



**GOVT.TOOL ROOM & TRAINING CENTRE**

**SEMESTER: THIRD**

**Course: DIPLOMA IN TOOL & DIE MAKING**

**Syllabus -Theory and practical Subjects**

SL. NO	CODE	SUBJECTS	Contact Hours/Week	Contact Hours/Semester
1	DTDM-IIIS301	Production Technology – III (Milling)	3	64
2	DTDM-IIIS302	E M & SOM	3	64
3	DTDM-IIIS303	Engineering Metrology	3	64
4	DTDM-IIIS304	Material Technology-1	3	64
<b>Practical</b>				
5	DTDM-IIIS305	Engineering Drawing – III(Assembly)	4	94
6	DTDM-IIIS306	CAD Lab – I (Solid Works)	3	64
7	DTDM-IIIS307	Work Shop – III	21	386

**Scheme of Examination**

**Course: DIPLOMA IN TOOL & DIE MAKING**

SL. No	Sub. Code	Subjects	Contact Hours per Week	Exam Duration	Scheme of Examination				Total Marks	Min marks for passing
					Exam		Internal Assessment			
					Max	Min	Max	Min		
					Marks	Marks	Marks	Marks		
1	DTDM-IIIS301	Production Technology – III (Milling)	3	3	100	50	20	10	120	60
2	DTDM-IIIS302	E M & SOM	3	3	100	50	20	10	120	60
3	DTDM-IIIS303	Engineering Metrology	2	3	100	50	20	10	120	60
4	DTDM-IIIS304	Material Technology-1	2	3	100	50	20	10	120	60
<b>Practical</b>										
5	DTDM-IIIS305	Engineering Drawing – III(Assembly)	4	4	100	50	20	10	120	60
6	DTDM-IIIS306	CAD Lab – I (Solid Works)	3	3	100	50	20	10	120	60
7	DTDM-IIIS307	Work Shop – III	21	10	900	540	100	60	1000	600
Total			40	---	1400	790	200	110	1600	900

## **PRODUCTION TECHNOLOGY-III (MILLING)**

**SUBJECT CODE:** DTDM-IIIS301

**Contact Hrs. /Week: 3**

**Contact Hrs. / Semester: 64**

### **SPECIFIC INSTRUCTIONAL OBJECTIVES:**

1. General safety
  - Safety precautions
2. Classifications of Milling
  - Definition
  - Types and parts description
3. Specification and Work Holding devices
  - Specification and example
  - Work Holding Devices
  - T- bolts and clamps
  - Angle plates
  - V-blocks
  - Vices
  - Special fixtures
4. Milling cutters
  - Definition
  - Types of cutters
  - Cutters geometry
  - Nomenclature of plain milling cutter
  - Nomenclature of side milling cutter
5. Tool holding device
  - Arber
  - collets
  - Adaptor
  - Spring collets
  - Bolted cutters
6. Milling operations
  - Plain milling and Face milling
  - Side milling and Straddle milling
  - Angular milling and Gang milling
  - Form milling and Profile milling
  - End milling and Saw milling
  - Milling key ways , grooves and slots
  - Gear cutting and Helical milling
  - Cam milling and Thread milling

## 7. Dividing Head and Rotary table

- Definition
- Working process and applications of dividing head
- Definition of rotary table
- Working process and applications of rotary table

## 8. Indexing and methods of indexing

- Definition
- Direct or rapid indexing
- Plane or simple indexing
- Compound indexing
- Differential indexing
- Angular indexing

## 9. Milling attachment

- Vertical milling attachment
- Universal milling attachment
- High speed milling attachment
- Slotting attachment
- Universal spiral milling attachment
- Rack milling attachment
- Circular milling attachment
- Dividing head milling attachment

## 10. Problems and Machining time calculations

- Definition of speed, feed and Depth of cut
- Machining time calculations

## 11. Coolant

- Necessity of coolant
- Mixing ratio

## 12. Safety

- Safety precautions

## ENGINEERING MECHANICS & STRENGTH OF MATERIALS

### SUBJECT CODE: TDM 302

Contact Hrs. /Week: 3

Contact Hrs. / Semester: 64

- 1. INTRODUCTION TO ENGINEERING MECHANICS AND STRENGTH OF MATERIALS**
  - 1.1 Introduction to Engineering Mechanics & SOM
  - 1.2 Scalar & Vector quantities.
- 2. FORCE ANALYSIS**
  - 2.1 Composition & Resolution of forces – Force, examples of force, effect, characteristics of a force, system of forces, Resultant force, methods for the resultant force and simple problems.
  - 2.2 Parallelogram law of forces and simple problems.
  - 2.3 Triangle law of forces
  - 2.4 Polygon law of forces
  - 2.5 Equilibrium of forces – Introduction, principles of equilibrium, lami's theorem, (with proof) Types of equilibrium.
- 3. CENTRE OF GRAVITY**
  - 3.1 Centre of gravity, methods of finding centre of gravity and axis of reference.
  - 3.2 Centre of gravity of symmetrical unsymmetrical plane figures & cut out hole sections.
  - 3.3 Simple problems.
- 4. SIMPLE STRESSES & STRAINS**
  - 4.1 Elasticity, stress, types of stress, strain.
  - 4.2 Elastic limit, Hooke's law, modulus of elasticity, factor of safety, working stress & ultimate stress. With stress-strain Diagram.
  - 4.3 Deformation of a body due to force acting on it.
  - 4.4 Simple problems.
  - 4.5 Volumetric strain of a rectangular body subjected to an axial force and 3 mutually perpendicular forces.
  - 4.6 Elastic constants, linear strain, lateral strain, volumetric strain & Poisson's ratio.
  - 4.7 Bulk modulus, relation between bulk modulus & young's modulus (with proof).
  - 4.8 Shear stress, shear strain & modulus of rigidity.
  - 4.9 Relation between modulus of elasticity & modulus of rigidity (with proof).
  - 4.10 Simple problems.
  - 4.11 Stresses in Bars of varying Cross sections & Simple Problems.

## **5. STRAIN ENERGY & IMPACT LOADING**

- 5.1 Introduction, resilience, proof resilience and modulus of resilience.
- 5.2 Types of loading.
- 5.3 Equation for strain energy stored in a body when the load is gradually applied.
- 5.4 Simple problems.
- 5.5 Equation for strain energy stored in a body when the load is suddenly applied.
- 5.6 Simple problems.

## **6. THICK AND THIN CYLINDERS**

- 6.1 Introduction to thin cylinders, stresses in thin cylindrical shells.
- 6.2 Expression for circumferential stress & longitudinal stresses (without proof).
- 6.3 Simple problems.
- 6.4 Design of thin cylinders with simple problems.
- 6.5 Simple problems.

## **7. TORSION:**

- 7.1 Torsion stress and strain
- 7.2 Theory of pure torsion
- 7.3 Angle of twist and shear strain – formulas
- 7.4 Equation for the strength of a shaft
- 7.5 Polar moment of inertia
- 7.6 Power transmitted by a shaft
- 7.7 Simple problems

### **REFERENCE BOOKS**

- 1. Engineering mechanics by R.S.Khurmi.
- 2. Strength of materials by R.S.Khurmi.
- 3. Applied Mechanics by S.S.Bhavikatti.
- 4. Strength of Materials by S.S.Bhavikatti.
- 5. Applied Mechanics & Strength of Materials by S.Ramamrutham.
- 6. Applied Mechanics & Strength of Materials by I.B.Prasad.

## **ENGINEERING DRAWING (ASSEMBLY)**

**SUBJECT CODE:** DTDM-IIIS305

**Contact Hrs. /Week: 4**

**Contact Hrs. / Semester: 94**

### 1. ASSEMBLY AND DETAIL DRAWINGS

- Review previously done assemblies.
- Concept of assembly drawings from the given part drawings.
- Indication and interpretation of surface roughness symbols as per IS 696:1972.
- Indication of fits and tolerances in assembly drawings.

### 2. Preparation of assembly drawings and parts list for the following:

- Leaf Drill Jig
- Universal Coupling
- Tool Head of shaping Machine
- Lathe slide rest
- Tail Stock
- Machine Swivel Vice
- Machine Vice
- Swivel Bearing
- Knuckle Joint
- 2 Stage Progressive Tool
- Blanking Tool

### **Reference books –**

Machine Drawing by KRG & N D Bhatt, Engineering Drawing by KRG & N D Bhatt.  
Engineering drawing with problems & solutions by K R Hart, Engineering drawing  
for mechanical trades by K L Narayana, P Kannaiah, K Venkata Reddy.  
Fundamentals of Engineering drawing by Warren J Luzadder, Jon M Duff

# **ENGINEERING METROLOGY**

**SUBJECT CODE:** DTDM-IIIS303

**Contact Hrs. /Week: 3**

**Contact Hrs. / Semester: 64**

## **1. STANDARDS OF MEASUREMENT**

- 1.1 Definition of Metrology
- 1.2 Objectives of Metrology
- 1.3 Definition of a standard
- 1.4 Need for standards
- 1.5 Imperial standard Yard
- 1.6 Airy points
- 1.7 International Prototype Meter
- 1.8 Types of Standards-Line, End and Wavelength standards
- 1.9 Subdivision of standards
- 1.10 Standardization and standardizing organizations

## **2. LIMITS, FITS AND TOLERANCES**

- 2.1 Concept of tolerances
- 2.2 Need for tolerances
- 2.3 Types of tolerances- Unilateral and Bilateral
- 2.4 Analysis of tolerances- Addition & Subtraction of tolerances
- 2.5 Accuracy & Precision
- 2.6 Interchangeability & Selective assembly
- 2.7 ISO representation of holes & shafts & basic terminology
- 2.8 Classes & grades of tolerances
- 2.9 Fits and types of fits
- 2.10 Hole basis and Shaft basis system
- 2.11 Gauges- plug & snap/ring gauges, Go & NOGO gauges
- 2.12 Maximum & Minimum metal condition
- 2.13 Taylors principle, Wear allowance and limitation of gauges  
Design problems
- 2.14 Brief description of form & positional tolerances

## **3. COMPARATORS**

- 3.1 Definition
- 3.2 Difference between comparators & measuring instruments
- 3.3 Mechanical comparators – Dial indicators & its advantages & disadvantages
- 3.4 General working principle of pneumatic comparators, advantages & disadvantages
- 3.5 Optical, Electrical & Electronic comparators

## **4. ANGULAR MEASUREMENTS**

- 4.1 Concept of Sine bars
- 4.2 Applications & limitations of sine bars
- 4.3 Sine table
- 4.4 Sine centre
- 4.5 Angle gauges
- 4.6 Problems on sine bar & Angle gauges

## **5. SURFACE ROUGHNESS**

- 5.1 Surface irregularities
- 5.2 Profile geometry
- 5.3 Terminology of a surface – Real surface, nominal surface, roughness, waviness, sampling length, lay, central line of profile, Ra value, RMS value

- 5.4 Indication of surface roughness
- 5.5 Measurement of surface finish by Tomlinson surface tester
- 5.6 Indirect inspection methods – Touch inspection, Visual inspection, Scratch inspection, Surface photographs, Microscopic inspection

## **6. MEASURING MACHINES**

- 6.1 Working principle of
- 6.2 Tool makers Microscope
- 6.3 Coordinate Measuring machines(CMM)

## **7. TOTAL QUALITY MANAGEMENT [TQM]**

- 7.1 Definition of TQM
- 7.2 Definition of quality and its characteristics
- 7.3 TQM concepts
- 7.4 Deming's philosophy
- 7.5 Principles of TQM
- 7.6 Benefits of TQM
- 7.7 TQM organization

## **8. LEADERSHIP**

- 8.1 Characteristics of TQM leaders
- 8.2 Role of TQM leadership
- 8.3 Continuous process improvement
- 8.4 The PDSA (Plan-Do-Study-Act) cycle
- 8.5 Six sigma ( $6\sigma$ ) quality

## **9. STATISTICAL PROCESS CONTROL**

- 9.1 Seven quality control tools
- 9.2 Process Capability
- 9.3 Defect v/s defective

## **10. RELIABILITY AND LIFE TESTING**

- 10.1 Definitions of Reliability, Life testing and Redundancy
- 10.2 Failure rate curve
- 10.3 Systems reliability – series and parallel configuration
- 10.4 Improvement factor

## **REFERENCE BOOKS:**

1. Engineering Metrology – R.K.Jain
2. A text book of Metrology – M.Mahajan
3. Engineering metrology –K.J. Hume
4. Engineering Metrology & Instrumentation –R.K.Rajput
5. Metrology & Quality control – P.G.Deshpande
6. Mechanical measurements – BeckwithMarangoni & Lienhard,Pearson Education,6<sup>th</sup> Ed,2006
7. Engineering Metrology – I.C. Gupta, Dhanpat Rai Publications,Delhi
8. Measurements Systems Application & Design – Ernest O, Doblin, Mc Graw hill book Co.
9. Total Quality Management by NVR Naidu
10. Total Quality Management By S D Ramachandra
11. Statistics by Mahajan
12. Statistics by Raj Mohan –volume 1 & 2



# **MATERIAL TECHNOLOGY - I**

**SUBJECT CODE:** DTDM-IIIS304

**Contact Hrs. /Week: 3**

**Contact Hrs. / Semester: 64**

## **1. INTRODUCTION TO METAL PROPERTIES & APPLICATION**

- 1.1. Definition of Material Technology, Classes of engineering materials – Metals & alloys, ceramics, organic substances
- 1.2. Metals – ferrous and non-ferrous metals
- 1.3. Different properties & behaviour of materials, Mechanical properties of materials – strength,
- 1.4. Elasticity, plasticity, ductility, malleability, brittleness, hardness, toughness, resilience, stiffness, fatigue
- 1.5. Crystalline structure of metal. Meaning of Structure
- 1.6. Crystal and crystallization
- 1.7. Space lattice and unit cell
- 1.8. Crystalline structure of metals – BCC, FCC, and HCP

## **2. FERROUS METAL & ITS MANUFACTURING PROCESS**

- 2.1. Pig iron – composition and structure
- 2.2. Allotropic changes of pure iron, Iron ore, Manufacture in blast furnace
- 2.3. Composition, fracture, properties and uses of pig iron
- 2.4. Cast Iron - composition and structure manufacture in cupola furnace
- 2.5. Composition, fracture, properties and uses of cast iron
- 2.6. Types of cast iron, Grey cast iron – properties and applications
- 2.7. White cast iron – properties and applications,
- 2.8. Malleable cast iron – properties and application
- 2.9. Alloy cast iron – need for alloying, properties and applications
- 2.10 Ductile cast iron – properties and applications
- 2.11 Wrought iron – composition and structure, properties and application

## **3. STEEL AND IT'S MANUFACTURING PROCESS**

- 3.1. Introduction to Steel, Application of Steel, Difference between cast iron and steel.
- 3.2. Manufacture of steel – Bessemer converter, open hearth furnace, electric arc furnace, high frequency induction furnace, crucible process, L-D process

## **4. CLASSIFICATION AND STRUCTURE OF STEEL**

- 4.1 Classification of steels – plain carbon and alloy steels, Plain carbon steels – properties,
- 4.2 Classification based on carbon content and their applications.
- 4.2 Effects of carbon on the mechanical properties
- 4.3 Derivation of Alloy steels, alloying elements & its effects,
- 4.4 Types of alloys steels – properties, applications of nickel steels, chromium steels, nickel-

- Chrome steels, vanadium steels, manganese steels, tungsten steels, silicon steels
- 4.5 Stainless steels.
- 4.6 Structure of steel – fractures of ferrite, pearlite and cementite

## **5. PLASTICS**

- 5.1 Definition of plastics
- 5.2 Monomers
- 5.3 Polymers
- 5.4 Polymerization
- 5.5 Advantages & disadvantages of plastics
- 5.6 Thermo setting
- 5.7 Thermo plastics
- 5.9 Transparent plastics

### **REFERENCE BOOKS:**

- 1 Heat treatment – Principles and techniques By T.V.Rajan, C.P.Sharma, Ashok Sharma
2. Material Science By R.B.Gupta
3. Material Science and processes By S.K.Hazra Chowdhary
4. Material Science and Metallurgy By O.P.Khanna
5. Westermann tables