometric Axes
- Isometric Scale
- Isometric View
- Isometric Projection
- Drawing Simple Solids
- Combination of Solids

8. Sectional Views

Introduction

Sectional views are used to reveal the internal features of machine components that are not visible in external views. They improve the clarity and understanding of complex engineering drawings.

Topics Covered:

- Full Section
- Half Section
- Offset Section
- Broken Section
- Cutting Plane
- Section Lining

9. Development of Surfaces

Introduction

Development of surfaces is the process of unfolding three-dimensional objects into flat patterns. It is widely used in fabrication, sheet metal work, ducting, and pipe fitting.

Topics Covered:

- Development of Cylinder
- Development of Cone
- Development of Prism
- Development of Pyramid
- Transition Pieces

10. Machine Drawing

Introduction

Machine drawing deals with the detailed representation of machine components including dimensions, tolerances, materials, and assembly requirements.

Topics Covered:

- Threaded Fasteners
- Nuts and Bolts
- Keys and Keyways
- Riveted Joints
- Couplings
- Bearings
- Shafts
- Pulleys
- Gears

11. Assembly Drawing

Introduction

Assembly drawings show how individual machine components fit together to form a complete machine or mechanism. These drawings guide fitters during assembly and maintenance.

Topics Covered:

- Reading Assembly Drawings
- Exploded Views
- Part Identification
- Bill of Materials (BOM)
- Assembly Sequence
- Disassembly Procedure

12. Limits, Fits and Tolerances

Introduction

Limits, fits, and tolerances specify the permissible variation in the dimensions of machine components. They ensure proper assembly, interchangeability, and quality control in manufacturing.

Topics Covered:

- Basic Size
- Limits
- Tolerance
- Types of Fits
- Clearance Fit
- Transition Fit
- Interference Fit
- ISO Tolerance System

13. Surface Finish and Conventional Symbols

Introduction

Surface finish symbols and conventional symbols provide additional manufacturing information on engineering drawings. These symbols help maintain quality and standardization during production.

Topics Covered:

- Surface Roughness Symbols
- Welding Symbols
- Machining Symbols
- Material Symbols
- Centre Lines
- Hidden Lines
- Conventional Representation

14. Reading and Interpretation of Engineering Drawings

Introduction

The ability to read and interpret engineering drawings is an essential skill for every fitter. It enables trainees to manufacture, inspect, assemble, and maintain machine components accurately according to design requirements.

Topics Covered:

- Reading Dimensions
- Identifying Views
- Interpreting Symbols
- Reading Tolerances
- Assembly Interpretation
- Manufacturing Instructions
- Inspection Requirements

Learning Outcomes

After completing **FT-1002: Engineering Drawing**, the trainee will be able to:

- Understand engineering drawing standards and conventions.
- Use drawing instruments correctly.
- Prepare neat and accurate engineering drawings.
- Interpret orthographic and isometric projections.
- Read and understand machine and assembly drawings.
- Apply dimensions, limits, fits, and tolerances correctly.
- Interpret welding, machining, and surface finish symbols.
- Develop visualization skills for engineering components.
- Use engineering drawings effectively in manufacturing, fitting, inspection, and maintenance work.

- Follow BIS and ISO standards while preparing and interpreting engineering drawings.

FT-1003: Trade Theory

Introduction

Trade Theory is the core technical subject of the ITI Fitter trade. It provides trainees with the theoretical knowledge required to perform fitting, assembly, maintenance, inspection, and repair work in engineering industries. The subject explains the principles, functions, construction, operation, and maintenance of tools, machines, equipment, engineering materials, and mechanical components used in the fitting trade.

Trade Theory enables trainees to understand how engineering principles are applied in practical workshop operations. It develops knowledge of measuring instruments, hand tools, machine tools, fastening methods, bearings, gears, lubrication systems, power transmission, hydraulic and pneumatic systems, preventive maintenance, quality control, and industrial safety. This knowledge forms the foundation for performing practical work accurately, efficiently, and safely.

The subject also introduces modern manufacturing techniques, precision engineering, industrial standards, and quality management systems used in mechanical engineering industries. By studying Trade Theory, trainees develop problem-solving skills, technical understanding, and the confidence to work independently in manufacturing plants, maintenance workshops, fabrication industries, automobile industries, machine shops, and production units.

Upon successful completion of this subject, trainees will be able to understand engineering concepts, interpret technical information, select appropriate tools and methods, identify faults, and perform fitting operations according to industrial standards and safety regulations.

Contents

1. Introduction to Fitter Trade

Introduction

The Fitter trade is one of the oldest and most important engineering trades. A fitter is responsible for manufacturing, assembling, fitting, repairing, maintaining, and inspecting machine components using hand tools, measuring instruments, and machine tools.

This topic introduces trainees to the scope, responsibilities, career opportunities, and industrial importance of the fitter profession.

Topics Covered:

- Introduction to Fitter Trade
- Duties and Responsibilities of a Fitter
- Scope of the Trade
- Career Opportunities
- Workshop Organization
- Industrial Applications

2. Workshop Safety and Occupational Health

Introduction

Safety is the first priority in every engineering workshop. This topic explains safe working practices, accident prevention, personal protective equipment (PPE), fire safety, first aid, and occupational health standards to ensure a safe working environment.

Topics Covered:

- Workshop Safety Rules
- Personal Protective Equipment (PPE)
- Accident Prevention
- Fire Safety

- First Aid
- Electrical Safety
- Housekeeping
- Environmental Protection

3. Engineering Materials

Introduction

Engineering materials are the basic raw materials used for manufacturing machine components. Understanding their properties, classification, and applications helps trainees select suitable materials for different engineering jobs.

Topics Covered:

- Ferrous Metals
- Non-Ferrous Metals
- Alloys
- Plastics
- Rubber
- Composite Materials
- Material Properties
- Heat Treatment

4. Measuring Instruments

Introduction

Accurate measurement is essential for quality manufacturing. This topic explains the construction, working principles, applications, and maintenance of precision measuring instruments used in engineering workshops.

Topics Covered:

- Steel Rule
- Vernier Caliper
- Micrometer
- Height Gauge
- Depth Gauge
- Dial Indicator
- Feeler Gauge
- Slip Gauges
- Bevel Protractor

5. Hand Tools

Introduction

Hand tools are commonly used for fitting, cutting, shaping, assembling, and maintenance work. Proper selection and use of hand tools improve productivity and ensure safety.

Topics Covered:

- Files
- Hacksaws
- Chisels
- Hammers
- Screwdrivers
- Spanners
- Pliers
- Punches
- Scrapers
- Vices

6. Marking and Measuring

Introduction

Marking and measuring are the first steps in manufacturing any component. Accurate marking ensures correct dimensions and reduces machining errors.

Topics Covered:

- Surface Plate
- Marking Table
- Scriber
- Divider
- Try Square
- Surface Gauge
- Centre Punch
- Marking Blue

7. Bench Work**Introduction**

Bench work consists of basic fitting operations performed manually on a workbench. These operations develop accuracy, workmanship, and practical skills required in engineering workshops.

Topics Covered:

- Filing
- Sawing
- Chipping
- Drilling
- Reaming
- Tapping
- Dieing
- Scraping
- Grinding

8. Fasteners and Joining Methods**Introduction**

Mechanical joining methods are used to assemble machine parts permanently or temporarily. This topic explains various fastening methods used in engineering industries.

Topics Covered:

- Nuts and Bolts
- Screws
- Washers
- Rivets
- Keys
- Cotters
- Pins
- Thread Forms
- Thread Identification

9. Machine Tools**Introduction**

Machine tools are used for machining engineering components accurately and efficiently. Understanding their construction and operation is essential for every fitter.

Topics Covered:

- Drilling Machine
- Lathe Machine
- Milling Machine
- Grinding Machine
- Shaper Machine
- Power Saw
- Bench Grinder

10. Bearings and Lubrication

Introduction

Bearings support rotating shafts and reduce friction between moving parts. Proper lubrication improves machine performance and extends equipment life.

Topics Covered:

- Plain Bearings
- Ball Bearings
- Roller Bearings
- Bearing Selection
- Lubricants
- Lubrication Methods
- Bearing Maintenance

11. Power Transmission

Introduction

Power transmission systems transfer mechanical power from one machine component to another. Understanding these systems is essential for installation and maintenance.

Topics Covered:

- Belt Drives
- Chain Drives
- Gear Drives
- Rope Drives
- Couplings
- Pulleys
- Shafts

12. Gears

Introduction

Gears are mechanical components used to transmit power and motion between rotating shafts with precise speed and torque ratios.

Topics Covered:

- Spur Gear
- Helical Gear
- Bevel Gear
- Worm Gear
- Rack and Pinion
- Gear Terminology
- Gear Applications

13. Pipe Fitting

Introduction

Pipe fitting involves assembling, installing, and maintaining piping systems used for water, air, oil, steam, and gas transmission.

Topics Covered:

- Pipe Materials
- Pipe Threads
- Pipe Fittings
- Pipe Bending
- Pipe Cutting
- Pipe Joining
- Leak Testing

14. Hydraulics and Pneumatics

Introduction

Hydraulic and pneumatic systems are widely used in modern industries for transmitting power and controlling machine movements. A fitter must understand their basic principles and components.

Topics Covered:

- Hydraulic System
- Pneumatic System
- Pumps
- Compressors
- Valves
- Cylinders
- Hydraulic Fluids
- Air Preparation Units

15. Preventive Maintenance

Introduction

Preventive maintenance is a planned maintenance activity performed to reduce equipment failure, increase machine life, and improve productivity.

Topics Covered:

- Types of Maintenance
- Inspection
- Cleaning
- Lubrication
- Alignment
- Fault Diagnosis
- Maintenance Records

16. Quality Control

Introduction

Quality control ensures that manufactured components meet specified standards and customer requirements. It helps reduce defects and improve product reliability.

Topics Covered:

- Quality Concepts
- Inspection Methods
- Gauges
- Tolerances
- Fits
- Statistical Quality Control
- ISO Standards

17. Industrial Engineering and Productivity

Introduction

Industrial engineering focuses on improving productivity, reducing waste, and optimizing manufacturing processes through efficient planning and resource utilization.

Topics Covered:

- Work Study
- Time Study
- Method Study
- Productivity
- Lean Manufacturing
- 5S System
- Kaizen

18. Modern Manufacturing Techniques

Introduction

Modern industries use advanced manufacturing technologies to improve precision, productivity, and automation. Understanding these technologies prepares trainees for contemporary engineering environments.

Topics Covered:

- CNC Machines
- CAD/CAM Basics
- Laser Cutting
- Plasma Cutting
- 3D Printing
- Automation
- Robotics Basics

Learning Outcomes

After completing **FT-1003: Trade Theory**, the trainee will be able to:

- Understand the principles and practices of the Fitter trade.
- Identify and use engineering materials, hand tools, and measuring instruments correctly.
- Perform marking, fitting, drilling, threading, and assembly operations safely.
- Understand the construction and working of machine tools and mechanical systems.
- Apply knowledge of bearings, gears, power transmission, hydraulics, and pneumatics in industrial applications.
- Carry out preventive maintenance and fault diagnosis of mechanical equipment.
- Follow quality control procedures and engineering standards.
- Demonstrate safe working practices, environmental awareness, and professional ethics in engineering workshops.
- Apply theoretical knowledge effectively during practical training and industrial work.

FT-1004: Employability Skills

Introduction

Employability Skills is an essential subject in the ITI Fitter trade that prepares trainees for successful employment, entrepreneurship, and lifelong career development. In today's competitive industrial environment, technical knowledge alone is not sufficient. Employers expect workers to possess strong communication skills, professional ethics, teamwork, problem-solving abilities, digital literacy, financial awareness, and a positive attitude toward work.

This subject develops the personal, social, and professional competencies required to work effectively in modern industries. It enables trainees to communicate confidently, use computers and digital technologies, understand workplace responsibilities, maintain professional behavior, and adapt to changing industrial environments. It also introduces entrepreneurship, financial management, environmental awareness, occupational safety, and customer service, helping trainees become responsible employees or successful entrepreneurs.

Employability Skills emphasize practical learning through group discussions, presentations, role plays, case studies, workplace simulations, and project-based activities. These experiences improve confidence, leadership qualities, decision-making, and interpersonal skills while preparing trainees for interviews, career advancement, and continuous professional growth.

Upon successful completion of this subject, trainees will be able to communicate effectively, work efficiently in teams, solve workplace problems, use digital technologies, manage personal finances, understand business opportunities, and demonstrate professional ethics and lifelong learning habits.

Contents

1. Communication Skills

Introduction

Communication is the process of exchanging information, ideas, thoughts, and feelings effectively. Good communication skills help employees interact with supervisors, co-workers, customers, and clients in a professional manner. Effective communication improves teamwork, productivity, and workplace relationships.

Topics Covered:

- Basics of Communication
- Verbal Communication
- Non-Verbal Communication
- Written Communication
- Listening Skills
- Speaking Skills
- Reading and Writing Skills
- Barriers to Communication
- Effective Workplace Communication

2. English Literacy

Introduction

Basic English literacy helps trainees understand technical documents, operating manuals, safety instructions, emails, and workplace conversations. It also improves confidence during interviews and professional communication.

Topics Covered:

- Basic English Grammar
- Vocabulary Development
- Sentence Formation
- Technical Terminology
- Reading Comprehension
- Letter and Email Writing
- Workplace Conversations
- Presentation Skills

3. Information Technology (IT) and Digital Literacy

Introduction

Digital literacy enables trainees to use computers, smartphones, and internet-based technologies effectively in modern workplaces. It is an essential skill in today's digital manufacturing environment.

Topics Covered:

- Introduction to Computers
- Operating System Basics
- Microsoft Office (Word, Excel, PowerPoint)
- Internet and Web Browsing
- Email Communication
- Online Meetings
- Cloud Storage
- Cyber Safety
- Digital Documentation

4. Entrepreneurship Development

Introduction

Entrepreneurship encourages trainees to establish their own businesses and become self-employed. This topic introduces the principles of business planning, innovation, leadership, and enterprise management.

Topics Covered:

- Entrepreneurship Concepts
- Characteristics of Entrepreneurs
- Business Opportunities
- Business Planning
- Market Survey
- Small Business Management
- Government Support Schemes
- Startup Basics

5. Financial Literacy**Introduction**

Financial literacy helps trainees manage personal and business finances responsibly. It develops awareness of banking services, savings, investments, budgeting, taxation, and digital payment systems.

Topics Covered:

- Personal Budgeting
- Saving and Investment
- Banking Services
- Digital Payments
- UPI and Internet Banking
- Insurance
- Income Tax Basics
- Financial Planning

6. Workplace Ethics and Professional Values**Introduction**

Professional ethics guide employees in maintaining honesty, discipline, responsibility, and respect at the workplace. Ethical behavior creates a positive work environment and improves organizational productivity.

Topics Covered:

- Professional Ethics
- Discipline
- Responsibility
- Integrity
- Punctuality
- Confidentiality
- Workplace Behavior
- Respect for Diversity

7. Teamwork and Leadership**Introduction**

Most industrial tasks are performed by teams. Teamwork and leadership skills help employees cooperate effectively, resolve conflicts, and achieve organizational goals.

Topics Covered:

- Team Building
- Roles and Responsibilities
- Leadership Qualities
- Motivation
- Conflict Resolution
- Decision Making
- Collaboration
- Workplace Coordination

8. Problem Solving and Critical Thinking

Introduction

Problem-solving and critical thinking enable trainees to identify workplace issues, analyze situations logically, and make informed decisions to improve productivity and efficiency.

Topics Covered:

- Problem Identification
- Root Cause Analysis
- Decision Making
- Creative Thinking
- Logical Reasoning
- Continuous Improvement
- Innovation Techniques

9. Occupational Safety and Health

Introduction

Occupational safety promotes a safe and healthy work environment by preventing accidents and occupational hazards. Every employee must understand workplace safety regulations and emergency procedures.

Topics Covered:

- Workplace Safety
- Hazard Identification
- Risk Assessment
- Personal Protective Equipment (PPE)
- Fire Safety
- First Aid
- Emergency Response
- Health and Hygiene

10. Environmental Awareness and Sustainable Development

Introduction

Industries have a responsibility to protect the environment and use natural resources wisely. This topic promotes environmental conservation and sustainable industrial practices.

Topics Covered:

- Environmental Protection
- Pollution Control
- Waste Management
- Recycling
- Energy Conservation
- Water Conservation
- Green Manufacturing
- Sustainable Development Goals (SDGs)

11. Customer Service and Workplace Relations

Introduction

Customer satisfaction and positive workplace relationships contribute significantly to organizational success. Employees should understand customer expectations and maintain professional interactions.

Topics Covered:

- Customer Service Principles
- Handling Customer Complaints
- Professional Conduct
- Workplace Etiquette
- Public Relations
- Service Quality
- Customer Satisfaction

12. Career Development and Interview Skills

Introduction

Career development prepares trainees for employment opportunities by improving their job search skills, interview performance, and professional presentation.

Topics Covered:

- Career Planning
- Resume/CV Preparation
- Job Search Techniques
- Interview Preparation
- Group Discussion
- Personality Development
- Time Management
- Goal Setting

13. Labour Laws and Workplace Rights

Introduction

Every employee should be aware of basic labour laws, workplace rights, and responsibilities to ensure fair treatment, legal compliance, and safe working conditions.

Topics Covered:

- Employee Rights and Responsibilities
- Labour Welfare
- Working Hours
- Leave Rules
- Industrial Discipline
- Social Security Schemes
- Equal Employment Opportunity

14. Lifelong Learning and Personality Development

Introduction

Continuous learning and personality development help employees remain competitive in rapidly changing industries. Developing confidence, adaptability, and a positive attitude supports long-term career growth.

Topics Covered:

- Self-Development
- Positive Attitude
- Confidence Building
- Adaptability
- Stress Management
- Emotional Intelligence
- Lifelong Learning
- Professional Growth

Learning Outcomes

After completing **FT-1004: Employability Skills**, the trainee will be able to:

- Communicate effectively in the workplace using verbal, written, and digital methods.
- Demonstrate professional ethics, discipline, and responsible workplace behavior.
- Use computers, office software, email, and internet tools for workplace tasks.
- Work efficiently in teams and demonstrate leadership qualities.
- Solve workplace problems through logical and critical thinking.
- Prepare professional resumes and perform confidently in interviews.
- Understand entrepreneurship concepts and identify self-employment opportunities.
- Manage personal finances and use modern banking and digital payment systems.
- Follow occupational safety, health, and environmental protection practices.
- Continue lifelong learning and adapt to technological and industrial advancements.

FT-1005: Trade Practical / Workshop Practice

Introduction

Trade Practical / Workshop Practice is the most important practical subject of the ITI Fitter trade. It provides trainees with hands-on experience in performing various fitting, assembly, maintenance, inspection, and repair operations commonly carried out in engineering workshops and manufacturing industries. The primary objective of this subject is to develop technical competence, manual dexterity, accuracy, safety awareness, and confidence through continuous practical training.

Workshop practice enables trainees to apply the theoretical knowledge learned in Trade Theory, Engineering Drawing, and Workshop Calculation & Science to real industrial situations. Trainees learn to identify engineering materials, use measuring instruments, operate hand tools and machine tools, prepare machine components, perform assembly and disassembly operations, maintain dimensional accuracy, and inspect finished jobs according to engineering standards.

The subject emphasizes industrial work practices, quality control, workplace discipline, teamwork, and occupational safety. Practical exercises are designed progressively—from basic bench fitting operations to advanced assembly, alignment, maintenance, and fault-finding activities—preparing trainees for employment in manufacturing industries, maintenance departments, fabrication workshops, automobile industries, power plants, and engineering organizations.

After successful completion of this subject, trainees will be able to perform fitting and maintenance operations independently while following industrial safety regulations, quality standards, and good engineering practices.

Contents

1. Workshop Safety and Familiarization

Introduction

Before performing any workshop activity, trainees must understand workshop safety rules, accident prevention methods, emergency procedures, and the correct use of Personal Protective Equipment (PPE). Safe working habits protect personnel, equipment, and the working environment.

Topics Covered:

- Workshop Rules and Regulations
- Personal Protective Equipment (PPE)
- Safe Handling of Tools
- Fire Prevention and Fire Extinguishers
- First Aid
- Electrical Safety
- Housekeeping
- Emergency Procedures

2. Identification and Use of Hand Tools

Introduction

Hand tools are the basic tools used by fitters for marking, cutting, shaping, assembling, and repairing mechanical components. Proper selection, handling, and maintenance of hand tools improve work quality and safety.

Topics Covered:

- Bench Vice
- Hammers
- Files
- Hacksaw
- Chisels
- Screwdrivers

- Spanners
- Pliers
- Punches
- Scrapers
- Allen Keys
- Torque Wrench

3. Measuring and Inspection

Introduction

Accurate measurement and inspection are essential to ensure that manufactured components meet specified dimensions and tolerances. Trainees learn to use precision measuring instruments correctly.

Topics Covered:

- Steel Rule
- Vernier Caliper
- Micrometer
- Height Gauge
- Depth Gauge
- Dial Indicator
- Feeler Gauge
- Slip Gauges
- Inspection Techniques

4. Marking and Layout Work

Introduction

Marking is the process of transferring dimensions from a drawing onto a workpiece before machining. Accurate marking minimizes errors and ensures proper machining operations.

Topics Covered:

- Surface Plate
- Surface Gauge
- Scriber
- Divider
- Try Square
- Centre Punch
- Marking Blue
- Layout Techniques

5. Bench Fitting Operations

Introduction

Bench fitting operations develop the fundamental practical skills required for shaping and finishing engineering components manually. These operations form the foundation of the fitter trade.

Topics Covered:

- Filing
- Hacksawing
- Chipping
- Scraping
- Drilling
- Reaming
- Tapping
- Dieing
- Deburring

6. Drilling and Thread Cutting

Introduction

Drilling and thread cutting are common workshop operations used to prepare holes and threaded components for assembly. Correct procedures ensure proper fit and durability.

Topics Covered:

- Portable Drill
- Bench Drilling Machine
- Twist Drill
- Counterboring
- Countersinking
- Reaming
- Internal Thread Cutting
- External Thread Cutting

7. Assembly and Disassembly

Introduction

Assembly and disassembly involve fitting machine components together or taking them apart for maintenance, repair, or inspection. Correct procedures improve machine performance and service life.

Topics Covered:

- Fastening Methods
- Bearings
- Keys and Keyways
- Couplings
- Pulleys
- Shafts
- Gear Assembly
- Mechanical Alignment

8. Pipe Fitting Practice

Introduction

Pipe fitting develops practical skills in cutting, threading, joining, and testing pipelines used in industrial fluid transportation systems.

Topics Covered:

- Pipe Cutting
- Pipe Threading
- Pipe Bending
- Pipe Joints
- Pipe Fittings
- Leak Testing
- Pipe Alignment

9. Machine Shop Practice

Introduction

Machine shop practice introduces trainees to the safe operation of common machine tools used for machining engineering components with precision.

Topics Covered:

- Drilling Machine
- Bench Grinder
- Lathe (Basic Operations)
- Grinding
- Tool Sharpening
- Machine Safety
- Preventive Maintenance

10. Bearings and Power Transmission

Introduction

Proper installation and maintenance of bearings and power transmission systems are essential for smooth machine operation and efficient power transfer.

Topics Covered:

- Bearing Removal and Installation
- Lubrication
- Belt Drive Alignment
- Chain Drive
- Gear Drive
- Coupling Alignment
- Pulley Installation

11. Hydraulic and Pneumatic Practice

Introduction

Hydraulic and pneumatic systems are widely used for industrial automation and machine operation. Practical training helps trainees understand system components and maintenance procedures.

Topics Covered:

- Hydraulic Pumps
- Hydraulic Cylinders
- Hydraulic Valves
- Air Compressor
- Pneumatic Cylinders
- Pneumatic Valves
- Air Line Connections
- Leak Detection

12. Preventive Maintenance

Introduction

Preventive maintenance involves regular inspection, cleaning, lubrication, adjustment, and servicing of machinery to prevent breakdowns and improve equipment reliability.

Topics Covered:

- Cleaning
- Lubrication
- Inspection
- Machine Alignment
- Fault Diagnosis
- Component Replacement
- Maintenance Schedule

13. Quality Inspection and Testing

Introduction

Quality inspection ensures that finished components meet dimensional accuracy, tolerance requirements, and functional standards before they are accepted for use.

Topics Covered:

- Dimensional Inspection
- Tolerance Checking
- Surface Finish Inspection
- Functional Testing
- Quality Documentation
- Defect Identification

14. Workshop Projects

Introduction

Workshop projects provide opportunities for trainees to integrate all the practical skills acquired during the course. Projects simulate real industrial jobs and improve confidence, planning, teamwork, and problem-solving abilities.

Topics Covered:

- Fabrication Projects
- Machine Assembly Projects
- Maintenance Projects
- Inspection Projects
- Project Documentation
- Presentation of Work

15. Industrial Practices and Good Housekeeping

Introduction

Professional work habits and good housekeeping improve workplace safety, productivity, and quality. Trainees learn industrial discipline, proper material handling, and efficient workplace organization.

Topics Covered:

- 5S System
- Material Handling
- Tool Control
- Waste Management
- Workplace Discipline
- Industrial Ethics
- Record Keeping

Learning Outcomes

After completing **Trade Practical / Workshop Practice**, the trainee will be able to:

1. Follow workshop safety rules and use Personal Protective Equipment (PPE) correctly.
2. Identify, use, and maintain hand tools, measuring instruments, and machine tools.
3. Perform accurate marking, measuring, cutting, filing, drilling, reaming, tapping, threading, and fitting operations.
4. Assemble, dismantle, inspect, and maintain mechanical components and equipment.
5. Carry out pipe fitting, alignment, bearing installation, lubrication, and power transmission tasks.
6. Operate basic workshop machines safely and efficiently.
7. Perform preventive maintenance and identify common mechanical faults.
8. Inspect finished jobs for dimensional accuracy and quality according to engineering standards.
9. Complete workshop projects independently while maintaining proper documentation.
10. Demonstrate professionalism, teamwork, housekeeping, and industrial work practices in accordance with quality and safety standards.

SECOND YEAR (2ND YEAR)

S.NO	Subject	Distribution Of Mark	Distribution Of Mark	Distribution Of Mark	Distribution Of Mark
S.NO	Subject	TH	PR	Viva - Voce	Total
FT-201	Advanced Trade Theory	100	-	-	100
FT-202	Workshop Calculation & Science	100	-	-	100
FT-203	Engineering Drawing	100	-	-	100
FT-204	Employability Skills	100	-	-	100
FT-205	Advanced Trade Practical / Shop Work	100	75	25	200
FT-PRS	Sessional Assessment (PRS)	100	-	-	100
	Total	600	75	25	700

SECOND YEAR (2ND YEAR)- ITI Fitter

RATIONALE

The second year of ITI Fitter focuses on advanced accuracy work, production methods, pipe work, gauges, power transmission, pneumatics, hydraulics, preventive maintenance and machine erection. At this stage the trainee is expected to apply first-year knowledge independently and complete jobs with better finish, fit, inspection control and functional reliability.

The learner develops competence in workshop planning, fault identification, fitting of transmission components, maintenance documentation, circuit understanding and machine alignment. These topics prepare the trainee for shop floor work, maintenance departments, apprenticeship and further technical progression.

FT-2001: Advanced Trade Theory

Introduction

Advanced Trade Theory is the core technical subject of the Second Year ITI Fitter (CTS 2.0) curriculum. It is designed to enhance the trainee's knowledge and understanding of advanced fitting techniques, precision engineering, machine maintenance, power transmission systems, hydraulic and pneumatic systems, industrial automation, quality control, and modern manufacturing technologies. The subject builds upon the concepts learned during the first year and prepares trainees to perform complex fitting, assembly, installation, inspection, troubleshooting, and maintenance operations in modern engineering industries.

In today's manufacturing environment, industries demand highly skilled fitters who can interpret engineering drawings, perform precision measurements, assemble sophisticated machinery, diagnose mechanical faults, maintain production equipment, and ensure quality

standards. Advanced Trade Theory equips trainees with the technical knowledge required to work confidently in manufacturing plants, automobile industries, power stations, refineries, machine shops, fabrication units, maintenance departments, and automation industries. This subject emphasizes industrial practices, preventive and predictive maintenance, precision alignment, bearing technology, gear systems, hydraulic and pneumatic circuits, lubrication techniques, quality assurance, CNC technology, and industrial safety. It also introduces modern engineering concepts such as lean manufacturing, Total Productive Maintenance (TPM), Computer Numerical Control (CNC), Industrial Automation, and Industry 4.0 technologies.

Upon successful completion of this subject, trainees will be able to understand advanced mechanical systems, analyze engineering problems, select appropriate maintenance techniques, perform precision fitting operations, and apply industrial standards while ensuring safety, quality, and productivity.

Contents

1. Advanced Measuring Instruments

Introduction

- Precision measurement is essential in modern engineering industries for maintaining dimensional accuracy and quality. Advanced measuring instruments are used for inspection, calibration, alignment, and quality control of machine components.

Topics Covered:

- Vernier Height Gauge
- Dial Test Indicator
- Bore Gauge
- Telescopic Gauge
- Slip Gauges
- Sine Bar
- Surface Roughness Measurement
- Precision Measurement Techniques
- Instrument Calibration

2. Precision Fitting and Assembly

Introduction

- Precision fitting involves assembling machine components with high dimensional accuracy and specified tolerances. It ensures proper functioning, interchangeability, and reliability of mechanical systems.

Topics Covered:

- Precision Scraping
- Lapping
- Honing
- Matching and Pairing
- Selective Assembly
- Precision Alignment
- Tolerance Control
- Surface Finish

3. Limits, Fits and Tolerances

Introduction

- Limits, fits, and tolerances ensure interchangeability and proper assembly of engineering components. Knowledge of tolerance systems is essential for precision manufacturing and quality assurance.

Topics Covered:

- ISO System of Limits
- Types of Fits

- Hole Basis System
- Shaft Basis System
- Tolerance Grades
- Gauge Design
- Interchangeability

4. Bearings and Bearing Maintenance

Introduction

- Bearings support rotating shafts and reduce friction between moving parts. Proper bearing selection, installation, lubrication, and maintenance improve machine efficiency and service life.

Topics Covered:

- Ball Bearings
- Roller Bearings
- Needle Bearings
- Thrust Bearings
- Bearing Installation
- Bearing Removal
- Bearing Failures
- Lubrication Practices

5. Gears and Gear Drives

Introduction

- Gear drives transmit motion and power efficiently between rotating shafts. Understanding gear construction, operation, maintenance, and troubleshooting is essential for industrial machinery.

Topics Covered:

- Spur Gears
- Helical Gears
- Bevel Gears
- Worm Gears
- Rack and Pinion
- Gear Inspection
- Gear Alignment
- Gear Failures

6. Power Transmission Systems

Introduction

- Power transmission systems transfer mechanical power from one component to another. Proper installation and maintenance ensure efficient machine operation.

Topics Covered:

- Belt Drives
- Chain Drives
- Rope Drives
- Couplings
- Clutches
- Pulleys
- Shafts
- Alignment Techniques

7. Hydraulics

Introduction

- Hydraulic systems use pressurized fluid to transmit power and perform heavy-duty industrial operations. Understanding hydraulic components and circuits is essential for maintenance personnel.

Topics Covered:

- Hydraulic Principles
- Hydraulic Pumps
- Hydraulic Cylinders
- Hydraulic Valves
- Hydraulic Fluids
- Hydraulic Circuits
- Troubleshooting
- Preventive Maintenance

8. Pneumatics**Introduction**

- Pneumatic systems use compressed air to operate industrial machines and automation equipment. Pneumatic systems are widely used because they are clean, safe, and efficient.

Topics Covered:

- Compressed Air System
- Air Compressors
- Pneumatic Cylinders
- Pneumatic Valves
- FRL Unit
- Pneumatic Circuits
- Leak Detection
- Maintenance

9. Industrial Maintenance**Introduction**

- Industrial maintenance ensures continuous operation of machinery by reducing downtime, increasing productivity, and extending equipment life through planned maintenance activities.

Topics Covered:

- Breakdown Maintenance
- Preventive Maintenance
- Predictive Maintenance
- Corrective Maintenance
- Machine Inspection
- Lubrication Management
- Maintenance Planning
- Maintenance Documentation

10. Fault Diagnosis and Troubleshooting**Introduction**

- Fault diagnosis involves identifying the root cause of machine failures and implementing corrective measures to restore normal operation with minimum downtime.

Topics Covered:

- Mechanical Faults
- Bearing Failures
- Shaft Misalignment
- Gear Problems
- Vibration Analysis
- Root Cause Analysis
- Troubleshooting Techniques
- Corrective Actions

11. Lubrication Systems

Introduction

- Lubrication reduces friction, minimizes wear, dissipates heat, and protects machine components from corrosion. Proper lubrication improves machine efficiency and reliability.

Topics Covered:

- Types of Lubricants
- Lubrication Methods
- Greasing Systems
- Oil Circulation Systems
- Lubrication Schedule
- Oil Testing
- Lubricant Selection

12. Quality Control and Inspection

Introduction

- Quality control ensures that manufactured components comply with specified dimensions, tolerances, and performance standards through systematic inspection procedures.

Topics Covered:

- Quality Assurance
- Statistical Quality Control
- Inspection Methods
- Gauges and Fixtures
- Acceptance Sampling
- ISO 9001
- Documentation
- 13. CNC and Modern Manufacturing

Introduction

- Computer Numerical Control (CNC) technology has transformed modern manufacturing by improving precision, productivity, and automation. Fitters should understand CNC systems and their applications.
- Topics Covered:
- CNC Machine Basics
- CNC Components
- Coordinate System
- CNC Programming Basics
- Tool Offsets
- CAD/CAM Overview
- CNC Safety

14. Industrial Automation

Introduction

- Industrial automation uses mechanical, electrical, electronic, and computer-controlled systems to improve manufacturing efficiency, quality, and productivity.
- Topics Covered:
- Automation Concepts
- Sensors
- Actuators
- PLC Basics
- Industrial Robots
- Automated Production Systems
- Industry 4.0 Overview

15. Lean Manufacturing and TPM

Introduction

- Lean Manufacturing and Total Productive Maintenance (TPM) are modern industrial approaches aimed at improving productivity, eliminating waste, reducing downtime, and enhancing equipment effectiveness.
- Topics Covered:
- Lean Manufacturing
- 5S System
- Kaizen
- TPM
- OEE (Overall Equipment Effectiveness)
- Waste Reduction
- Continuous Improvement

16. Industrial Safety and Environmental Protection

Introduction

- Advanced industrial operations require strict adherence to safety regulations and environmental protection practices to prevent accidents and promote sustainable manufacturing.

Topics Covered:

- Advanced Safety Practices
- Lockout/Tagout (LOTO)
- Risk Assessment
- Hazard Identification
- Fire Protection Systems
- Pollution Control
- Waste Management
- Environmental Regulations

Learning Outcomes

- After completing IF-2001: Advanced Trade Theory, the trainee will be able to:
- Apply advanced fitting principles in precision assembly and maintenance.
- Use precision measuring instruments for inspection and quality control.
- Understand limits, fits, tolerances, and interchangeability in manufacturing.
- Install, align, inspect, and maintain bearings, gears, shafts, and power transmission systems.
- Diagnose and rectify mechanical faults using systematic troubleshooting methods.
- Maintain hydraulic and pneumatic systems safely and efficiently.
- Apply preventive, predictive, and corrective maintenance techniques.
- Understand CNC machines, industrial automation, and modern manufacturing technologies.
- Implement quality assurance systems, lean manufacturing principles, and Total Productive Maintenance (TPM).
- Follow advanced industrial safety standards, environmental regulations, and professional engineering practices.

FT-2002: Advanced Workshop Calculation & Science

Introduction

- Advanced Workshop Calculation & Science is an important subject in the Second-Year ITI Fitter (CTS 2.0) curriculum. It enhances the trainee's knowledge of advanced mathematical calculations, engineering science, and mechanical principles required for precision fitting, machine maintenance, production, and quality control. The subject builds upon the concepts learned during the first year and develops the ability

to solve complex engineering problems encountered in modern manufacturing industries.

- In engineering workshops, accurate calculations are essential for machining, fitting, assembly, maintenance, inspection, and production planning. Every fitter must calculate dimensions, tolerances, cutting speeds, feed rates, material weight, power requirements, gear ratios, mechanical efficiency, pressure, force, and other engineering parameters. A strong understanding of applied science enables trainees to understand the behavior of engineering materials, heat treatment processes, fluid mechanics, electricity, hydraulics, pneumatics, and mechanical systems used in industries.
- The subject emphasizes the practical application of mathematics and scientific principles through numerical problems, industrial examples, engineering calculations, and workshop applications. It also develops logical thinking, analytical ability, and problem-solving skills required for troubleshooting and decision-making in engineering industries.
- Upon successful completion of this subject, trainees will be able to perform advanced engineering calculations, apply scientific principles in industrial operations, interpret engineering data accurately, and support precision manufacturing and maintenance activities.

Contents

1. Advanced Arithmetic and Engineering Calculations

Introduction

- Advanced arithmetic forms the basis of engineering calculations used in manufacturing, maintenance, estimation, and production planning. Accurate numerical calculations improve precision, productivity, and quality.
- Topics Covered:
 - Revision of Basic Arithmetic
 - Engineering Formulae
 - Percentage Applications
 - Ratio and Proportion
 - Engineering Estimation
 - Industrial Calculations
 - Problem Solving Techniques

2. Algebra and Engineering Equations

Introduction

- Algebra is widely used in engineering to solve unknown values, rearrange formulae, and perform technical calculations related to machine design and production.
- Topics Covered:
 - Algebraic Expressions
 - Linear Equations
 - Formula Transposition
 - Engineering Formula Applications
 - Mathematical Modelling

3. Geometry and Mensuration

Introduction

- Geometry and mensuration are used for calculating dimensions, areas, perimeters, volumes, and weights of engineering components during fabrication and machining.
- Topics Covered:
 - Plane Geometry
 - Solid Geometry
 - Area Calculations

- Volume Calculations
- Surface Area
- Weight Estimation
- Material Requirement Calculations

4. Trigonometry

Introduction

- Trigonometry is essential for engineering drawing, layout work, alignment, machine installation, fabrication, and angle calculations.
- Topics Covered:
- Trigonometric Functions
- Right Triangle Calculations
- Angle Measurement
- Height and Distance
- Engineering Applications
- Solution of Triangles

5. Engineering Mechanics

Introduction

- Engineering mechanics explains the effect of forces on bodies and machine components. Understanding mechanics is essential for machine design, maintenance, and safe operation.
- Topics Covered:
- Force
- Resultant Force
- Equilibrium
- Moment of Force
- Couple
- Centre of Gravity
- Friction
- Mechanical Advantage

6. Work, Power and Energy

Introduction

- Work, power, and energy are fundamental engineering concepts used in machine operation, lifting devices, and production equipment.
- Topics Covered:
- Mechanical Work
- Power
- Energy
- Efficiency
- Horsepower
- Mechanical Efficiency
- Industrial Applications

7. Strength of Materials

Introduction

- Strength of Materials explains how engineering materials behave under different types of loads. It helps fitters understand the safe use of machine components and structural members.
- Topics Covered:
- Stress
- Strain
- Elasticity
- Plasticity
- Tensile Strength

- Compressive Strength
- Shear Stress
- Factor of Safety

8. Heat and Heat Treatment

Introduction

- Heat treatment improves the mechanical properties of engineering materials. Understanding heat transfer and heat treatment processes is essential for manufacturing and maintenance.
- Topics Covered:
- Heat Transfer
- Thermal Expansion
- Annealing
- Normalizing
- Hardening
- Tempering
- Case Hardening
- Surface Hardening

9. Engineering Materials

Introduction

- Engineering materials are selected according to their mechanical, physical, and chemical properties. Proper material selection improves machine performance and durability.
- Topics Covered:
- Ferrous Materials
- Non-Ferrous Materials
- Alloy Steels
- Tool Steels
- Composite Materials
- Heat Resistant Materials
- Material Selection

10. Hydraulics and Fluid Mechanics

Introduction

- Hydraulic systems use fluid pressure to transmit power in industrial machines. Basic fluid mechanics helps trainees understand the operation of hydraulic equipment.
- Topics Covered:
- Pressure
- Pascal's Law
- Hydraulic Fluids
- Hydraulic Pumps
- Hydraulic Cylinders
- Hydraulic Power Transmission
- Fluid Flow Principles

11. Pneumatics

Introduction

- Pneumatic systems use compressed air to perform industrial operations. Understanding pneumatic principles is essential for automation and machine maintenance.
- Topics Covered:
- Compressed Air
- Air Pressure
- Pneumatic Cylinders
- Pneumatic Valves

- Air Compressors
- Pneumatic Circuits
- Industrial Applications

12. Electricity and Magnetism

Introduction

- Basic electrical knowledge helps fitters understand electrically operated machines, control systems, and maintenance procedures.
- Topics Covered:
- Electric Current
- Voltage
- Resistance
- Ohm's Law
- Power
- Magnetism
- Electromagnetism
- Electrical Safety

13. Power Transmission Calculations

Introduction

- Power transmission calculations help determine the speed, torque, and power required for mechanical systems and machine components.
- Topics Covered:
- Belt Drive Calculations
- Gear Ratio
- Pulley Ratio
- Chain Drive Calculations
- Shaft Speed
- Torque Calculation
- Mechanical Efficiency

14. Engineering Estimation

Introduction

- Engineering estimation involves calculating the quantity of materials, production time, labour requirements, and manufacturing costs before starting a job.
- Topics Covered:
- Material Estimation
- Weight Calculation
- Cost Estimation
- Time Calculation
- Labour Calculation
- Productivity Calculation
- Production Planning

15. Industrial Science Applications

Introduction

- Scientific principles are applied in every engineering workshop to improve manufacturing quality, machine performance, and production efficiency.
- Topics Covered:
- Scientific Method
- Machine Efficiency
- Friction Reduction
- Lubrication Principles
- Corrosion Prevention
- Energy Conservation
- Environmental Protection

16. Numerical Problems and Industrial Applications

Introduction

- Engineering calculations become meaningful when applied to real industrial situations. This section develops practical problem-solving abilities using workshop examples and industrial case studies.
 - Topics Covered:
 - Engineering Numericals
 - Workshop Calculations
 - Machine Shop Problems
 - Maintenance Calculations
 - Production Calculations
 - Industrial Case Studies
 - Practical Applications
-

Learning Outcomes

- After completing FT-2002: Advanced Workshop Calculation & Science, the trainee will be able to:
- Perform advanced engineering calculations accurately.
- Apply algebra, geometry, mensuration, and trigonometry to engineering problems.
- Calculate force, work, power, energy, stress, strain, and mechanical efficiency.
- Estimate material requirements, production time, and manufacturing costs.
- Understand the principles of hydraulics, pneumatics, electricity, and fluid mechanics.
- Apply heat treatment and material science concepts in workshop practice.
- Perform power transmission calculations for belts, gears, chains, and pulleys.
- Solve practical engineering numerical problems encountered in manufacturing and maintenance.
- Apply scientific principles to improve productivity, quality, and machine performance in industrial environments.
- Top of Form
- Bottom of Form

FT-2003: Advanced Engineering Drawing

Introduction

- Advanced Engineering Drawing is an important subject in the Second Year ITI Fitter (CTS 2.0) curriculum. It builds upon the basic drawing concepts learned during the first year and develops the trainee's ability to interpret, prepare, and apply complex engineering drawings used in manufacturing, assembly, maintenance, and inspection. Engineering drawing serves as the universal language of engineers, technicians, and skilled workers, enabling clear communication of design specifications, dimensions, tolerances, materials, and manufacturing instructions.
- Modern industries require fitters to read and understand detailed machine drawings, assembly drawings, sectional views, production drawings, piping layouts, hydraulic and pneumatic diagrams, and CAD-generated drawings. This subject equips trainees with the knowledge and skills required to interpret technical drawings accurately, visualize machine components, and perform fitting and assembly operations according to engineering standards.
- Advanced Engineering Drawing also introduces limits and tolerances, geometric dimensioning, welding symbols, surface finish symbols, machine component drawings, exploded views, piping drawings, and Computer-Aided Design (CAD) concepts. Through practical drawing exercises and industrial examples, trainees develop visualization skills, technical communication, and drawing interpretation abilities necessary for modern manufacturing industries.

- Upon successful completion of this subject, trainees will be able to read, interpret, and prepare advanced engineering drawings accurately, ensuring precision, quality, and efficiency in industrial operations.

Contents

1. Advanced Engineering Drawing Standards

Introduction

- Engineering drawings are prepared according to national and international standards to ensure uniformity and easy interpretation across industries. Understanding these standards helps fitters read and prepare technical drawings correctly.
- Topics Covered:
 - BIS Standards
 - ISO Standards
 - Drawing Sheet Sizes
 - Title Block
 - Revision Block
 - Drawing Conventions
 - Standard Symbols

2. Orthographic Projection (Advanced)

Introduction

- Orthographic projection represents three-dimensional objects using multiple two-dimensional views. Advanced projection techniques help trainees interpret complex machine components accurately.
- Topics Covered:
 - First Angle Projection
 - Third Angle Projection
 - Multi-View Drawings
 - Auxiliary Views
 - Hidden Details
 - Projection of Complex Components

3. Sectional Views

Introduction

- Sectional views reveal the internal construction of machine components that cannot be clearly shown in external views. These views simplify complex engineering drawings.
- Topics Covered:
 - Full Section
 - Half Section
 - Offset Section
 - Broken Section
 - Revolved Section
 - Removed Section
 - Cutting Plane Representation
 - Section Lining

4. Isometric Drawing and Isometric Projection

Introduction

- Isometric drawings provide a three-dimensional representation of engineering components. They improve visualization and help fitters understand machine parts before manufacturing or assembly.
- Topics Covered:
 - Isometric Axes
 - Isometric Scale

- Isometric View
- Isometric Projection
- Conversion from Orthographic to Isometric
- Combination of Solids

5. Development of Surfaces

Introduction

- Development of surfaces is used for preparing flat layouts of three-dimensional objects before fabrication. It is widely applied in sheet metal work, ducting, and pipe fabrication.
- Topics Covered:
- Development of Cylinder
- Cone Development
- Prism Development
- Pyramid Development
- Transition Pieces
- Elbows and Pipe Layouts

6. Machine Component Drawing

Introduction

- Machine component drawings provide complete manufacturing information for individual mechanical parts. These drawings include dimensions, tolerances, materials, and machining details.
- Topics Covered:
- Shafts
- Keys and Keyways
- Bearings
- Bushes
- Couplings
- Pulleys
- Gears
- Springs
- Fasteners

7. Assembly Drawing

Introduction

- Assembly drawings illustrate how individual machine parts fit together to form a complete assembly. They are essential for machine assembly, maintenance, and repair work.
- Topics Covered:
- Assembly Drawings
- Exploded Views
- Part Identification
- Assembly Sequence
- Bill of Materials (BOM)
- Dismantling Procedures

8. Limits, Fits and Tolerances

Introduction

- Limits, fits, and tolerances define the permissible variation in dimensions to ensure proper assembly, interchangeability, and functional performance of machine components.
- Topics Covered:
- Basic Size
- Limits
- Tolerance

- Fits
- Clearance Fit
- Transition Fit
- Interference Fit
- ISO Tolerance System
- Hole Basis System
- Shaft Basis System

9. Geometrical Dimensioning and Tolerancing (GD&T)

Introduction

- Geometrical Dimensioning and Tolerancing (GD&T) provides a standardized method for defining the allowable variation in the geometry of engineering components, improving manufacturing accuracy and quality.
- Topics Covered:
 - Datum
 - Straightness
 - Flatness
 - Circularity
 - Parallelism
 - Perpendicularity
 - Position Tolerance
 - Concentricity
 - Run-out

10. Surface Finish Symbols

Introduction

- Surface finish symbols specify the required quality of machined surfaces. These symbols guide manufacturing processes and ensure proper performance of machine components.
- Topics Covered:
 - Surface Roughness
 - Machining Symbols
 - Surface Texture
 - Roughness Values
 - Surface Finish Standards
 - Manufacturing Requirements

11. Welding Symbols

Introduction

- Welding symbols provide standardized instructions for welded joints on engineering drawings. They communicate welding requirements clearly to fabricators and fitters.
- Topics Covered:
 - Basic Welding Symbols
 - Fillet Weld
 - Butt Weld
 - Groove Weld
 - Plug Weld
 - Spot Weld
 - Welding Positions
 - Weld Size and Length

12. Hydraulic and Pneumatic Circuit Drawings

Introduction

- Hydraulic and pneumatic circuit diagrams use standardized symbols to represent fluid power systems. Reading these diagrams is essential for installation, troubleshooting, and maintenance.

- Topics Covered:
- Hydraulic Symbols
- Pneumatic Symbols
- Pumps
- Compressors
- Cylinders
- Valves
- Flow Control Devices
- Circuit Interpretation

13. Piping and Plant Layout Drawings

Introduction

- Piping drawings represent the arrangement of pipelines and equipment in industrial plants. They help fitters install and maintain piping systems accurately.
- Topics Covered:
- Pipe Layout
- Pipe Fittings
- Flow Direction
- Valves
- Flanges
- Supports
- Piping Symbols
- Plant Layout

14. Computer-Aided Design (CAD) Basics

Introduction

- Computer-Aided Design (CAD) is widely used in modern industries to prepare accurate engineering drawings. Basic CAD knowledge helps trainees understand digital drafting techniques.
- Topics Covered:
- Introduction to CAD
- CAD Software Interface
- Drawing Commands
- Editing Commands
- Layers
- Dimensioning
- Printing Drawings
- CAD Applications

15. Reading and Interpretation of Industrial Drawings

Introduction

- The ability to interpret industrial drawings enables fitters to manufacture, assemble, inspect, and maintain engineering components according to design specifications.
- Topics Covered:
- Reading Assembly Drawings
- Machine Component Identification
- Material Specifications
- Dimensional Interpretation
- Tolerance Reading
- Surface Finish Interpretation
- Welding Symbol Interpretation
- Inspection Notes

16. Industrial Drawing Projects

Introduction

- Industrial drawing projects provide practical experience in preparing and interpreting engineering drawings based on real industrial applications. These projects improve technical knowledge and drawing proficiency.
- Topics Covered:
- Machine Part Drawings
- Assembly Drawings
- Exploded Views
- Fabrication Drawings
- Pipe Layout Drawings
- CAD Practice
- Drawing Documentation

Learning Outcomes

- After completing IF-2003: Advanced Engineering Drawing, the trainee will be able to:
- Interpret advanced engineering drawings prepared according to BIS and ISO standards.
- Prepare orthographic, sectional, isometric, and assembly drawings accurately.
- Read and apply limits, fits, tolerances, and GD&T symbols in engineering drawings.
- Interpret machine component, piping, hydraulic, pneumatic, and fabrication drawings.
- Understand surface finish symbols, welding symbols, and conventional engineering symbols.
- Read assembly drawings and prepare Bill of Materials (BOM) for machine assemblies.
- Use basic CAD concepts for preparing and modifying engineering drawings.
- Visualize complex machine components and assemblies from engineering drawings.
- Apply engineering drawing knowledge effectively during manufacturing, fitting, inspection, installation, and maintenance operations in modern industries.
- Top of Form

FT-2004: Advanced Employability Skills

Introduction

- Advanced Employability Skills is an integral subject of the Second Year ITI Fitter (CTS 2.0) curriculum. It is designed to strengthen the professional, managerial, entrepreneurial, and interpersonal competencies required to succeed in today's highly competitive industrial environment. While technical expertise enables a fitter to perform engineering tasks, advanced employability skills help trainees communicate effectively, solve workplace problems, work collaboratively, adapt to technological changes, and progress in their careers.
- Modern industries seek employees who possess not only technical proficiency but also strong communication, leadership, teamwork, digital literacy, customer service, financial awareness, and professional ethics. This subject develops these competencies through practical activities such as group discussions, presentations, case studies, workplace simulations, project work, and problem-solving exercises.
- Advanced Employability Skills also introduce trainees to entrepreneurship, business management, innovation, quality culture, workplace safety, labour laws, environmental sustainability, Industry 4.0, and lifelong learning. These skills prepare trainees for employment, self-employment, supervisory roles, and continuous professional development.
- Upon successful completion of this subject, trainees will be able to communicate professionally, lead teams, solve workplace challenges, manage resources effectively,

understand business opportunities, and contribute positively to organizational growth and industrial productivity.

Contents

1. Professional Communication Skills

Introduction

- Professional communication is essential for effective interaction with supervisors, colleagues, customers, suppliers, and management. Clear communication improves workplace productivity, reduces misunderstandings, and strengthens professional relationships.
- Topics Covered:
 - Advanced Verbal Communication
 - Written Communication
 - Business Email Writing
 - Report Writing
 - Technical Documentation
 - Presentation Skills
 - Public Speaking
 - Active Listening
 - Workplace Communication

2. Advanced English for Industry

Introduction

- English is widely used in engineering industries for technical manuals, operating procedures, quality documents, meetings, and customer interactions. Advanced English skills improve employability and career growth.
- Topics Covered:
 - Technical Vocabulary
 - Business Communication
 - Reading Technical Manuals
 - Workplace Conversations
 - Grammar Review
 - Professional Writing
 - Interview Communication
 - Presentation Techniques

3. Digital Literacy and Information Technology

Introduction

- Digital technologies are an essential part of modern industries. Employees should be able to use computers, software applications, online platforms, and digital tools efficiently.
- Topics Covered:
 - MS Word
 - MS Excel
 - MS PowerPoint
 - Internet Applications
 - Email Management
 - Cloud Computing Basics
 - Digital Collaboration Tools
 - Cyber Security
 - Data Management

4. Entrepreneurship Development

Introduction

- Entrepreneurship encourages trainees to establish and manage their own businesses. It develops innovative thinking, leadership, business planning, and decision-making skills.
- Topics Covered:
- Entrepreneurship Concepts
- Business Opportunity Identification
- Business Plan Preparation
- Startup Ecosystem
- MSME Registration
- Government Schemes
- Marketing Strategies
- Business Ethics

5. Financial Literacy and Business Management

Introduction

- Financial literacy helps trainees manage personal and business finances effectively. Understanding budgeting, banking, taxation, and financial planning is essential for economic stability.
- Topics Covered:
- Personal Finance
- Budget Preparation
- Banking Services
- Digital Payments
- GST Basics
- Income Tax Basics
- Cost Management
- Investment Planning

6. Leadership and Team Management

Introduction

- Leadership and teamwork are essential for achieving organizational goals. Effective leaders motivate team members, resolve conflicts, and improve workplace performance.
- Topics Covered:
- Leadership Styles
- Team Building
- Delegation
- Motivation
- Conflict Management
- Decision Making
- Coordination
- Workplace Collaboration

7. Critical Thinking and Problem Solving

Introduction

- Modern industries require employees who can analyze situations, identify problems, and implement effective solutions using logical and systematic approaches.
- Topics Covered:
- Analytical Thinking
- Root Cause Analysis
- Decision Making
- Creative Thinking
- Brainstorming

- Continuous Improvement
- Workplace Problem Solving

8. Quality Management Systems

Introduction

- Quality management ensures that products and services meet customer expectations and comply with national and international standards.
- Topics Covered:
 - Quality Concepts
 - Quality Assurance
 - Quality Control
 - ISO 9001 Basics
 - Six Sigma Overview
 - Total Quality Management (TQM)
 - Continuous Improvement

9. Workplace Ethics and Professional Conduct

Introduction

- Professional ethics guide employees in maintaining honesty, integrity, responsibility, and discipline at the workplace. Ethical behavior builds trust and improves organizational culture.
- Topics Covered:
 - Professional Ethics
 - Integrity
 - Accountability
 - Workplace Discipline
 - Confidentiality
 - Respect for Diversity
 - Organizational Values
 - Code of Conduct

10. Occupational Health, Safety and Environment (OHSE)

Introduction

- A safe and healthy workplace reduces accidents, protects employees, and ensures compliance with industrial safety regulations. Environmental protection is equally important for sustainable industrial development.
- Topics Covered:
 - Occupational Health
 - Workplace Safety
 - Risk Assessment
 - Hazard Control
 - Personal Protective Equipment (PPE)
 - Fire Safety
 - Emergency Response
 - Environmental Management

11. Labour Laws and Industrial Relations

Introduction

- Knowledge of labour laws and industrial relations helps employees understand their rights, responsibilities, and legal obligations while maintaining healthy employer–employee relationships.
- Topics Covered:
 - Labour Laws
 - Employee Rights
 - Industrial Relations
 - Social Security

- Wages and Benefits
- Working Hours
- Grievance Handling
- Workplace Policies

12. Customer Relationship Management

Introduction

- Customer satisfaction is essential for business success. Employees should understand customer needs, provide quality service, and maintain professional relationships.
- Topics Covered:
- Customer Service
- Complaint Handling
- Communication with Customers
- Service Quality
- Customer Satisfaction
- Professional Behaviour
- Business Etiquette

13. Industry 4.0 and Emerging Technologies

Introduction

- Modern industries are adopting advanced digital technologies such as automation, artificial intelligence, robotics, and the Internet of Things (IoT). Understanding these concepts prepares trainees for future industrial environments.
- Topics Covered:
- Industry 4.0 Concepts
- Automation
- Internet of Things (IoT)
- Artificial Intelligence (AI)
- Robotics
- Smart Manufacturing
- Digital Transformation
- Future Skills

14. Career Development and Interview Preparation

Introduction

- Career development helps trainees prepare for employment opportunities, promotions, and long-term professional growth through effective planning and continuous learning.
- Topics Covered:
- Career Planning
- Resume Preparation
- Cover Letter Writing
- Job Search Techniques
- Interview Skills
- Group Discussion
- Personality Development
- Time Management

15. Lifelong Learning and Professional Development

Introduction

- Continuous learning is essential for adapting to changing technologies and industry requirements. Lifelong learning supports career advancement and personal growth.
- Topics Covered:
- Self-Learning
- Professional Development
- Skill Upgradation

- Adaptability
- Innovation
- Emotional Intelligence
- Stress Management
- Goal Setting

16. Project Work and Workplace Case Studies

Introduction

- Project work and workplace case studies provide opportunities to apply employability skills in practical situations. These activities strengthen analytical thinking, teamwork, communication, and leadership.
- Topics Covered:
 - Workplace Projects
 - Industrial Case Studies
 - Team Assignments
 - Problem Analysis
 - Presentation of Findings
 - Report Preparation
 - Project Evaluation

Learning Outcomes

- After completing FT-2004: Advanced Employability Skills, the trainee will be able to:
- Communicate effectively in professional and industrial environments.
- Prepare technical reports, business emails, resumes, and presentations.
- Use digital tools and office software efficiently.
- Demonstrate leadership, teamwork, and workplace coordination skills.
- Apply problem-solving and critical-thinking techniques to workplace situations.
- Understand entrepreneurship concepts and prepare basic business plans.
- Manage personal and business finances responsibly.
- Follow workplace ethics, labour laws, and occupational health, safety, and environmental (OHSE) practices.
- Understand Industry 4.0 technologies and adapt to modern industrial workplaces.
- Plan career growth through lifelong learning, continuous skill development, and professional conduct.
- Bottom of Form

FT-2005: Advanced Trade Practical / Shop Work

Introduction

- Advanced Trade Practical / Shop Work is the most important practical subject in the Second-Year ITI Fitter (CTS 2.0) curriculum. It provides trainees with advanced hands-on training in precision fitting, machine assembly, installation, maintenance, fault diagnosis, inspection, and repair of mechanical systems used in modern engineering industries. This subject builds upon the practical skills acquired during the first year and prepares trainees to perform complex industrial tasks independently with confidence, accuracy, and efficiency.
- The primary objective of Advanced Trade Practical is to develop the technical competence, problem-solving ability, and professional work habits required for employment in manufacturing industries, maintenance workshops, automobile industries, fabrication plants, power stations, refineries, railways, heavy engineering industries, and machine tool industries.
- During practical training, trainees learn to perform precision fitting operations, align rotating equipment, install bearings, assemble gearboxes, maintain hydraulic and pneumatic systems, inspect machine components, troubleshoot mechanical faults, and carry out preventive and predictive maintenance. Emphasis is also given to quality

control, industrial safety, documentation, teamwork, and modern manufacturing practices.

- The practical exercises simulate real industrial working conditions, enabling trainees to integrate theoretical knowledge with practical applications while following engineering standards, safety regulations, and quality management systems.
- Upon successful completion of this subject, trainees will be able to perform advanced fitting, assembly, maintenance, inspection, and troubleshooting operations independently, ensuring reliability, productivity, and safety in industrial environments.
- Contents

1. Workshop Safety and Industrial Practices

Introduction

- Industrial workshops require strict adherence to safety regulations, safe operating procedures, and workplace discipline. Trainees learn advanced safety practices to prevent accidents and maintain a safe working environment.
- Topics Covered:
- Industrial Safety Rules
- Personal Protective Equipment (PPE)
- Lockout/Tagout (LOTO)
- Fire Prevention
- Emergency Response
- Hazard Identification
- Risk Assessment
- Good Housekeeping (5S)

2. Precision Measuring and Inspection

Introduction

- Precision measurement is essential for maintaining dimensional accuracy and quality in manufacturing. Advanced measuring instruments are used to inspect machine components according to engineering standards.
- Topics Covered:
- Vernier Height Gauge
- Dial Test Indicator
- Bore Gauge
- Telescopic Gauge
- Slip Gauges
- Sine Bar
- Surface Plate Inspection
- Instrument Calibration

3. Precision Bench Fitting

Introduction

- Precision bench fitting develops high levels of accuracy and workmanship by performing advanced manual fitting operations on engineering components.
- Topics Covered:
- Precision Filing
- Scraping
- Lapping
- Honing
- Precision Drilling
- Reaming
- Internal Threading
- External Threading
- Surface Finishing

4. Machine Assembly and Disassembly

Introduction

- Machine assembly and disassembly involve fitting mechanical components together according to engineering drawings and maintenance procedures. Correct assembly improves machine performance and reliability.
- Topics Covered:
- Gearbox Assembly
- Bearing Assembly
- Shaft Assembly
- Coupling Assembly
- Pulley Assembly
- Machine Dismantling
- Machine Reassembly
- Assembly Inspection

5. Bearings Installation and Maintenance

Introduction

- Bearings support rotating shafts and reduce friction. Proper installation, lubrication, alignment, and maintenance are essential for efficient machine operation.
- Topics Covered:
- Bearing Identification
- Bearing Mounting
- Bearing Dismounting
- Bearing Heating Methods
- Bearing Lubrication
- Bearing Inspection
- Bearing Failure Analysis

6. Power Transmission Systems

Introduction

- Power transmission systems transfer mechanical power between machine components. Practical training develops skills in installation, alignment, adjustment, and maintenance.
- Topics Covered:
- Belt Drive Installation
- Chain Drive Assembly
- Gear Drive Alignment
- Coupling Alignment
- Pulley Installation
- Shaft Alignment
- Power Transmission Inspection

7. Hydraulic System Practice

Introduction

- Hydraulic systems are widely used in heavy industrial machinery. Practical exercises develop the skills required for assembling, operating, maintaining, and troubleshooting hydraulic systems.
- Topics Covered:
- Hydraulic Pump Assembly
- Hydraulic Cylinders
- Hydraulic Valves
- Hydraulic Hose Connections
- Hydraulic Circuit Testing

- Pressure Measurement
- Leak Detection
- Hydraulic Maintenance

8. Pneumatic System Practice

Introduction

- Pneumatic systems use compressed air to operate industrial machines and automation equipment. Trainees learn installation, operation, maintenance, and troubleshooting of pneumatic systems.
- Topics Covered:
- Air Compressor
- FRL Unit
- Pneumatic Cylinders
- Pneumatic Valves
- Pneumatic Circuit Assembly
- Air Line Connections
- Leak Testing
- Pneumatic Maintenance

9. Preventive and Predictive Maintenance

Introduction

- Preventive and predictive maintenance reduce machine breakdowns and improve equipment reliability through planned inspections and condition monitoring.
- Topics Covered:
- Machine Inspection
- Lubrication Schedule
- Alignment Check
- Vibration Observation
- Condition Monitoring
- Maintenance Planning
- Maintenance Documentation

10. Mechanical Fault Diagnosis

Introduction

- Mechanical fault diagnosis develops the ability to identify, analyze, and rectify faults in machine components using systematic troubleshooting techniques.
- Topics Covered:
- Bearing Faults
- Gear Faults
- Shaft Misalignment
- Belt Slippage
- Coupling Defects
- Noise Analysis
- Vibration Analysis
- Root Cause Identification

11. Machine Tool Practice

Introduction

- Machine tool practice provides practical experience in operating workshop machines safely and accurately for manufacturing and maintenance work.
- Topics Covered:
- Drilling Machine
- Bench Grinder
- Lathe Machine (Basic Operations)
- Milling Machine (Demonstration)
- Grinding Operations

- Tool Sharpening
- Machine Maintenance

12. Quality Control and Inspection

Introduction

- Quality inspection ensures that manufactured and assembled components meet specified dimensions, tolerances, and performance standards.
- Topics Covered:
 - Dimensional Inspection
 - Tolerance Verification
 - Surface Finish Inspection
 - Functional Testing
 - Quality Documentation
 - Acceptance Criteria
 - Defect Identification

13. Pipe Fitting and Fabrication

Introduction

- Pipe fitting involves cutting, threading, bending, assembling, and testing piping systems used for industrial fluid transportation.
- Topics Covered:
 - Pipe Cutting
 - Pipe Threading
 - Pipe Bending
 - Pipe Joint Assembly
 - Flange Fitting
 - Leak Testing
 - Pipe Alignment

14. CNC and Modern Workshop Practices

Introduction

- Modern workshops increasingly use CNC machines and automated systems. Trainees are introduced to basic CNC operations and modern manufacturing practices.
- Topics Covered:
 - CNC Machine Familiarization
 - CNC Safety
 - Machine Coordinates
 - Tool Holding
 - Basic CNC Demonstration
 - CAD/CAM Awareness
 - Automation Concepts

15. Industrial Project Work

Introduction

- Industrial project work allows trainees to apply their technical knowledge and practical skills to complete real-world engineering tasks. Projects enhance planning, teamwork, documentation, and technical problem-solving abilities.
- Topics Covered:
 - Machine Assembly Project
 - Maintenance Project
 - Fabrication Project
 - Inspection Project
 - Project Planning
 - Documentation
 - Project Presentation

16. Industrial Training and Documentation

Introduction

Industrial documentation is essential for maintenance planning, quality assurance, and production management. Trainees learn to prepare technical records according to industry practices.

- Topics Covered:
- Job Cards
- Maintenance Records
- Inspection Reports
- Service Reports
- Work Permits
- Production Records
- Quality Checklists

Learning Outcomes

- After completing IF-2005: Advanced Trade Practical / Shop Work, the trainee will be able to:
- Follow advanced industrial safety procedures and good workshop practices.
- Use precision measuring instruments for inspection and quality control.
- Perform precision fitting, scraping, lapping, honing, drilling, reaming, and threading operations.
- Assemble, dismantle, align, and maintain machine components and mechanical systems.
- Install and maintain bearings, gears, shafts, couplings, and power transmission systems.
- Assemble, operate, inspect, and troubleshoot hydraulic and pneumatic systems.
- Perform preventive and predictive maintenance to improve machine reliability.
- Diagnose and rectify mechanical faults using systematic troubleshooting methods.
- Carry out quality inspection and prepare technical documentation according to industrial standards.
- Execute industrial project work independently while demonstrating professionalism, teamwork, technical competence, and adherence to engineering standards and safety regulations.
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