



**CERTIFICATE COURSE IN CNC
TURNING & MILLING**



curriculum

**Ministry of Micro, Small and Medium
Enterprises, New Delhi
(MSME-Technology Centre)**

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Engineering Drawing-Theory

COURSE CODE: CCCTM-01

COURSE OUTCOMES:

After completion of course Student should be able to

- Describe and explain various Drawing Equipments.
- Understand of engineering Dimensioning method and their application.
- Explain and demonstrate four quadrants
- Explain the projection of points – front view, top view and side view
- Understand of Surface development of geometrical object.
- State Meaning of orthographic projection
- Distinguish between Isometric view and Isometric projections.
- Distinguish between temporary and permanent fastenings
- Preparation of assembly drawing and surface finish symbol

THEORY HOURS: 48

PRACTICAL HOURS: 48

THEORY MARKS: 40

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks
Unit I	Drawing equipments	After completion of unit Student should be able to <ul style="list-style-type: none"> • Use of Drawing Instrument and Purpose. • Use of different grade of Pencils • Under stand of drawing sheet lay out. • Explain and demonstrate use of scales. 	Explain the use of , Drawing board, T - square Set square, Mini drafter, Instrument box, Protractors, French curves Identify the different grades of pencils HB, H, 2H, 3H. Classify the different sizes of drawing sheets according to B.I.S. Describe the layout of Drawing sheets and their contents. Give idea about Letters and numerals Explain the use of scales – Enlarging, Reducing, full scale and representative fraction.	4	2
Unit II	Dimensioning Techniques	After completion of unit Student should be able to <ul style="list-style-type: none"> • Identify and use of different types of lines. • Use of co-ordinate dimensioning 	State the types of lines and their uses. Identify different dimensioning methods. Use Chain, parallel and combined dimensioning. Use aligned and unidirectional system of dimensioning in given situation.	4	2

		<ul style="list-style-type: none"> Understand of dimensioning Diameter, Radii, Chords, angles . 	Use co-ordinate dimensioning, methods of dimensioning Diameter, Radii, Chords, angles.			
Unit III	Recognize the points in various quadrants	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand of four quadrants. Use of different Plane Understand of front view, top view and side view 	<p>Explain all four quadrants</p> <p>Identify Horizontal plane, Vertical plane and Profile plane.</p> <p>Explain the projection of points – front view, top view and side view (both left and right).</p>	4	4	
Unit IV	Development of surfaces of objects	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Use of parallel line and radial line methods Understand of Development of surfaces with sections 	<p>Illustrate the Development of surfaces by parallel line and radial line methods</p> <p>Draw the development of surfaces of geometrical objects and utility objects</p> <p>Draw Development of surfaces with section plane inclined to HP and Perpendicular to VP</p> <p>Draw development of Solids resting completely on its base</p>	4	4	
Unit V	Orthographic projection of machine parts	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Meaning of orthographic projection 	<p>State Meaning of orthographic projection</p> <p>Draw elevation, plan and side elevation of the machine parts like stepped block, fork lever, bearing block, etc.</p>	4	4	
Unit VI	Isometric projection and views of solids and machine parts	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Distinguish between Isometric view and Isometric projections Understand of Use of different Isometric view of different geometrical objects and machine parts 	<p>Describe the use of Isometric scale</p> <p>Distinguish between Isometric view and Isometric projections</p> <p>To draw the Isometric view of different geometrical objects and machine parts</p> <p>Convert orthographic views into isometric view</p>	4	4	
Unit VII	Temporary fastenings used in engineering applications	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Use of Drawing Instrument and Purpose. Use of different grade of Pencils Understand of drawing sheet lay out. <p>Explain and demonstrate use of</p>	<p>Distinguish between temporary and permanent fastenings</p> <p>Draw the profiles of different screw threads</p> <p>Show the representation of screw threads with conventional symbols</p> <p>Draw the three views of hexagonal headed bolt with hexagonal nut</p> <p>Draw the two views of square headed bolt</p>	4	5	

		scales	with square nut			
Unit VIII	Preparation of assembly drawing	After completion of unit Student should be able to <ul style="list-style-type: none"> • Understand of assembly drawing • Identify parts of the assembly • Parts drawing 	hinge C-clamp Drill base and table Tool makers clamp Drill jig Plumber block, etc.	6	5	
Unit IX	Surface finish symbols	After completion of unit Student should be able to <ul style="list-style-type: none"> • Understand of symbols of surface finish. • Understand of machining allowance • Understand of special drawing instruction. 	Indication Special surface Direction of lay Machining allowance Position of symbol Symbols with inscriptions Additional indications	4	5	
Unit X	Preparation of detail drawing, assembly and part list	After completion of unit Student should be able to <ul style="list-style-type: none"> • Understand of drawing of Jigs & fixture. • Able to draw different parts of tools. 	Jigs & fixtures Screw jack Pipe vice Tail stock Swivel bearing Plumber block Machine vice Shaper tool head Machine elements	8	5	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Engineering Drawing-Theory

Course Code : CCCTM-01

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
46	-	02	40	-	40

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Engineering Drawing theory is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Engineering Drawing theory is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Engineering Drawing theory is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Describe and explain various Drawing Equipments.
2. Understand of engineering Dimensioning method and their application.
3. Explain and demonstrate four quadrants
4. Explain the projection of points – front view, top view and side view
5. Understand of Surface development of geometrical object.
6. State Meaning of orthographic projection
7. Distinguish between Isometric view and Isometric projections.
8. Distinguish between temporary and permanent fastenings
9. Preparation of assembly drawing and surface finish symbol

Theory: Engineering Drawing

Topic and Contents	Hours	Marks
<p>Topic 1: Drawing equipments</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Use of Drawing Instrument and Purpose. ➤ Use of different grade of Pencils ➤ Under stand of drawing sheet lay out. ➤ Explain and demonstrate use of scales. <p>Explain the use of, Drawing board, T - square Set square, Mini drafter, Instrument box, Protractors, French curves Identify the different grades of pencils HB, H, 2H, 3H. Classify the different sizes of drawing sheets according to B.I.S. Describe the layout of Drawing sheets and their contents. Give idea about Letters and numerals Explain the use of scales – Enlarging, Reducing, full scale and representative fraction.</p>	4	2
<p>Topic 2: Dimensioning Techniques</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Identify and use of different types of lines. ➤ Use of co-ordinate dimensioning ➤ Under stand of dimensioning Diameter, Radii, Chords, angles . <p>State the types of lines and their uses. Identify different dimensioning methods. Use Chain, parallel and combined dimensioning. Use aligned and unidirectional system of dimensioning in given situation. Use co-ordinate dimensioning, methods of dimensioning Diameter, Radii, Chords, angles.</p>	4	2
<p>Topic 3: Recognize the points in various quadrants</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand of four quadrants. ➤ Use of different Plane ➤ Understand of front view, top view and side view <p>Explain all four quadrants Identify Horizontal plane, Vertical plane and Profile plane. Explain the projection of points – front view, top view and side view (both left and right).</p>	4	4
<p>Topic 4: Development of surfaces of objects</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Use of parallel line and radial line methods ➤ Understand of Development of surfaces with sections <p>Illustrate the Development of surfaces by parallel line and radial line methods, Draw the development of surfaces of geometrical objects and utility objects, Draw Development of surfaces with section plane</p>	4	4

inclined to HP and Perpendicular to VP, Draw development of Solids resting completely on its base		
Topic 5: Orthographic projection of machine parts Objective: <ul style="list-style-type: none"> ➤ Meaning of orthographic projection State Meaning of orthographic projection, Draw elevation, plan and side elevation of the machine parts like stepped block, fork lever, bearing block, etc.	4	4
Topic 6: Isometric projection and views of solids and machine parts Objective: <ul style="list-style-type: none"> ➤ Distinguish between Isometric view and Isometric projections ➤ Understand of Use of different Isometric view of different geometrical objects and machine parts Describe the use of Isometric scale, Distinguish between Isometric view and Isometric projections, To draw the Isometric view of different geometrical objects and machine parts, Convert orthographic views into isometric view	4	4
Topic 7: Temporary fastenings used in engineering applications Objective: <ul style="list-style-type: none"> ➤ Use of Drawing Instrument and Purpose. ➤ Use of different grade of Pencils ➤ Under stand of drawing sheet lay out. ➤ Explain and demonstrate use of scales Distinguish between temporary and permanent fastenings, Draw the profiles of different screw threads, Show the representation of screw threads with conventional symbols, Draw the three views of hexagonal headed bolt with hexagonal nut, Draw the two views of square headed bolt with square nut	4	5
Topic 8: Preparation of assembly drawing Objective: <ul style="list-style-type: none"> ➤ Understand of assembly drawing ➤ Identify parts of the assembly ➤ Parts drawing Hinge, C-clamp, Drill base and table, Tool makers clamp, Drill jig, Plumber block, etc.	6	5
Topic 9: Surface finish symbols Objective: <ul style="list-style-type: none"> ➤ Understand of symbols of surface finish. ➤ Understand of machining allowance ➤ Under stand of special drawing instruction. Indication , Special surface, Direction of lay, Machining allowance, Position of symbol, Symbols with inscriptions, Additional indications	4	5
Topic 10: Preparation of detail drawing, assembly and part list Objective: <ul style="list-style-type: none"> ➤ Understand of drawing of Jigs & fixture. ➤ Able to draw different parts of tools. Jigs & fixtures , Screw jack, Pipe vice, Tail stock, Swivel bearing, Plumber block, Machine vice, Shaper tool head, Machine elements	8	5

Learning Resources:

1. Books: Engineering Drawing

Sl. No.	Author	Title	Publisher
1	A k Xavier and S Radhakrishnan	Text Book of Engg Drawing Se-I To IV	JKP
2	Neelkanth	ITI Workbook Engineering Drawing (Mechanical)	neelkantha
3	Neelkanth	ITI Workbook Engineering Drawing Mechanical Group	Neelkantha
4	N.D. Bhat/ panchal	Engineering Drawing	
5	M.L. Anwani	Basic Engineering Drawing	
6	N.D.Bhatt	Engineering Drawing	
7	Mali & Choudhari	Engineering Drawing	Runda
8	M.L.Ananwani	Basic Engineering Drawing	Dhanpatrai & Co.
9	M.L.Ananwani	Basic Engineering Drawing	Dhanpatrai & Co.
10	S. K. Arya	Engineering Drawing	Asian Publisher
11	A. K. Xavier	Engineering Drawing	J.K.P.Publications
12	Ghorleg	Engineering Drawing Work book	Ghorleg Publishing

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Engineering Drawing - Practical

COURSE CODE: CCCTM-02

COURSE OUTCOMES:

After completion of course Student should be able to

- Describe and explain various Drawing Equipments.
- Understand of engineering Dimensioning method and their application.
- Explain and demonstrate four quadrants
- Explain the projection of points – front view, top view and side view
- Understand of Surface development of geometrical object.
- State Meaning of orthographic projection
- Distinguish between Isometric view and Isometric projections.
- Distinguish between temporary and permanent fastenings
- Preparation of assembly drawing and surface finish symbol

THEORY HOURS: 48

PRACTICAL HOURS: 48

THEORY MARKS:

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
Unit I	Drawing equipments	After completion of unit Student should be able to <ul style="list-style-type: none"> • Use of Drawing Instrument and Purpose. • Use of different grade of Pencils • Under stand of drawing sheet lay out. • Explain and demonstrate use of scales. 	Explain the use of , Drawing board, T - square Set square, Mini drafter, Instrument box, Protractors, French curves Identify the different grades of pencils HB, H, 2H, 3H. Classify the different sizes of drawing sheets according to B.I.S. Describe the layout of Drawing sheets and their contents. Give idea about Letters and numerals Explain the use of scales – Enlarging, Reducing, full scale and representative fraction.	4	6	

Unit II	Dimensioning Techniques	After completion of unit Student should be able to <ul style="list-style-type: none"> • Identify and use of different types of lines. • Use of co-ordinate dimensioning • Under stand of dimensioning Diameter, Radii, Chords, angles. 	State the types of lines and their uses. Identify different dimensioning methods. Use Chain, parallel and combined dimensioning. Use aligned and unidirectional system of dimensioning in given situation. Use co-ordinate dimensioning, methods of dimensioning Diameter, Radii, Chords, angles.	4	6	
Unit III	Recognize the points in various quadrants	After completion of unit Student should be able to <ul style="list-style-type: none"> • Understand of four quadrants. • Use of different Plane • Understand of front view, top view and side view 	Explain all four quadrants Identify Horizontal plane, Vertical plane and Profile plane. Explain the projection of points – front view, top view and side view (both left and right).	4	6	
Unit IV	Development of surfaces of objects	After completion of unit Student should be able to <ul style="list-style-type: none"> • Use of parallel line and radial line methods • Understand of Developme 	Illustrate the Development of surfaces by parallel line and radial line methods Draw the development of surfaces of geometrical objects and utility objects Draw Development of surfaces with section plane inclined to HP and Perpendicular to VP Draw development of Solids resting completely on its base	4	6	

		nt of surfaces with sections			
Unit V	Orthographic projection of machine parts	After completion of unit Student should be able to <ul style="list-style-type: none"> • Meaning of orthographic projection 	State Meaning of orthographic projection Draw elevation, plan and side elevation of the machine parts like stepped block, fork lever, bearing block, etc.	4	6
Unit VI	Isometric projection and views of solids and machine parts	After completion of unit Student should be able to <ul style="list-style-type: none"> • Distinguish between Isometric view and Isometric projections • Understand of Use of different Isometric view of different geometrical objects and machine parts 	Describe the use of Isometric scale Distinguish between Isometric view and Isometric projections To draw the Isometric view of different geometrical objects and machine parts Convert orthographic views into isometric view	6	6
Unit VII	Temporary fastenings used in engineering applications	After completion of unit Student should be able to <ul style="list-style-type: none"> • Use of Drawing Instrument and Purpose. • Use of different grade of Pencils • Under stand of drawing 	Distinguish between temporary and permanent fastenings Draw the profiles of different screw threads Show the representation of screw threads with conventional symbols Draw the three views of hexagonal headed bolt with hexagonal nut Draw the two views of square headed bolt with square nut	4	6

		<p>sheet lay out.</p> <p>Explain and demonstrate use of scales</p>			
Unit VIII	Preparation of assembly drawing	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand of assembly drawing • Identify parts of the assembly • Parts drawing 	<p>hinge</p> <p>C-clamp</p> <p>Drill base and table</p> <p>Tool makers clamp</p> <p>Drill jig</p> <p>Plumber block, etc.</p>	6	6
Unit IX	Surface finish symbols	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand of symbols of surface finish. • Understand of machining allowance • Under stand of special drawing instruction. 	<p>Indication</p> <p>Special surface</p> <p>Direction of lay</p> <p>Machining allowance</p> <p>Position of symbol</p> <p>Symbols with inscriptions</p> <p>Additional indications</p>	4	6
Unit X	Preparation of detail drawing, assembly and part list	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand of drawing of Jigs & fixture. • Able to draw different parts of tools. 	<p>Jigs & fixtures</p> <p>Screw jack</p> <p>Pipe vice</p> <p>Tail stock</p> <p>Swivel bearing</p> <p>Plumber block</p> <p>Machine vice</p> <p>Shaper tool head</p> <p>Machine elements</p>	4	6

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Engineering Drawing-Practical

Course Code : CCCTM-02

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	44	04	-	60	60

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, “Skills to Transfer Skills”. To cope up this quality possession of core skills is imperative.

Ability to read Engineering Drawing Practical is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Engineering Drawing Practical is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Engineering Drawing practical is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Describe and explain various Drawing Equipments.
2. Understand of engineering Dimensioning method and their application.
3. Explain and demonstrate four quadrants

4. Explain the projection of points – front view, top view and side view
5. Understand of Surface development of geometrical object.
6. State Meaning of orthographic projection
7. Distinguish between Isometric view and Isometric projections.
8. Distinguish between temporary and permanent fastenings
9. Preparation of assembly drawing and surface finish symbol

Practical: Engineering Drawing

Topic and Contents	Hours	Marks
<p>Topic 1: Drawing equipments</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Use of Drawing Instrument and Purpose. ➤ Use of different grade of Pencils ➤ Under stand of drawing sheet lay out. ➤ Explain and demonstrate use of scales. <p>Explain the use of, Drawing board, T - square Set square, Mini drafter, Instrument box, Protractors, French curves Identify the different grades of pencils HB, H, 2H, 3H. Classify the different sizes of drawing sheets according to B.I.S. Describe the layout of Drawing sheets and their contents. Give idea about Letters and numerals Explain the use of scales – Enlarging, Reducing, full scale and representative fraction.</p>	4	6
<p>Topic 2: Dimensioning Techniques</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Identify and use of different types of lines. ➤ Use of co-ordinate dimensioning ➤ Under stand of dimensioning Diameter, Radii, Chords, angles . <p>State the types of lines and their uses. Identify different dimensioning methods. Use Chain, parallel and combined dimensioning. Use aligned and unidirectional system of dimensioning in given situation. Use co-ordinate dimensioning, methods of dimensioning Diameter, Radii, Chords, angles.</p>	4	6
<p>Topic 3: Recognize the points in various quadrants</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand of four quadrants. ➤ Use of different Plane ➤ Understand of front view, top view and side view <p>Explain all four quadrants Identify Horizontal plane, Vertical plane and Profile plane. Explain the projection of points – front view, top view and side view (both left and right).</p>	4	6
<p>Topic 4: Development of surfaces of objects</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Use of parallel line and radial line methods ➤ Understand of Development of surfaces with sections <p>Illustrate the Development of surfaces by parallel line and radial line methods, Draw the development of surfaces of geometrical objects and utility objects, Draw Development of surfaces with section plane inclined to HP and Perpendicular to VP, Draw development of Solids resting completely on its base</p>	4	6
<p>Topic 5: Orthographic projection of machine parts</p>	4	6

<p>Objective:</p> <ul style="list-style-type: none"> ➤ Meaning of orthographic projection <p>State Meaning of orthographic projection, Draw elevation, plan and side elevation of the machine parts like stepped block, fork lever, bearing block, etc.</p>		
<p>Topic 6: Isometric projection and views of solids and machine parts</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Distinguish between Isometric view and Isometric projections ➤ Understand of Use of different Isometric view of different geometrical objects and machine parts <p>Describe the use of Isometric scale, Distinguish between Isometric view and Isometric projections, To draw the Isometric view of different geometrical objects and machine parts, Convert orthographic views into isometric view</p>	6	6
<p>Topic 7: Temporary fastenings used in engineering applications</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Use of Drawing Instrument and Purpose. ➤ Use of different grade of Pencils ➤ Under stand of drawing sheet lay out. ➤ Explain and demonstrate use of scales <p>Distinguish between temporary and permanent fastenings, Draw the profiles of different screw threads, Show the representation of screw threads with conventional symbols, Draw the three views of hexagonal headed bolt with hexagonal nut, Draw the two views of square headed bolt with square nut</p>	4	6
<p>Topic 8: Preparation of assembly drawing</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand of assembly drawing ➤ Identify parts of the assembly ➤ Parts drawing <p>Hinge, C-clamp, Drill base and table, Tool makers clamp, Drill jig, Plumber block, etc.</p>	6	6
<p>Topic 9: Surface finish symbols</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand of symbols of surface finish. ➤ Understand of machining allowance ➤ Under stand of special drawing instruction. <p>Indication, Special surface, Direction of lay, Machining allowance, Position of symbol, Symbols with inscriptions, Additional indications</p>	4	6
<p>Topic 10: Preparation of detail drawing, assembly and part list</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand of drawing of Jigs & fixture. ➤ Able to draw different parts of tools. <p>Jigs & fixtures, Screw jack, Pipe vice, Tail stock, Swivel bearing, Plumber block, Machine vice, Shaper tool head, Machine elements</p>	4	6

Learning Resources:

Books: Engineering Drawing

Sl. No.	Author	Title	Publisher
1	A k Xavier and S Radhakrishnan	Text Book of Engg Drawing Se-I To IV	JKP
2	Neelkanth	ITI Workbook Engineering Drawing (Mechanical)	neelkantha
3	Neelkanth	ITI Workbook Engineering Drawing Mechanical Group	Neelkantha
4	N.D. Bhat/ panchal	Engineering Drawing	
5	M.L. Anwani	Basic Engineering Drawing	
6	N.D.Bhatt	Engineering Drawing	
7	Mali & Choudhari	Engineering Drawing	Runda
8	M.L.Ananwani	Basic Engineering Drawing	Dhanpatrai & Co.
9	M.L.Ananwani	Basic Engineering Drawing	Dhanpatrai & Co.
10	S. K. Arya	Engineering Drawing	Asian Publisher
11	A. K. Xavier	Engineering Drawing	J.K.P.Publications
12	Ghorleg	Engineering Drawing Work book	Ghorleg Publishing

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Engineering Metrology -Theory

COURSE CODE: CCCTM-03

COURSE OUTCOMES:

After completion of course Student should be able to

- Describe and explain various metrological terms like line standards, end standards , calibration etc
- Explain and demonstrate instruments like Slip gauges, photoelectric microscope
- Explain and demonstrate various gauges like NPL gauge
- Classify & describe various measuring machines like Floating carriage diameter measuring m/c etc
- Calibrate and explain Calibration of line standards
- Predict and examine various modes and types of errors and also the demonstration of devices used for measurement.
- Evaluate and do analysis of parameters of screw threads
- Determine and describe various methods of measurements of gear terminology

THEORY HOURS: 48

PRACTICAL HOURS:48

THEORY MARKS:40

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks
UNIT-I	Introduction to basic Metrology	After completion of unit Student should be able to <ul style="list-style-type: none"> • Describe and explain End and line standards. • Explain use and manufacturing of Slip gauges • Demonstrate and use of Slip gauges • Explain and demonstrate various gauges • Calibrate and explain Calibration of line standards 	End & line standards for length, Airy & Bessel points, Desirable features of end standards, slip gauge manufacture, calibration of end standards by interferometry. NPL gauge interferometer, calibration of line standards by micrometer microscope – superposition, coincidence and symmetric straddling, photoelectric microscope and Moir fringe techniques, measurement of large displacements using lasers, Photoelectric Autocollimator, calibration of polygons & circular scales. Types of interchangeability, dimensional chains	10	8

UNIT-II	Fixed & Indicating Gauges	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand Taylor's principles of gauge design • Explain and demonstrate various gauges • Understand and demonstrate comparators like multi angle, sigma comparators • Understand and explain use of LVDT 	<p>Taylor's principles of gauge design Limitations of ring & plug gauges, position and receiver gauges, types of indicating gauges. Comparators: Multi angle Sigma comparator, Back pressure and free flow type pneumatic comparators, Differential back pressure gauge, usage of different types of jets, contact & non-contact tooling. Amplification selection. Air to electric transducer, Differential transducer, Variation transducer, Preprocess, In-process & Post process gauging, computation & match gauging. Usage of LVDT & Capacitive type gauge heads, Automatic inspection</p>	10	8	
UNIT-III	Measuring Machines	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain various measuring machines • Demonstrate and explain Optical dividing head • Analyse the co-ordinate systems and its applications • Understand and explain Design principals of measuring machines 	<p>Floating carriage diameter measuring m/c. Universal measuring m/c. Matrix internal diameter measuring machine. Optical dividing head. Coordinate measuring machine, Optical projector-light beam systems, Work tables, measurement techniques, fixture & accessories. Sources of error in measurement. Design principles of measuring machines Abbe's rule, Kelvin coupling, flexible steel strip, advantages & limitations of hydrostatic & aerostatic bearings</p>	8	8	
UNIT-IV	Form Errors	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Evaluate straightness & flatness 	<p>Evaluation of straightness & flatness, usage of beam comparator, evaluation of roundness – intrinsic & extrinsic datums. Talyrond. PGC, RGC, MZC & LSC, methods, roundness evaluation for even & odd number of lobes. Surface Finish: stylus</p>	8	8	

		<ul style="list-style-type: none"> • Explain and demonstrate comparators • Evaluate roundness – intrinsic & extrinsic datum • Demonstrate the equipment for surface testing 	instrument (TALYSURF). M & E Systems, numerical assessment, vertical & horizontal descriptors, profile as a random process, usage of interferograms. Plastic replica technique			
UNIT-V	Screw Threads	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Evaluate and do analysis of parameters of screw threads • Identify and understand pitch errors • Determine and describe various methods of measurements of gear terminology 	Measurement of thread elements for internal & external threads, progressive periodic, drunkenness and irregular pitch errors. NPL pitch measuring machine, virtual effective diameter, thread gauging. Gears: measurement of tooth thickness, involute profile, pitch, concentricity and alignment, rolling gear test.	10	8	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Engineering Metrology -Theory

Course Code : CCCTM-03

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
46	-	02	40	-	40

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Engineering Metrology Theory is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Engineering Metrology Theory is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Engineering Metrology Theory is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Describe and explain various metrological terms like line standards ,end standards , calibration etc
2. Explain and demonstrate instruments like Slip gauges, photoelectric microscope
3. Explain and demonstrate various gauges like NPL gauge
4. Classify & describe various measuring machines like Floating carriage diameter measuring m/c etc
5. Calibrate and explain Calibration of line standards
6. Predict and examine various modes and types of errors and also the demonstration of devices used for measurement.
7. Evaluate and do analysis of parameters of screw threads
8. Determine and describe various methods of measurements of gear terminology

Theory: Engineering Metrology

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to basic Metrology</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Describe and explain End and line standards. ➤ Explain use and manufacturing of Slip gauges ➤ Demonstrate and use of Slip gauges ➤ Explain and demonstrate various gauges ➤ Calibrate and explain Calibration of line standards <p>End & line standards for length, Airy & Bessel points, Desirable features of end standards, slip gauge manufacture, calibration of end standards by interferometry. NPL gauge interferometer, calibration of line standards by micrometer microscope – superposition, coincidence and symmetric straddling, photoelectric microscope and Moir fringe techniques, measurement of large displacements using lasers, Photoelectric Autocollimator, calibration of polygons & circular scales. Types of interchangeability, dimensional chains.</p>	10	8
<p>Topic 2: Fixed & Indicating Gauges</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand Taylor’s principles of gauge design ➤ Explain and demonstrate various gauges ➤ Understand and demonstrate comparators like multi angle, sigma comparators ➤ Understand and explain use of LVDT <p>Taylor’s principles of gauge design, Limitations of ring & plug gauges, position and receiver gauges, types of indicating gauges. Comparators: Multi angle Sigma comparator, Back pressure and free flow type pneumatic comparators, Differential back pressure gauge, usage of different types of jets, contact & non-contact tooling. Amplification selection. Air to electric transducer, Differential transducer, Variation transducer, Preprocess, In-process & Post process gauging, computation & match gauging. Usage of LVDT & Capacitive type gauge heads, Automatic inspection</p>	10	8

<p>Topic 3: Measuring Machines</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain various measuring machines ➤ Demonstrate and explain Optical dividing head ➤ Annalise the co-ordinate systems and its applications ➤ Understand and explain Design principals of measuring machines <p>Floating carriage diameter measuring m/c. Universal measuring m/c. Matrix internal diameter measuring machine. Optical dividing head. Coordinate measuring machine, Optical projector-light beam systems, Work tables, measurement techniques, fixture & accessories. Sources of error in measurement. Design principles of measuring machines Abbe's rule, Kelvin coupling, flexible steel strip, advantages & limitations of hydrostatic & aerostatic bearings.</p>	8	8
<p>Topic 4: Form Errors</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Evaluate straightness & flatness ➤ Explain and demonstrate comparators ➤ Evaluate roundness – intrinsic & extrinsic datum ➤ Demonstrate the equipment for surface testing <p>Evaluation of straightness & flatness, usage of beam comparator, evaluation of roundness – intrinsic & extrinsic datums. Talyrond. PGC, RGC, MZC & LSC, methods, roundness evaluation for even & odd number of lobes. Surface Finish: stylus instrument (TALYSURF). M & E Systems, numerical assessment, vertical & horizontal descriptors, profile as a random process, usage of interferograms. Plastic replica technique.</p>	8	8
<p>Topic 5: Screw Threads</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Evaluate and do analysis of parameters of screw threads ➤ Identify and understand pitch errors <p>Determine and describe various methods of measurements of gear terminology, Measurement of thread elements for internal & external threads, progressive periodic, drunkenness and irregular pitch errors. NPL pitch measuring machine, virtual effective diameter, thread gauging. Gears: measurement of tooth thickness, involute profile, pitch, concentricity and alignment, rolling gear test.</p>	10	8

Books: Engineering Metrology

Sl. No.	Author	Title	Publisher
1	Gaylor, Shotbolt and Sharp	Metrology for Engineers	O.R.Cassel, London
2	R.K.Jain	Engineering Metrology	Khanna Publishers
3	Thomas	Engineering Metrology	Butthinson & Co.
4	Graham T. Smith	Industrial Metrology	Springer-Verlag London
5	White house, D. J,	Handbook of Surface & Nanometrology	The institute of Physics, London
6	M.Mahajan	A text - Book of Metrology	Dhanpat Rai & Co. (P) Ltd

References and other study material are available at –

- 1.<http://www.mitcalc.com/doc/tolerances/help/en/tolerances.htm>
2. http://www.ecs.umass.edu/mie/labs/mda/dlib/fit_tol/fitandtol.htm

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Engineering Metrology- Practical

COURSE CODE: CCCTM-04

COURSE OUTCOMES:

After completion of course Student should be able to

- Describe and explain various metrological terms like line standards ,end standards , calibration etc
- Explain and demonstrate instruments like Slip gauges, photoelectric microscope
- Explain and demonstrate various gauges like NPL gauge
- Classify & describe various measuring machines like Floating carriage diameter measuring m/c etc
- Calibrate and explain Calibration of line standards
- Predict and examine various modes and types of errors and also the demonstration of devices used for measurement.
- Evaluate and do analysis of parameters of screw threads
- Determine and describe various methods of measurements of gear terminology

THEORY HOURS: 48

PRACTICAL HOURS:48

THEORY MARKS:

PRACTICAL MARKS:60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to basic Metrology	After completion of unit Student should be able to <ul style="list-style-type: none"> • Describe and explain End and line standards. • Explain use and manufacturing of Slip gauges • Demonstrate and use of Slip gauges • Explain and demonstrate various gauges • Calibrate and explain Calibration of line standards 	End & line standards for length, Airy & Bessel points, Desirable features of end standards, slip gauge manufacture, calibration of end standards by interferometry. NPL gauge interferometer, calibration of line standards by micrometer microscope – superposition, coincidence and symmetric straddling, photoelectric microscope and Moir fringe techniques, measurement of large displacements using lasers, Photoelectric Autocollimator, calibration of polygons & circular scales. Types of interchangeability, dimensional chains	08	12	
UNIT-II	Fixed &	After completion of unit	Taylor's principles of gauge	08	12	

	Indicating Gauges	<p>Student should be able to</p> <ul style="list-style-type: none"> • Understand Taylor's principles of gauge design • Explain and demonstrate various gauges • Understand and demonstrate comparators like multi angle, sigma comparators • Understand and explain use of LVDT 	<p>design</p> <p>Limitations of ring & plug gauges, position and receiver gauges, types of indicating gauges.</p> <p>Comparators: Multi angle Sigma comparator, Back pressure and free flow type pneumatic comparators, Differential back pressure gauge, usage of different types of jets, contact & non-contact tooling. Amplification selection.</p> <p>Air to electric transducer, Differential transducer, Variation transducer, Preprocess, In-process & Post process gauging, computation & match gauging.</p> <p>Usage of LVDT & Capacitive type gauge heads, Automatic inspection</p>			
UNIT-III	Measuring Machines	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain various measuring machines • Demonstrate and explain Optical dividing head • Annualize the co-ordinate systems and its applications • Understand and explain Design principals of measuring machines 	<p>Floating carriage diameter measuring m/c.</p> <p>Universal measuring m/c.</p> <p>Matrix internal diameter measuring machine.</p> <p>Optical dividing head.</p> <p>Coordinate measuring machine, Optical projector-light beam systems, Work tables, measurement techniques, fixture & accessories.</p> <p>Sources of error in measurement.</p> <p>Design principles of measuring machines Abbe's rule, Kelvin coupling, flexible steel strip, advantages & limitations of hydrostatic & aerostatic bearings</p>	8	12	
UNIT-IV	Form Errors	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Evaluate straightness & flatness • Explain and demonstrate comparators 	<p>Evaluation of straightness & flatness, usage of beam comparator, evaluation of roundness – intrinsic & extrinsic datums. Talyrond. PGC, RGC, MZC & LSC,</p>	8	12	

		<ul style="list-style-type: none"> Evaluate roundness – intrinsic & extrinsic datum Demonstrate the equipment for surface testing 	<p>methods, roundness evaluation for even & odd number of lobes. Surface Finish: stylus instrument (TALYSURF). M & E Systems, numerical assessment, vertical & horizontal descriptors, profile as a random process, usage of interferograms. Plastic replica technique</p>			
UNIT-V	Screw Threads	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Evaluate and do analysis of parameters of screw threads Identify and understand pitch errors Determine and describe various methods of measurements of gear terminology 	<p>Measurement of thread elements for internal & external threads, progressive periodic, drunkenness and irregular pitch errors. NPL pitch measuring machine, virtual effective diameter, thread gauging. Gears: measurement of tooth thickness, involute profile, pitch, concentricity and alignment, rolling gear test.</p>	12	12	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Engineering Metrology - Practical

Course Code : CCCTM-04

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	44	04	-	60	60

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Engineering Metrology Practical is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Engineering Metrology Practical is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Engineering Metrology practical is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Describe and explain various metrological terms like line standards ,end standards , calibration etc
2. Explain and demonstrate instruments like Slip gauges, photoelectric microscope
3. Explain and demonstrate various gauges like NPL gauge
4. Classify & describe various measuring machines like Floating carriage diameter measuring m/c etc
5. Calibrate and explain Calibration of line standards
6. Predict and examine various modes and types of errors and also the demonstration of devices used for measurement.
7. Evaluate and do analysis of parameters of screw threads
8. Determine and describe various methods of measurements of gear terminology

Practical: Engineering Metrology

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to basic Metrology Objective:</p> <ul style="list-style-type: none"> ➤ Describe and explain End and line standards. ➤ Explain use and manufacturing of Slip gauges ➤ Demonstrate and use of Slip gauges ➤ Explain and demonstrate various gauges ➤ Calibrate and explain Calibration of line standards <p>End & line standards for length, Airy & Bessel points, Desirable features of end standards, slip gauge manufacture, calibration of end standards by interferometry. NPL gauge interferometer, calibration of line standards by micrometer microscope – superposition, coincidence and symmetric straddling, photoelectric microscope and Moir fringe techniques, measurement of large displacements using lasers, Photoelectric Autocollimator, calibration of polygons & circular scales. Types of interchangeability, dimensional chains.</p>	08	12
<p>Topic 2: Fixed & Indicating Gauges Objective:</p> <ul style="list-style-type: none"> ➤ Understand Taylor’s principles of gauge design ➤ Explain and demonstrate various gauges ➤ Understand and demonstrate comparators like multi angle, sigma comparators ➤ Understand and explain use of LVDT <p>Taylor’s principles of gauge design, Limitations of ring & plug gauges, position and receiver gauges, types of indicating gauges. Comparators: Multi angle Sigma comparator, Back pressure and free flow type pneumatic comparators, Differential back pressure gauge, usage of different types of jets, contact & non-contact tooling. Amplification selection. Air to electric transducer, Differential transducer, Variation transducer, Preprocess, In-process & Post process gauging, computation & match gauging. Usage of LVDT & Capacitive type gauge heads, Automatic inspection</p>	08	12

<p>Topic 3: Measuring Machines Objective:</p> <ul style="list-style-type: none"> ➤ Explain various measuring machines ➤ Demonstrate and explain Optical dividing head ➤ Analyse the co-ordinate systems and its applications ➤ Understand and explain Design principals of measuring machines <p>Floating carriage diameter measuring m/c. Universal measuring m/c. Matrix internal diameter measuring machine. Optical dividing head. Coordinate measuring machine, Optical projector-light beam systems, Work tables, measurement techniques, fixture & accessories. Sources of error in measurement. Design principles of measuring machines Abbe’s rule, Kelvin coupling, flexible steel strip, advantages & limitations of hydrostatic & aerostatic bearings.</p>	8	12
<p>Topic 4: Form Errors Objective:</p> <ul style="list-style-type: none"> ➤ Evaluate straightness & flatness ➤ Explain and demonstrate comparators ➤ Evaluate roundness – intrinsic & extrinsic datum ➤ Demonstrate the equipment for surface testing <p>Evaluation of straightness & flatness, usage of beam comparator, evaluation of roundness – intrinsic & extrinsic datums. Talyrond. PGC, RGC, MZC & LSC, methods, roundness evaluation for even & odd number of lobes. Surface Finish: stylus instrument (TALYSURF). M & E Systems, numerical assessment, vertical & horizontal descriptors, profile as a random process, usage of interferograms. Plastic replica technique.</p>	8	12
<p>Topic 5: Screw Threads Objective:</p> <ul style="list-style-type: none"> ➤ Evaluate and do analysis of parameters of screw threads ➤ Identify and understand pitch errors <p>Determine and describe various methods of measurements of gear terminology, Measurement of thread elements for internal & external threads, progressive periodic, drunkenness and irregular pitch errors. NPL pitch measuring machine, virtual effective diameter, thread gauging. Gears: measurement of tooth thickness, involute profile, pitch, concentricity and alignment, rolling gear test.</p>	12	12

Books: Engineering Metrology

Sl. No.	Author	Title	Publisher
1	Gaylor, Shotbolt and Sharp	Metrology for Engineers	O.R.Cassel, London
2	R.K.Jain	Engineering Metrology	Khanna Publishers
3	Thomas	Engineering Metrology	Butthinson & Co.
4	Graham T. Smith	Industrial Metrology	Springer-Verlag London
5	White house, D. J,	Handbook of Surface & Nanometrology	The institute of Physics, London
6	M.Mahajan	A text - Book of Metrology	Dhanpat Rai & Co. (P) Ltd

References and other study material are available at –

1. <http://www.mitcalc.com/doc/tolerances/help/en/tolerances.htm>
2. http://www.ecs.umass.edu/mie/labs/mda/dlib/fit_tol/fitandtol.htm

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Workshop Technology - Theory

COURSE CODE: CCCTM-05

COURSE OUTCOMES:

After completion of course Student should be able to:

- Explain Hand Tools, Marking Tools and Drills
- Demonstrate and explain Drilling Machines
- The importance and use of PPE's
- The working of Bench grinding,
- Metal working technique, Lathe Machine , Turning tools and Tool Geometry , Turning operations & safety.
- Taper Turning Methods, Thread cutting methods.
- Calculate Cutting Speed and rpm.
- Lathe machines like Turret lathe, Capston lathe
- The working of Milling Machines,.
- Various types of Milling cutters, Work holding devices.
- Various types of Milling operations like Indexing, Boring .
- Calculate Speeds & Feeds and Calculation of Machining time.
- The working of various types of Holding devices for Milling cutters and milling machine attachments and accessories
- Grind Drills for Drilling Machines.

THEORY HOURS: 96 PRACTICAL HOURS: 132 THEORY MARKS: 40 PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to Hand Tools	After completion of unit Student should be able to <ul style="list-style-type: none"> • Explain Hand Tools, Marking Tools and Drills 	Vices , Construction parts specification uses of, Bench vice, Leg vice, Pipe vice, Hand vice, Pin vice, Tool makers vice, Care of vices, Vice clamps, Hammers, Ball peen , Cross peen, Straight peen, Soft hammers, Files, Parts, size, cut of teeth, shapes, filing, methods of filing, care, special purpose file and needle files. Centre punches, Dot punch, Prick punch, Scrapers, Shapes, Scraping, Frosting or flowering, Hacksaws, Definition, types of frames, Parts of a blades, Kinds of blade, Types of blade,	6	2	

			Teeth arrangements, Sawing - Power hacksaw, parts, function of type of blade, band saw, parts function, types of blade. Pliers, Spanners, Screw drivers,.			
UNIT-II	Marking tools	After completion of unit Student should be able to <ul style="list-style-type: none"> • Demonstrate and explain Marking techniques • Demonstrate and explain marking tools 	Scribers , Try squares, parts of uses, Jenny calipers, parts uses calipers O/S I/S, dividers. Surface plates, material, constructions, specification and uses. Parallel blocks, 'V' blocks, Scribers, Features, uses, Surface gauges, types, ordinary universal, parts and uses. Angle plate, features, functions, types of uses.	6	2	
UNIT-III	Drills and Drill Machine	After completion of unit Student should be able to <ul style="list-style-type: none"> • Demonstrate and explain drilling method • Demonstrate and explain drills, taps, dies etc • Drill machines 	Drills – Types of drills, flat drill, straight fluted drill and twist drill, parts of a twist drill. Counter sinkers – Definition angle of counter sinking, countersinks, counter sink with pilots. Counter boring & spot facing. Reamers, Definition of advantages of reaming, classification M/c reamer, hand reamer, parts of a hand reamer, terms – cutting geometry, flutes. Threads , Taps – hand taps, features, parts, set and taps, tap wrench, tapping, tap size drill. Dies – Definition, types of dies, solid, circular split die. Adjustable screw plate die, Parts of screw thread, Forms of screw thread, IS Standards , Pillar Drilling Machine , Bench, Column Multi Spindle, Gang Spindle Radial, Parts, Functions, Different types, Work holding devices, Speeds, Feeds, Coolants, Safety.	6	2	
UNIT-IV	Single point cutting tools	After completion of unit Student should be able to <ul style="list-style-type: none"> • Demonstrate and explain pedestal grinding machine • Demonstrate and explain single point cutting tool • Tool terminologies 	Bench & pedestal grinders, features. Wheel dressers, Safety. Construction, Cutting Tool shape & Geometry, Work Holding Devices, Cutting Speed feed and depth of cut.	6	2	
UNIT-V	Lathe machine	After completion of unit Student should be able to <ul style="list-style-type: none"> • Demonstrate and 	Centre lathe and its parts , Specification of a center lathe, Parts, head stock, Lathe bed, Carriage, Feed mechanism, Tool	6	2	

		<p>explain lathe machine</p> <ul style="list-style-type: none"> • Demonstrate and explain lathe machine accessories • Demonstrate and explain lathe machine attachments 	<p>paste, Tail stock, work holding devices, Chucks – 3 jaws, 4 jaws, Self centering , Independent. Face plate. Work supporting accessories, Catch plate, Driving plate, Tail stock center Lathe dogs, Fixed study rest, Traveling study rest, Collets, Mandrels.</p>			
UNIT-VI	Types of cutting tools	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain different types of turning tools • Demonstrate and explain lathe machine accessories and attachments. 	<p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools Plain turning (1) L.H. tool, (2) R.H. tool, Facing tool, Threading tool, Boring tool, Profile tool, Parting of or end cutting tool. Tool holders, Holders for tool bit, Tool post, Clamping plate, Four way tool post, Single roller knurling tool holder, Joint type knurling tool holder, Revolving head knurling tool.</p>	6	3	
UNIT-VII	Types of lathe operations	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain different types of turning operations 	<p>Plain, Steps, Square shoulder, Filleted shoulder, Beveled shoulder, Parting, Boring, Grooving, Facing, Threading, Profile, Drilling, Tapping, Reaming, Counter boring, Knurling, Trepanning operation.</p>	7	3	
UNIT-VIII	Taper turning	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain different types of taper turning methods. 	<p>Form tool method, Compound slide method, Offset tail stock, Taper turning attachment, Effect of tool position, Taper calculations, eccentric turning, Calculations, Aids, Inspection, copy turning, Equipment, Hydraulic, Mechanical, Templates.</p>	6	3	
UNIT-IX	Thread cutting	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain thread cutting techniques on lathe machine 	<p>Gear setting, Inch conversion, Metric threads from inch lead screw, Inch threads from metric lead screw, Multistart threads, Threading dial, Right & left hand threads, External & internal threads, Thread Terminology, inch, metric, pitch, square profile, saw tooth, pipe threads</p>	6	3	
UNIT-X	Turning parameters	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Calculate various parameters of turning operation 	<p>Calculation OF R.P.M , Cutting speed, Diameter of work piece, Tables Feeds & depth of cut, Material Cutting Tools, Cutting angles, Feed in mm per revolution, Calculation of machining time</p>	6	3	

			, Setting time, Machining time, Auxiliary time, Delay time, Total time			
UNIT-XI	Milling machine	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand the working principle of a milling machine. Demonstrate and explain different parts of a milling machine Explain different types of milling machine 	<p>Principle of Milling, Classification Column & knee type, Fixed bed type, Planer type, Special type</p> <p>Different types, Plain / horizontal milling machine</p> <p>Vertical milling machine, Universal milling machine, Main parts – column, knee, gear box, spindle, saddle, over arm and brace, Controls</p> <p>Functions, Specifications</p>	6	3	
UNIT-XII	Milling cutters	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand the working principle of a milling cutters. Explain different types of milling cutters Demonstrate and explain different parts of a milling cutters and their specifications 	<p>Solid cutters</p> <p>Plain Milling cutter of slab milling cutter (solid, inserted), Light duty plain milling cutter, Heavy duty plain milling cutter, Helical plain milling cutters, Brazed on tip cutters, Side and face milling cutters, Plain S/F, Staggered teeth S/F, Milling , Inter locking S/F, End milling cutters</p> <p>Slot drills, Gear cutters, Shell end mills, Slot drills</p> <p>Carbide milling cutters, Angular milling cutters, Single angle, Equal angle, Double unequal angle</p> <p>Slitting saw, Form Milling cutters, Convex and concave, Corner rounding milling cutter, T-Slot cutter, Wood ruff key cutters, Thread Milling , cutter, Sprocket cutters, Spline cutters , Tap & reamer cutter, Fly cutters, Bolted cutters</p>	6	3	
UNIT-XIII	Milling attachments	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand the working principle of a milling machine accessories and attachments Understand and explain indexing principles and methods. 	<p>Long arbor & stub arbor, Collects, Tapered shanks</p> <p>“Clarkson” system, Adopter, Machine vice, Direct clamping, 3-jaw chuck, 4-jaw chuck, milling fixtures, Angle plates, Index plate, Vertical Milling attachment, High Speed attachment</p> <p>Slotting attachment, Universal attachment</p> <p>Rack Milling attachment, Circular Table attachment, Internal grooves, Key ways</p> <p>Design of attachment, Length of stroke</p> <p>Slotting tools,</p>	6	3	

UNIT- XIV	Milling operations	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand and explain different milling operations. 	<p>Plain / slab milling, Face milling, End milling, Up cut milling, Down cut milling, Gang milling, Key ways, Slides, Hexagons, Profiles, Cam milling, Types of Indexing heads, Direct Indexing head, Purpose Principle Direct Indexing mechanism , Plain or Simple Indexing , Purpose Principle Simple Indexing mechanism, Linear Indexing , Angular Indexing ,</p>	9	3	
UNIT- XV	Milling parameters	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Calculate various parameters of milling operation • Explain various milling surface finish 	<p>Cutting Speed Calculations, Milling Feeds, Depth of cut, Feed rate mm/min, Feed / Tooth, Feed / Cutter revolution, Feed / minute, Chip formation Machine power, Surface finish, Roughness waviness revolution, Cutting fluid Advantages & characteristics of a cutting fluid Types, functions and application of cutting fluid</p>	6	3	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Workshop Technology - Theory

Course Code : CCCTM-05

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
94	-	02	40	-	40

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Workshop Technology Theory is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Workshop Technology Theory is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Workshop Technology Theory is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Explain Hand Tools, Marking Tools and Drills
2. Demonstrate and explain Drilling Machines
3. The importance and use of PPE's
4. The working of Bench grinding,
5. Metal working technique, Lathe Machine, Turning tools and Tool Geometry, Turning operations & safety.
6. Taper Turning Methods, Thread cutting methods.
7. Calculate Cutting Speed and rpm.
8. Lathe machines like Turret lathe, Capston lathe
9. The working of Milling Machines,.
10. Various types of Milling cutters, Work holding devices.
11. Various types of Milling operations like Indexing, Boring .
12. Calculate Speeds & Feeds and Calculation of Machining time.
13. The working of various types of Holding devices for Milling cutters and milling machine attachments and accessories
14. Grind Drills for Drilling Machines.

Theory: Workshop Technology

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to Hand Tools</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain Hand Tools, Marking Tools and Drills <p>Vices, Construction parts specification uses of, Bench vice, Leg vice, Pipe vice, Hand vice, Pin vice, Tool makers vice, Care of vices, Vice clamps, Hammers, Ball peen , Cross peen, Straight peen, Soft hammers, Files, Parts, size, cut of teeth, shapes, filing, methods of filing, care, special purpose file and needle files. Centre punches, Dot punch, Prick punch, Scrapers, Shapes, Scraping, Frosting or flowering, Hacksaws, Definition, types of frames, Parts of a blades, Kinds of blade, Types of blade, Teeth arrangements, Sawing - Power hacksaw, parts, function of type of blade, band saw, parts function, types of blade. Pliers, Spanners, Screw drivers.</p>	6	2
<p>Topic 2: Marking tools</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ explain Marking techniques ➤ explain marking tools <p>Scribers, Try squares, parts of uses, Jenny calipers, parts uses calipers O/S I/S, dividers. Surface plates, material, constructions, specification and uses. Parallel blocks, 'V' blocks, Scribers, Features, uses, Surface gauges, types, ordinary universal, parts and uses. Angle plate, features, functions, types of uses.</p>	6	2
<p>Topic 3: Drills and Drill Machine</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ explain drilling method ➤ explain drills, taps, dies etc ➤ Drill machines <p>Drills – Types of drills, flat drill, straight fluted drill and twist drill, parts of a twist drill. Counter</p>	6	2

<p>sinkers – Definition angle of counter sinking, countersinks, counter sink with pilots. Counter boring & spot facing. Reamers, Definition of advantages of reaming, classification M/c reamer, hand reamer, parts of a hand reamer, terms – cutting geometry, flutes. Threads , Taps – hand taps, features, parts, set and taps, tap wrench, tapping, tap size drill. Dies – Definition, types of dies, solid, circular split die. Adjustable screw plate die, Parts of screw thread, Forms of screw thread, IS Standards , Pillar Drilling Machine, Bench, Column Multi Spindle, Gang Spindle Radial, Parts, Functions, Different types, Work holding devices, Speeds, Feeds, Coolants, Safety.</p>		
<p>Topic 4: Single point cutting tools Objective:</p> <ul style="list-style-type: none"> ➤ explain pedestal grinding machine ➤ explain single point cutting tool ➤ Tool terminologies <p>Bench & pedestal grinders, features. Wheel dressers, Safety. Construction, Cutting Tool shape & Geometry, Work Holding Devices, Cutting Speed feed and depth of cut.</p>	6	2
<p>Topic 5: Lathe machine Objective:</p> <ul style="list-style-type: none"> ➤ explain lathe machine ➤ explain lathe machine accessories ➤ explain lathe machine attachments <p>Centre lathe and its parts, Specification of a center lathe, Parts, head stock, Lathe bed, Carriage, Feed mechanism, Tool post, Tail stock, work holding devices, Chucks – 3 jaws, 4 jaws, Self centering , Independent. Face plate. Work supporting accessories, Catch plate, Driving plate, Tail stock center Lathe dogs, Fixed study rest, Traveling study rest, Collets, Mandrels.</p>	6	2
<p>Topic 6: Types of cutting tools Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of turning tools ➤ explain lathe machine accessories and attachments. <p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools Plain turning (1) L.H. tool, (2) R.H. tool, Facing tool, Threading tool, Boring tool, Profile tool, Parting of or end cutting tool. Tool holders, Holders for tool bit, Tool post, Clamping plate, Four way tool post, Single roller knurling tool holder, Joint type knurling tool holder, Revolving head knurling tool.</p>	6	3
<p>Topic 7: Types of lathe operations Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of turning operations <p>Plain, Steps, Square shoulder, Filleted shoulder, Beveled shoulder, Parting, Boring, Grooving, Facing, Threading, Profile, Drilling, Tapping, Reaming, Counter boring, Knurling, Trepanning operation.</p>	7	3
<p>Topic 8: Taper turning Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of taper turning methods. <p>Form tool method, Compound slide method, Offset tail stock, Taper turning attachment, Effect of tool position, Taper calculations, eccentric turning, Calculations, Aids, Inspection, copy turning, Equipment, Hydraulic, Mechanical, Templates.</p>	6	3
<p>Topic 9: Thread cutting Objective:</p> <ul style="list-style-type: none"> ➤ explain thread cutting techniques on lathe machine <p>Gear setting, Inch conversion, Metric threads from inch lead screw, Inch threads from metric lead</p>	6	3

screw, Multistart threads, Threading dial, Right & left hand threads, External & internal threads, Thread Terminology, inch, metric, pitch, square profile, saw tooth, pipe threads		
Topic 10: Turning parameters Objective: <ul style="list-style-type: none"> ➤ Calculate various parameters of turning operation Calculation OF R.P.M , Cutting speed, Diameter of work piece, Tables Feeds & depth of cut, Material Cutting Tools, Cutting angles, Feed in mm per revolution, Calculation of machining time , Setting time, Machining time, Auxiliary time, Delay time, Total time	6	3
Topic 11: Milling machine Objective: <ul style="list-style-type: none"> ➤ The working principle of a milling machine. ➤ explain different parts of a milling machine ➤ Explain different types of milling machine Principle of Milling , Classification Column & knee type, Fixed bed type, Planer type, Special type, Different types, Plain / horizontal milling machine, Vertical milling machine, Universal milling machine, Main parts – column, knee, gear box, spindle, saddle, over arm and brace, Controls Functions, Specifications.	6	3
Topic 12: Milling cutters Objective: <ul style="list-style-type: none"> ➤ The working principle of a milling cutters. ➤ Explain different types of milling cutters ➤ explain different parts of a milling cutters and their specifications Solid cutters , Plain Milling cutter of slab milling cutter (solid, inserted), Light duty plain milling cutter, Heavy duty plain milling cutter, Helical plain milling cutters, Brazed on tip cutters, Side and face milling cutters, Plain S/F, Staggered teeth S/F, Milling , Inter locking S/F, End milling cutters, Slot drills, Gear cutters, Shell end mills, Slot drills, Carbide milling cutters, Angular milling cutters, Single angle, Equal angle, Double unequal angle, Slitting saw, Form Milling cutters, Convex and concave, Corner rounding milling cutter, T-Slot cutter, Wood ruff key cutters, Thread Milling , cutter, Sprocket cutters, Spline cutters , Tap & reamer cutter, Fly cutters, Bolted cutters	6	3
Topic 13: Milling attachments Objective: <ul style="list-style-type: none"> ➤ Understand the working principle of a milling machine accessories and attachments ➤ Understand and explain indexing principles and methods. Long arbor & stub arbor , Collects, Tapered shanks. “Clarkson” system, Adopter, Machine vice, Direct clamping, 3-jaw chuck, 4-jaw, chuck, milling fixtures, Angle plates, Index plate, Vertical Milling attachment , High Speed attachment, Slotting attachment, Universal attachment, Rack Milling attachment, Circular Table attachment, Internal grooves, Key ways, Design of attachment, Length of stroke Slotting tools.	6	3
Topic 14: Milling operations Objective: <ul style="list-style-type: none"> ➤ Understand and explain different milling operations. Plain / slab milling, Face milling , End milling, Up cut milling, Down cut milling, Gang milling, Key ways, Slides, Hexagons, Profiles, Cam milling, Types of Indexing heads, Direct Indexing head, Purpose Principle Direct Indexing mechanism , Plain or Simple Indexing , Purpose Principle Simple Indexing mechanism, Linear Indexing , Angular Indexing	9	3
Topic 15: Milling parameters Objective:	6	3

<ul style="list-style-type: none"> ➤ Calculate various parameters of milling operation ➤ Explain various milling surface finish <p>Cutting Speed Calculations, Milling Feeds, Depth of cut, Feed rate mm/min, Feed / Tooth, Feed / Cutter revolution, Feed / minute, Chip formation, Machine power, Surface finish, Roughness waviness revolution, Cutting fluid, Advantages & characteristics of a cutting fluid Types, functions and application of cutting fluid.</p>		
---	--	--

Books: Workshop Technology

Sl. No.	Author	Title	Publisher
1	Rajendra Singh	Introduction to Basic Manufacturing Processes & Workshop Technology.	New Age International (P) Limited, Publishers
2	V. Ramesh Babu	Engineering Work shop practice for JNTU	VRB Publishers Pvt. Ltd
3	P.Kannaiah/ K.L.Narayana	Work shop Manual	SciTech Publishers
4	S. K. Hajra Choudhury, Nirjhar Roy, A. K. Hajra Choudhury	Elements of Workshop Technology (Volume - 1)	Media Promoters Pvt. Ltd.
5	W. A. J. Chapman	Workshop Technology	Edward Arnold

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Workshop Technology - Practical

COURSE CODE: CCCTM-06

COURSE OUTCOMES:

After completion of course Student should be able to:

- Explain Hand Tools, Marking Tools and Drills
- Demonstrate and explain Drilling Machines
- The importance and use of PPE's
- The working of Bench grinding,
- Metal working technique, Lathe Machine, Turning tools and Tool Geometry, Turning operations & safety.
- Taper Turning Methods, Thread cutting methods.
- Calculate Cutting Speed and rpm.
- Lathe machines like Turret lathe, Capston lathe
- The working of Milling Machines,.
- Various types of Milling cutters, Work holding devices.
- Various types of Milling operations like Indexing, Boring.
- Calculate Speeds & Feeds and Calculation of Machining time.
- The working of various types of Holding devices for Milling cutters and milling machine attachments and accessories
- Grind Drills for Drilling Machines.

THEORY HOURS: 96

PRACTICAL HOURS: 132

THEORY MARKS: -

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to Hand Tools	After completion of unit Student should be able to <ul style="list-style-type: none"> • Explain Hand Tools, Marking Tools and Drills 	Vices, Construction parts specification uses of, Bench vice, Leg vice, Pipe vice, Hand vice, Pin vice, Tool makers vice, Care of vices, Vice clamps, Hammers, Ball peen , Cross peen, Straight peen, Soft hammers, Files, Parts, size, cut of teeth, shapes, filing, methods of filing, care, special purpose file and needle files. Centre punches, Dot punch, Prick punch, Scrapers, Shapes, Scraping, Frosting or flowering, Hacksaws, Definition, types of frames, Parts of a blades, Kinds of blade, Types of blade, Teeth	6	4	

			arrangements, Sawing - Power hacksaw, parts, function of type of blade, band saw, parts function, types of blade. Pliers, Spanners, Screw drivers,.			
UNIT-II	Marking tools	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain Marking techniques • Demonstrate and explain marking tools 	<p>Scribers, Try squares, parts of uses, Jenny calipers, parts uses calipers O/S I/S, dividers. Surface plates, material, constructions, specification and uses. Parallel blocks, 'V' blocks, Scribers, Features, uses, Surface gauges, types, ordinary universal, parts and uses. Angle plate, features, functions, types of uses.</p>	6	4	
UNIT-III	Drills and Drill Machine	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain drilling method • Demonstrate and explain drills, taps, dies etc • Drill machines 	<p>Drills – Types of drills, flat drill, straight fluted drill and twist drill, parts of a twist drill. Counter sinkers – Definition angle of counter sinking, countersinks, counter sink with pilots. Counter boring & spot facing. Reamers, Definition of advantages of reaming, classification M/c reamer, hand reamer, parts of a hand reamer, terms – cutting geometry, flutes. Threads , Taps – hand taps, features, parts, set and taps, tap wrench, tapping, tap size drill. Dies – Definition, types of dies, solid, circular split die. Adjustable screw plate die, Parts of screw thread, Forms of screw thread, IS Standards , Pillar Drilling Machine, Bench, Column Multi Spindle, Gang Spindle Radial, Parts, Functions, Different types, Work holding devices, Speeds, Feeds, Coolants, Safety.</p>	8	4	
UNIT-IV	Single point cutting tools	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain pedestal grinding machine • Demonstrate and explain single point cutting tool • Tool terminologies 	<p>Bench & pedestal grinders, features. Wheel dressers, Safety. Construction, Cutting Tool shape & Geometry, Work Holding Devices, Cutting Speed feed and depth of cut.</p>	8	4	

UNIT-V	Lathe machine	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain lathe machine • Demonstrate and explain lathe machine accessories • Demonstrate and explain lathe machine attachments 	<p>Centre lathe and its parts, Specification of a center lathe, Parts, head stock, Lathe bed, Carriage, Feed mechanism, Tool post, Tail stock, work holding devices, Chucks – 3 jaws, 4 jaws, Self centring, Independent. Face plate. Work supporting accessories, Catch plate, Driving plate, Tail stock center Lathe dogs, Fixed steady rest, Traveling steady rest, Collets, Mandrels.</p>	8	4	
UNIT-VI	Types of cutting tools	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain different types of turning tools • Demonstrate and explain lathe machine accessories and attachments. 	<p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools Plain turning (1) L.H. tool, (2) R.H. tool, Facing tool, Threading tool, Boring tool, Profile tool, Parting of or end cutting tool. Tool holders, Holders for tool bit, Tool post, Clamping plate, Four way tool post, Single roller knurling tool holder, Joint type knurling tool holder, Revolving head knurling tool.</p>	8	4	
UNIT-VII	Types of lathe operations	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain different types of turning operations 	<p>Plain, Steps, Square shoulder, Filleted shoulder, Beveled shoulder, Parting, Boring, Grooving, Facing, Threading, Profile, Drilling, Tapping, Reaming, Counter boring, Knurling, Trepanning operation.</p>	8	4	
UNIT-VIII	Taper turning	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain different types of taper turning methods. 	<p>Form tool method, Compound slide method, Offset tail stock, Taper turning attachment, Effect of tool position, Taper calculations, eccentric turning, Calculations, Aids, Inspection, copy turning, Equipment, Hydraulic, Mechanical, Templates.</p>	8	4	
UNIT-IX	Thread cutting	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Demonstrate and explain thread cutting techniques on lathe machine 	<p>Gear setting, Inch conversion, Metric threads from inch lead screw, Inch threads from metric lead screw, Multistart threads, Threading dial, Right & left hand threads, External & internal threads, Thread Terminology, inch, metric, pitch, square profile, saw tooth, pipe</p>	8	4	

			threads			
UNIT-X	Turning parameters	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Calculate various parameters of turning operation 	<p>Calculation OF R.P.M , Cutting speed, Diameter of work piece, Tables Feeds & depth of cut, Material Cutting Tools, Cutting angles, Feed in mm per revolution, Calculation of machining time , Setting time, Machining time, Auxiliary time, Delay time, Total time</p>	10	4	
UNIT-XI	Milling machine	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand the working principle of a milling machine. Demonstrate and explain different parts of a milling machine Explain different types of milling machine 	<p>Principle of Milling, Classification Column & knee type, Fixed bed type, Planer type, Special type Different types, Plain / horizontal milling machine Vertical milling machine, Universal milling machine, Main parts – column, knee, gear box, spindle, saddle, over arm and brace, Controls Functions, Specifications</p>	10	4	
UNIT-XII	Milling cutters	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand the working principle of a milling cutters. Explain different types of milling cutters Demonstrate and explain different parts of a milling cutters and their specifications 	<p>Solid cutters Plain Milling cutter of slab milling cutter (solid, inserted), Light duty plain milling cutter, Heavy duty plain milling cutter, Helical plain milling cutters, Brazed on tip cutters, Side and face milling cutters, Plain S/F, Staggered teeth S/F, Milling , Inter locking S/F, End milling cutters Slot drills, Gear cutters, Shell end mills, Slot drills Carbide milling cutters, Angular milling cutters, Single angle, Equal angle, Double unequal angle Slitting saw, Form Milling cutters, Convex and concave, Corner rounding milling cutter, T-Slot cutter, Wood ruff key cutters, Thread Milling , cutter, Sprocket cutters, Spline cutters , Tap & reamer cutter, Fly cutters, Bolted cutters</p>	10	4	

UNIT- XIII	Milling attachments	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand the working principle of a milling machine accessories and attachments • Understand and explain indexing principles and methods. 	<p>Long arbor & stub arbor, Collects, Tapered shanks “Clarkson” system, Adopter, Machine vice, Direct clamping, 3-jaw chuck, 4-jaw chuck, milling fixtures, Angle plates, Index plate, Vertical Milling attachment, High Speed attachment Slotting attachment, Universal attachment Rack Milling attachment, Circular Table attachment, Internal grooves, Key ways Design of attachment, Length of stroke Slotting tools,</p>	10	4	
UNIT- XIV	Milling operations	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand and explain different milling operations 	<p>Plain / slab milling, Face milling, End milling, Upcut milling, Down cut milling, Gang milling, Key ways, Slides, Hexagons, Profiles, Cam milling, Types of Indexing heads, Direct Indexing head, Purpose Principle Direct Indexing mechanism , Plain or Simple Indexing , Purpose Principle Simple Indexing mechanism, Linear Indexing , Angular Indexing ,</p>	10	4	
UNIT- XV	Milling parameters	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Calculate various parameters of milling operation • Explain various milling surface finish 	<p>Cutting Speed Calculations, Milling Feeds, Depth of cut, Feed rate mm/min, Feed / Tooth, Feed / Cutter revolution, Feed / minute, Chip formation Machine power, Surface finish, Roughness waviness revolution, Cutting fluid Advantages & characteristics of a cutting fluid Types, functions and application of cutting fluid</p>	10	4	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Workshop Technology - Practical

Course Code : CCCTM-06

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	128	04	-	60	60

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Workshop Technology Practical is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Workshop Technology Practical is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Workshop Technology practical is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

COURSE OUTCOMES:

1. Explain Hand Tools, Marking Tools and Drills
2. Demonstrate and explain Drilling Machines
3. The importance and use of PPE's
4. The working of Bench grinding,
5. Metal working technique, Lathe Machine , Turning tools and Tool Geometry , Turning operations & safety.
6. Taper Turning Methods, Thread cutting methods.
7. Calculate Cutting Speed and rpm.
8. Lathe machines like Turret lathe, Capston lathe
9. The working of Milling Machines,.
10. Various types of Milling cutters, Work holding devices.
11. Various types of Milling operations like Indexing, Boring .
12. Calculate Speeds & Feeds and Calculation of Machining time.
13. The working of various types of Holding devices for Milling cutters and milling machine attachments and accessories
14. Grind Drills for Drilling Machines.

Practical: Workshop Technology

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to Hand Tools</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain Hand Tools, Marking Tools and Drills <p>Vices, Construction parts specification uses of, Bench vice, Leg vice, Pipe vice, Hand vice, Pin vice, Tool makers vice, Care of vices, Vice clamps, Hammers, Ball peen , Cross peen, Straight peen, Soft hammers, Files, Parts, size, cut of teeth, shapes, filing, methods of filing, care, special purpose file and needle files. Centre punches, Dot punch, Prick punch, Scrapers, Shapes, Scraping, Frosting or flowering, Hacksaws, Definition, types of frames, Parts of a blades, Kinds of blade, Types of blade, Teeth arrangements, Sawing - Power hacksaw, parts, function of type of blade, band saw, parts function, types of blade. Pliers, Spanners, Screw drivers.</p>	6	4
<p>Topic 2: Marking tools</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ explain Marking techniques ➤ explain marking tools <p>Scribers, Try squares, parts of uses, Jenny calipers, parts uses calipers O/S I/S, dividers. Surface plates, material, constructions, specification and uses. Parallel blocks, 'V' blocks, Scribers, Features, uses, Surface gauges, types, ordinary universal, parts and uses. Angle plate, features, functions, types of uses.</p>	6	4
<p>Topic 3: Drills and Drill Machine</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ explain drilling method ➤ explain drills, taps, dies etc ➤ Drill machines <p>Drills – Types of drills, flat drill, straight fluted drill and twist drill, parts of a twist drill. Counter</p>	8	4

<p>sinkers – Definition angle of counter sinking, countersinks, counter sink with pilots. Counter boring & spot facing. Reamers, Definition of advantages of reaming, classification M/c reamer, hand reamer, parts of a hand reamer, terms – cutting geometry, flutes. Threads , Taps – hand taps, features, parts, set and taps, tap wrench, tapping, tap size drill. Dies – Definition, types of dies, solid, circular split die. Adjustable screw plate die, Parts of screw thread, Forms of screw thread, IS Standards , Pillar Drilling Machine, Bench, Column Multi Spindle, Gang Spindle Radial, Parts, Functions, Different types, Work holding devices, Speeds, Feeds, Coolants, Safety.</p>		
<p>Topic 4: Single point cutting tools Objective:</p> <ul style="list-style-type: none"> ➤ explain pedestal grinding machine ➤ explain single point cutting tool ➤ Tool terminologies <p>Bench & pedestal grinders, features. Wheel dressers, Safety. Construction, Cutting Tool shape & Geometry, Work Holding Devices, Cutting Speed feed and depth of cut.</p>	8	4
<p>Topic 5: Lathe machine Objective:</p> <ul style="list-style-type: none"> ➤ explain lathe machine ➤ explain lathe machine accessories ➤ explain lathe machine attachments <p>Centre lathe and its parts, Specification of a center lathe, Parts, head stock, Lathe bed, Carriage, Feed mechanism, Tool paste, Tail stock, work holding devices, Chucks – 3 jaws, 4 jaws, Self centering , Independent. Face plate. Work supporting accessories, Catch plate, Driving plate, Tail stock center Lathe dogs, Fixed study rest, Traveling study rest, Collets, Mandrels.</p>	8	4
<p>Topic 6: Types of cutting tools Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of turning tools ➤ explain lathe machine accessories and attachments. <p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools Plain turning (1) L.H. tool, (2) R.H. tool, Facing tool, Threading tool, Boring tool, Profile tool, Parting of or end cutting tool. Tool holders, Holders for tool bit, Tool post, Clamping plate, Four way tool post, Single roller knurling tool holder, Joint type knurling tool holder, Revolving head knurling tool.</p>	8	4
<p>Topic 7: Types of lathe operations Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of turning operations <p>Plain, Steps, Square shoulder, Filleted shoulder, Beveled shoulder, Parting, Boring, Grooving, Facing, Threading, Profile, Drilling, Tapping, Reaming, Counter boring, Knurling, Trepanning operation.</p>	8	4
<p>Topic 8: Taper turning Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of taper turning methods. <p>Form tool method, Compound slide method, Offset tail stock, Taper turning attachment, Effect of tool position, Taper calculations, eccentric turning, Calculations, Aids, Inspection, copy turning, Equipment, Hydraulic, Mechanical, Templates.</p>	8	4
<p>Topic 9: Thread cutting Objective:</p> <ul style="list-style-type: none"> ➤ explain thread cutting techniques on lathe machine 	8	4

<p>Gear setting, Inch conversion, Metric threads from inch lead screw, Inch threads from metric lead screw, Multistart threads, Threading dial, Right & left hand threads, External & internal threads, Thread Terminology, inch, metric, pitch, square profile, saw tooth, pipe threads</p>		
<p>Topic 10: Turning parameters Objective: ➤ Calculate various parameters of turning operation Calculation OF R.P.M , Cutting speed, Diameter of work piece, Tables Feeds & depth of cut, Material Cutting Tools, Cutting angles, Feed in mm per revolution, Calculation of machining time , Setting time, Machining time, Auxiliary time, Delay time, Total time</p>	10	4
<p>Topic 11: Milling machine Objective: ➤ The working principle of a milling machine. ➤ explain different parts of a milling machine ➤ Explain different types of milling machine Principle of Milling, Classification Column & knee type, Fixed bed type, Planer type, Special type, Different types, Plain / horizontal milling machine, Vertical milling machine, Universal milling machine, Main parts – column, knee, gear box, spindle, saddle, over arm and brace, Controls Functions, Specifications.</p>	10	4
<p>Topic 12: Milling cutters Objective: ➤ The working principle of a milling cutters. ➤ Explain different types of milling cutters ➤ explain different parts of a milling cutters and their specifications Solid cutters, Plain Milling cutter of slab milling cutter (solid, inserted), Light duty plain milling cutter, Heavy duty plain milling cutter, Helical plain milling cutters, Brazed on tip cutters, Side and face milling cutters, Plain S/F, Staggered teeth S/F, Milling , Inter locking S/F, End milling cutters, Slot drills, Gear cutters, Shell end mills, Slot drills, Carbide milling cutters, Angular milling cutters, Single angle, Equal angle, Double unequal angle, Slitting saw, Form Milling cutters, Convex and concave, Corner rounding milling cutter, T-Slot cutter, Wood ruff key cutters, Thread Milling , cutter, Sprocket cutters, Spline cutters , Tap & reamer cutter, Fly cutters, Bolted cutters</p>	10	4
<p>Topic 13: Milling attachments Objective: ➤ Understand the working principle of a milling machine accessories and attachments ➤ Understand and explain indexing principles and methods. Long arbor & stub arbor, Collects, Tapered shanks. “Clarkson” system, Adopter, Machine vice, Direct clamping, 3-jaw chuck, 4-jaw, chuck, milling fixtures, Angle plates, Index plate, Vertical Milling attachment, High Speed attachment, Slotting attachment, Universal attachment, Rack Milling attachment, Circular Table attachment, Internal grooves, Key ways, Design of attachment, Length of stroke Slotting tools.</p>	10	4
<p>Topic 14: Milling operations Objective: ➤ Understand and explain different milling operations. Plain / slab milling, Face milling, End milling, Up cut milling, Down cut milling, Gang milling, Key ways, Slides, Hexagons, Profiles, Cam milling, Types of Indexing heads, Direct Indexing head, Purpose Principle Direct Indexing mechanism , Plain or Simple Indexing , Purpose Principle Simple Indexing mechanism, Linear Indexing , Angular Indexing</p>	10	4
<p>Topic 15: Milling parameters</p>	10	4

Objective:

- Calculate various parameters of milling operation
- Explain various milling surface finish

Cutting Speed Calculations, Milling Feeds, Depth of cut, Feed rate mm/min, Feed / Tooth, Feed / Cutter revolution, Feed / minute, Chip formation, Machine power, Surface finish, Roughness waviness revolution, Cutting fluid, Advantages & characteristics of a cutting fluid
Types, functions and application of cutting fluid.

Books: Workshop Technology

Sl. No.	Author	Title	Publisher
1	Rajendra Singh	Introduction to Basic Manufacturing Processes & Workshop Technology.	New Age International (P) Limited, Publishers
2	V. Ramesh Babu	Engineering Work shop practice for JNTU	VRB Publishers Pvt. Ltd
3	P.Kannaiah/ K.L.Narayana	Work shop Manual	SciTech Publishers
4	S. K. Hajra Choudhury, Nirjhar Roy, A. K. Hajra Choudhury	Elements of Workshop Technology (Volume - 1)	Media Promoters Pvt. Ltd.
5	W. A. J. Chapman	Workshop Technology	Edward Arnold

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Workshop Calculation

COURSE CODE: CCCTM-07

COURSE OUTCOMES:

After completion of course Student should be able to:

- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle
- Area of cut-out regular surfaces: circle and segment and sector of circle.
- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple machine blocks.
- Material weight and cost problems related to trade.
- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.
- Finding height and distance by trigonometry.
- Application of trigonometry in shop problems. (viz. taper angle calculation).
- Graph: -Read images, graphs, diagrams—bar chart, pie chart. Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.

THEORY HOURS: 96

PRACTICAL HOURS:

THEORY MARKS: -100

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I	UNITS RATIO & PROPORTION	After completion of unit Student should be able to <ul style="list-style-type: none"> • systems (British & metric) of units, measurement, relationship & conversion problems • types of proportion, direct, indirect and mixed-application of ratio and proportion 	UNITS : Introduction, systems (British & metric) of units, measurement, relationship & conversion problems. Numbers and their types. Fundamental operations of decimal and whole numbers, fraction and decimal conversions and simplifications, methods to find out square root. RATIO & PROPORTION: Definition, types of proportion, direct, indirect and mixed-application of ratio and proportion to trade related problems.	14	20	

UNIT-II	DENSITY PERCENTAGE	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Calculate Density • Calculate Percentage 	<p>DENSITY:- Definition of mass & weight. density and relative density and comparison between them. Archimedes principles, Law of floatation with example R.D of solid, R.D of liquid calculation. Calculation of weight of material. Problems.</p> <p>PERCENTAGE: Definition, changing percentage to decimal and fraction and vice versa. Applied problems related to trade.</p>	20	20	
UNIT-III	ALGEBRA MENSURATIO N	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Algebra operations and algebra formula derivations and problems. • Factorization of equations like simple, simultaneous, quadratic. Learning to use calculator. • Pythagoras theorem, geometry & properties of 2D & 3D figures, Area, perimeter and other dimension determination of plane 	<p>ALGEBRA:- Fundamental algebra operations and simplification problems- algebra formula derivations and problems. Factorization of equations like simple, simultaneous, quadratic. Learning to use calculator.</p> <p>MENSURATION:- Introduction. Pythagoras theorem, geometry & properties of 2D & 3D figures, Area, perimeter and other dimension determination of plane geometrical figures(2D figures) such as square, rectangle, parallelogram, rhombus, trapezium, all types of triangles polygons, circles, sector and segment of circles and practical related exercise.</p>	20	20	

UNIT-IV	TRIGONOMETRY GRAPH	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Trigonometrically relations, Relationship between them- Measurement of angles, Trigonometric tables. • Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper turning. • GRAPH: Introduction - Procedure of drawing graph, solving of algebraic equations. 	<p>TRIGONOMETRY: Introduction. Trigonometrically relations, Relationship between them- Measurement of angles, Trigonometric tables. Formulae and their proof. Values for certain angles</p> <p>TRIGONOMETRY APPICATIONS: Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper turning problems and other practical problems.</p> <p>GRAPH: Introduction - Procedure of drawing graph, solving of algebraic equations.</p>	20	20	
UNIT-V	Indices Quadratic equations	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Indices, Concept and rules. • Application of Quadratic equations. • Area & Volume of different geometrical shapes (2D &3D). • Measurement of angles in degrees, grades and radians and their conversions. • Compound angles, multiple angles, and sub-multiple angles (2A, 3A, A/2) inverse circular functions. 	<p>AIGEBRA: Indices, Concept and rules, Examples on indices. Application of Quadratic equations.</p> <p>MENSURETION: Area & Volume of different geometrical shapes (2D &3D).</p> <p>TRIGNOMETRY: Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Review of ratios of some standard angles (0, 30,45,60,90 degrees), Compound angles, multiple angles, and sub-multiple angles (2A, 3A, A/2) inverse circular functions.</p>	20	20	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Workshop Calculation

Course Code : CCCTM-07

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
94	-	02	100	-	100

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Workshop Calculation is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Workshop Calculation is regarded as a core skill set which supplement hard skill in all CNC Operator. Recognizing this importance of the core skill, the subjects of Workshop Calculation is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle
2. Area of cut-out regular surfaces: circle and segment and sector of circle.
3. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple machine blocks.
4. Material weight and cost problems related to trade.
5. Finding the value of unknown sides and angles of a triangle by Trigonometrical method.
6. Finding height and distance by trigonometry.
7. Application of trigonometry in shop problems. (viz. taper angle calculation).
8. Graph: -Read images, graphs, diagrams—bar chart, pie chart. Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.

Theory: Workshop Calculation

Topic and Contents	Hours	Marks
<p>Topic 1: UNITS RATIO & PROPORTION</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ systems (British & metric) of units, measurement, relationship & conversion problems ➤ types of proportion, direct, indirect and mixed-application of ratio and proportion <p>UNITS : Introduction, systems (British & metric) of units, measurement, relationship & conversion problems. Numbers and their types. Fundamental operations of decimal and whole numbers, fraction and decimal conversions and simplifications, methods to find out square root.</p> <p>RATIO & PROPORTION: Definition, types of proportion, direct, indirect and mixed-application of ratio and proportion to trade related problems.</p>	14	20
<p>Topic 2: DENSITY PERCENTAGE</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Calculate Density ➤ Calculate Percentage <p>DENSITY:- Definition of mass & weight. density and relative density and comparison between them. Archimedes principles, Law of floatation with example R.D of solid, R.D of liquid calculation. Calculation of weight of material. Problems.</p> <p>PERCENTAGE: Definition, changing percentage to decimal and fraction and vice versa. Applied problems related to trade.</p>	20	20
<p>Topic 3: ALGEBRA MENSURATION</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Algebra operations and algebra formula derivations and problems. ➤ Factorization of equations like simple, simultaneous, quadratic. Learning to use calculator. ➤ Pythagoras theorem, geometry & properties of 2D & 3D figures, Area, perimeter and other dimension determination of plane <p>ALGEBRA:- Fundamental algebra operations and simplification problems- algebra formula derivations and problems. Factorization of equations like simple, simultaneous, quadratic. Learning to use calculator.</p> <p>MENSURATION:- Introduction. Pythagoras theorem, geometry & properties of 2D & 3D figures, Area, perimeter and other dimension determination of plane geometrical figures(2D figures) such as square, rectangle, parallelogram, rhombus, trapezium, all types of triangles polygons, circles,</p>	20	20

sector and segment of circles and practical related exercise.		
<p>Topic 4: TRIGONOMETRY GRAPH</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Trigonometrically ratios, Relationship between them-Measurement of angles, Trigonometric tables. ➤ Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper turning. ➤ GRAPH: Introduction - Procedure of drawing graph, solving of algebraic equations. <p>TRIGONOMETRY: Introduction. Trigonometrically ratios, Relationship between them-Measurement of angles, Trigonometric tables. Formulae and their proof. Values for certain angles</p> <p>TRIGONOMETRY APPICATONS: Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper turning problems and other practical problems.</p> <p>GRAPH: Introduction - Procedure of drawing graph, solving of algebraic equations.</p>	20	20
<p>Topic 5: Indices Quadratic equations</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Indices, Concept and rules. ➤ Application of Quadratic equations. ➤ Area & Volume of different geometrical shapes (2D &3D). ➤ Measurement of angles in degrees, grades and radians and their conversions. ➤ Compound angles, multiple angles, and sub-multiple angles (2A, 3A, A/2) inverse circular functions. <p>AIGEBRA: Indices, Concept and rules, Examples on indices. Application of Quadratic equations.</p> <p>MENSURETION: Area & Volume of different geometrical shapes (2D &3D).</p> <p>TRIGONOMETRY: Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Review of ratios of some standard angles (0, 30,45,60,90 degrees), Compound angles, multiple angles, and sub-multiple angles (2A, 3A, A/2) inverse circular functions.</p>	20	20

Books: Workshop Calculation

Sl. No.	Author	Title	Publisher
1	A. K. Xavior	Workshop Calculations and Science	JKP
2	Baseshankar	Workshop Calculations and Science	Vijayshree
3	Kapil Dev	Workshop Calculations and Science	Asian Pub.
4	L.R.Hans / M Lanwani	Basic Workshop Calculation & Science	Dhanpat Ray& Co.Lim
5	R. Pande	Workshop Calculation & Science	Amul

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Employability Skill

COURSE CODE: CCCTM-08

COURSE OUTCOMES:

After completion of course Student should be able to

- Interact effectively with co-workers and customers.
- Make persons excellent workers and suitable to work in a team.
- Develop Resumes or curriculum vita.
- Operated computer with MS office tool
- Access internet and web browsing.
- Personal safety and work ethics.
- Overcome communication barriers.
- Process of setting up business and loan form Bank.
- Monitoring the working environment and making sure it meets requirements for health, safety and security

THEORY HOURS: 72

PRACTICAL HOURS: 24

THEORY MARKS: 40

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
Unit I	English Literacy Pronunciation/ Functional Grammar	After completion of unit Student should be able to <ul style="list-style-type: none"> • Make Small Sentence • Use of word of and speech 	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech) Transformation of sentences, change, Change of tense, Spellings.	8 Voice	4	
Unit II	English Literacy Reading/ Writing	After completion of unit Student should be able to <ul style="list-style-type: none"> • Understand simple sentence. • Write simple sentence • Develop curriculum vita, Letters of 	Reading and understanding simple sentences about self, work and environment Construction of simple sentences Writing simple English. Develop Resumes or curriculum vita. Letters of application reference to previous communication.	8 Resumes	4	

		application			
Unit III	English Literacy Speaking / Spoken English	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Communicate with team member • Participate with technical discussion 	<p>Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions.</p>	4	
Unit IV	Basics of Computer Word processing and Worksheet	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Operate the computer • Understand MS Office • Use of excel sheet and Creating simple work sheet 	<p>Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets</p>	4	
Unit V	Computer Networking and INTERNET	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Assessing internet and web browsing • Knowledge of basic computer networking • Opening an email account. • Use of Social sites 	<p>Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.</p>	4	
Unit VI	Introduction to Communication Skills	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Remove nervousness. • Manners, Etiquette Dress code for interview 	<p>Communication and its importance Principles of Effective communication Types of communication – verbal, written, email, talking on phone Non verbal communication characteristics, components-Para-lar Body – language Barriers to communication and with barriers.</p>	8	4

			Handling nervousness/ discomfort.		
Unit VII	Motivational Training Behavioral Skills	After completion of unit Student should be able to <ul style="list-style-type: none"> Confidence building attitude. Personal goal setting Under stand of work ethics and teamwork. 	Characteristics Essential to Achieving Success The Power of Positive Attitude Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning Problem Solving	8	4
Unit VIII	Safety & Health	After completion of unit Student should be able to <ul style="list-style-type: none"> Use of Accident Prevention techniques. Use of protective equipment. Understanding of Occupation safety. 	Introduction to Occupational Safety and Health importance of safety and health at workplace Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention Basic principles for protective equipment. Accident Prevention techniques – control of accidents and safety measures.	8	4
Unit IX	Environment	After completion of unit Student should be able to <ul style="list-style-type: none"> Understanding Factors causing imbalance. Global warm climate change 	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance. Right attitude towards environment, Maintenance of in – house environment	8	4
Unit X	Concept of Entrepreneurship	After completion of unit Student should be able to <ul style="list-style-type: none"> Process of set up a business Knowledge of Project report 	Entrepreneur – Entrepreneurship – Enterprises:- Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of	8	4

		<ul style="list-style-type: none"> Processes of Bank loan 	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.		
--	--	--	---	--	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Employability Skill

Course Code : CCCTM-08

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
70	-	02	40	-	40

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Employability Skill is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Employability Skill is regarded as a core skill set which supplement hard skill in all CNC Operator. Recognizing this importance of the core skill, the subjects of Employability Skill is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Interact effectively with co-workers and customers.
2. Make persons excellent workers and suitable to work in a team.
3. Develop Resumes or curriculum vita.
4. Operated computer with MS office tool
5. Access internet and web browsing.
6. Personal safety and work ethics.
7. Overcome communication barriers.
8. Process of setting up business and loan form Bank.
9. Monitoring the working environment and making sure it meets requirements for health, safety and security

Theory: Employability Skill

Topic and Contents	Hours	Marks
<p>Topic 1: English Literacy Pronunciation/ Functional Grammar</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Make Small Sentence ➤ Use of word of and speech <p>Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech), change, Change of tense, Spellings.</p>	8	4
<p>Topic 2: English Literacy Reading/Writing</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand simple sentence. ➤ Write simple sentence ➤ Develop curriculum vita, Letters of application <p>Reading and understanding simple sentences about self, work and environment, Constr simple English. Develop Resumes or curriculum vita. Letters of application reference to prev</p>	8	4
<p>Topic 3: English Literacy Speaking / Spoken English</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Communicate with team member ➤ Participate with technical discussion <p>Speaking with preparation on self, on family, on friends/ classmates, on know, picture re playing and discussions on current happening job description, asking about someone's job h</p>	6	4
<p>Topic 4: Basics of Computer Word processing and Worksheet</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Operate the computer ➤ Understand MS Office ➤ Use of excel sheet and ➤ Creating simple work sheet <p>Introduction, Computer and its applications, Hardware and peripherals, Switching on-Start Basic operating of Word Processing, Creating, opening and closing Documents, use of sh Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Ex</p>	4	4

commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Print simple excel sheets		
Topic 5: Computer Networking and INTERNET Objective: <ul style="list-style-type: none"> ➤ Assessing internet and web browsing ➤ Knowledge of basic computer networking ➤ Opening an email account. ➤ Use of Social sites <p>Basic of computer Networks (using real life examples), Definitions of Local Area Network, Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW) and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing account and use of email. Social media sites and its implication.</p>	4	4
Topic 6: Introduction to Communication Skills Objective: <ul style="list-style-type: none"> ➤ Remove nervousness. ➤ Manners, Etiquettes, ➤ Dress code for an interview <p>Communication and its importance, Principles of Effective communication, Types of communication written, email, talking on phone, Non verbal communication –characteristics, components Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.</p>	8	4
Topic 7: Motivational Training Behavioral Skills Objective: <ul style="list-style-type: none"> ➤ Confidence building attitude. ➤ Personal goal setting ➤ Under stand of work ethics and teamwork. <p>Characteristics Essential to Achieving, Success, The Power of Positive Attitude, Self awareness Ethics and Values, Ways to Motivate Oneself, Personal Goal setting and Employability Planning</p>	8	4
Topic 8: Safety & Health Objective: <ul style="list-style-type: none"> ➤ Use of Accident Prevention techniques. ➤ Use of protective equipment. ➤ Understanding of Occupation safety. <p>Introduction to Occupational Safety and Health importance of safety and health at workplace, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational Diseases/ Disorders & its prevention, Basic principles for protective equipment control of accidents and safety measures.</p>	8	4
Topic 9: Environment Objective: <ul style="list-style-type: none"> ➤ Understanding Factors causing imbalance. ➤ Global warming, climate change 	8	4

Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance in attitude towards environment, Maintenance of in – house environment		
<p>Topic 10: Concept of Entrepreneurship</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Process of setting up a business ➤ Knowledge of Project report ➤ Processes of Bank loan <p>Entrepreneur – Entrepreneurship – Enterprises:- Conceptual issue, Entrepreneurship motivation. Performance & Record, Role & Function of Preparation of Project. Role of Various agencies for employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies / Programmes & procedure & the available scheme.</p>	8	4

Books: Employability Skill

Sl. No.	Author	Title	Publisher
1	Neelkanth	Employability Skills	Neelkantha
2	C.SubhasKapil Dev	Employability Skills	Asian Publishers
3	R.T.UparathR.H.Patil	Rogar Shamta koushlya	Amul publisher
4	C. Subhas	Self employment&enterpreneurship	New asinpublishers Delhi
5	R.T.Uprath	Employablility Skill	Amul

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: Employability Skill - Practical

COURSE CODE: CCCTM-09

COURSE OUTCOMES:

After completion of course Student should be able to

- Interact effectively with co-workers and customers.
- Make persons excellent workers and suitable to work in a team.
- Develop Resumes or curriculum vita.
- Operated computer with MS office tool
- Access internet and web browsing.
- Personal safety and work ethics.
- Overcome communication barriers.
- Process of setting up business and loan form Bank.
- Monitoring the working environment and making sure it meets requirements for health, safety and security

THEORY HOURS: 72

PRACTICAL HOURS: 24

THEORY MARKS:

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks
Unit I	Basics of Computer Word processing and Worksheet	After completion of unit Student should be able to <ul style="list-style-type: none"> • Operate the computer • Understand MS Office • Use of excel sheet and Creating simple work sheet 	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets	8	20
Unit V	Computer Networking and INTERNET	After completion of unit Student should be able to <ul style="list-style-type: none"> • Assessing internet and web browsing • Knowledge of 	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and	8	20

		<p>basic computer networking</p> <ul style="list-style-type: none"> • Opening an email account. • Use of Social sites 	<p>Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.</p>			
Unit III	Introduction Communication Skills	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Remove nervousness. • Manners, Etiquette <p>Dress code for interview</p>	<p>Communication and its importance Principles of Effective communication Types of communication – verbal, non-verbal, written, email, talking on phone Non verbal communication characteristics, components-Para-language Body – language Barriers to communication and deal with barriers. Handling nervousness/ discomfort.</p>	6	20	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : Employability Skill- Practical

Course Code : CCCTM-09

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	22	02	-	60	60

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Employability Skill - Practical is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Employability Skill - Practical is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Employability Skill - Practical is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

COURSE OUTCOMES:

1. Interact effectively with co-workers and customers.
2. Make persons excellent workers and suitable to work in a team.
3. Develop Resumes or curriculum vita.
4. Operated computer with MS office tool
5. Access internet and web browsing.
6. Personal safety and work ethics.
7. Overcome communication barriers.
8. Process of setting up business and loan form Bank.
9. Monitoring the working environment and making sure it meets requirements for health, safety and security

Practical: Employability Skill

Topic and Contents	Hours	Marks
<p>Topic 1: Basics of Computer Word processing and Worksheet</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Operate the computer ➤ Understand MS Office ➤ Use of excel sheet and ➤ Creating simple work sheet <p>Introduction, Computer and its applications, Hardware and peripherals, Switching on-down of computer, Basic operating of Word Processing, Creating, opening and closing shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Table Basics of Excel worksheet, understanding basic commands, creating simple worksheets, u worksheets, use of simple formulas and functions, Printing of simple excel sheets</p>	8	20
<p>Topic 2: Computer Networking and INTERNET</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Assessing internet and web browsing ➤ Knowledge of basic computer networking ➤ Opening an email account. ➤ Use of Social sites <p>Basic of computer Networks (using real life examples), Definitions of Local Area Network Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW and Search Engines. Accessing the Internet using Web Browser, Downloading and Pri account and use of email. Social media sites and its implication.</p>	8	20
<p>Topic 3: Introduction to Communication Skills</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Remove nervousness. ➤ Manners, Etiquettes, ➤ Dress code for an interview <p>Communication and its importance, Principles of Effective communication, Types verbal, written, email, talking on phone, Non verbal communication –characteristics, co language, Barriers to communication and dealing with barriers. Handling nervousness/ dis</p>	6	20

Books: Employability Skill

Sl. No.	Author	Title	Publisher
1	Neelkanth	Employability Skills	Neelkantha
2	C.SubhasKapil Dev	Employability Skills	Asian Publishers
3	R.T.UparathR.H.Patil	Rogar Shamta koushlya	Amul publisher
4	C. Subhas	Self employment&enterpreneurship	New asinpublishers Delhi
5	R.T.Uprath	Employablility Skill	Amul

COURSES / MODULE TEMPLATE

Semester-I

COURSE NAME: CNC PROGRAMMING AND CNC MACHINING - THEORY

COURSE CODE: CCCTM-10

COURSE OUTCOMES:

After completion of course Student should be able to:

- Explain applications and advantages of CNC machines and technology
- Demonstrate and explain various CNC control Calculate technological data for CNC machining
- The importance and use of PPE’s
- Prepare and understand line program for various profiles Identify and set parameters for various simulators
- Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
- Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
- Define and explain Modern CNC systems and explain its importance in manufacturing.

THEORY HOURS: 134

PRACTICAL HOURS: 238

THEORY MARKS: -40

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I	Introduction to CNC technology and CNC programming	After completion of unit Student should be able to <ul style="list-style-type: none"> • Explain applications and advantages of CNC machines and technology • Understand and explain difference between conventional & non-conventional machine tool • Demonstrate and explain various CNC control • Calculate technological data for CNC machining • Explain the JH 	Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC Basic health and safety CNC programming basics. Introduction to manual NC programming Manual NC programming for	22	8	

		<p>system, its use and application</p> <ul style="list-style-type: none"> Understand the importance and use of PPE's 	<p>lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.</p>			
UNIT-II	CNC Programming	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Understand and explain the concept and importance of CNC programming Prepare and understand line program for various profiles Identify and set parameters for various simulators Prepare and simulate various operation cycles for lathe and milling Use and simulate cycles using various Controls Analyze parameters for various machining cycles and operations 	<p>Introduction to CNC programming Introduction and demonstration of line programs CNC programming for lathe & milling machine using iso codes into the CNC simulator. CNC programming for lathe and milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations Exposure for programming and simulator of FANUC, SINUMERIC, DMG TURNPLUS & Controls through post processors. Programming exercise. Machining of programmed exercise on CNC lathe & milling machines.</p>	24	8	
UNIT-III	CNC Machining – Lathe	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> Optimize parameters for turning operations Analyze the parameters of lathe operations Explain operation sequence for the lathe operations Prepare operation 	<p>Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc. and set a references for the various operations Prepare operation and operation sequence for the lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed Execute program and inspect</p>	24	8	

		<p>sequence for test run</p> <ul style="list-style-type: none"> • Set , Simulate, and perform various operations like turning , grooving threading etc 	<p>simple geometrical forms / standard parts</p> <p>Use of various PPE's on CNC lathe machine</p>			
UNIT-IV	CNC Machining – Milling	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Optimize parameters for milling operations • Analyze the parameters of milling operations • Explain operation sequence for the milling operations • Prepare operation sequence for test run • Set , Simulate, and perform various operations like core milling , cavity milling , PCD drilling etc. 	<p>Plan and optimize programs for CNC Milling operations.</p> <p>Calculate parameters like speed feed , depth of cut etc. and set a references for the various operations</p> <p>Various methods of work process like edge finding block center etc.</p> <p>Prepare & set CNC Milling operations and test run programmed</p> <p>Execute program and inspect simple geometrical forms / standard parts</p> <p>Use of various PPE's on CNC milling machine</p>	24	8	
UNIT-V	Modern CNC Systems	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain and use Indexable tools • Describe and use ATC and explain its applications • Describe advanced CNC systems and its applications • Explain the importance of Computer Aided Part Programming • Interface Computer systems for Manufacturing 	<p>Indexable carbide tools, Modular Tooling & Tool Presetting, Machining Centers, Automatic tool changers</p> <p>Introduction to advanced CNC systems like HSM, RP,CIM</p> <p>Importance and application of advanced CNC systems</p> <p>Computer Aided Part Programming</p> <p>Part Program Generation through ProE/DelCAM</p> <p>Post Processors Computations for part programming</p>	38	8	

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : I

Course Title : CNC PROGRAMMING AND CNC MACHINING - Theory

Course Code : CCCTM-10

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
132	-	02	40	-	40

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read CNC PROGRAMMING AND CNC MACHINING - THEORY is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyze the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. Speed and feed of a cutting operation.

Thus CNC PROGRAMMING AND CNC MACHINING - THEORY is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of CNC PROGRAMMING AND CNC MACHINING - THEORY is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Explain applications and advantages of CNC machines and technology
2. Demonstrate and explain various CNC control Calculate technological data for CNC machining
3. The importance and use of PPE's
4. Prepare and understand line program for various profiles Identify and set parameters for various simulators
5. Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
6. Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
7. Define and explain Modern CNC systems and explain its importance in manufacturing.

Theory: CNC PROGRAMMING AND CNC MACHINING

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to CNC technology and CNC programming</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain applications and advantages of CNC machines and technology ➤ Understand and explain difference between conventional & non-conventional machine tool ➤ Demonstrate and explain various CNC control ➤ Calculate technological data for CNC machining ➤ Explain the JH system, its use and application ➤ Understand the importance and use of PPE's <p>Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control, Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC, Basic health and safety, CNC programming basics. Introduction to manual NC programming, Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.</p>	22	8
<p>Topic 2: CNC Programing</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand and explain the concept and importance of CNC programming ➤ Prepare and understand line program for various profiles ➤ Identify and set parameters for various simulators ➤ Prepare and simulate various operation cycles for lathe and milling ➤ Use and simulate cycles using various Controls ➤ Annalise parameters for various machining cycles and operations <p>Introduction to CNC programming, Introduction and demonstration of line programs, CNC programming for lathe & milling machine using iso codes into the CNC simulator. CNC programming for lathe and milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations Exposure for programming and simulator of</p>	24	8

<p>FANUC, SINUMERIC, DMG TURNPLUS & Controls through post processors. Programming exercise. Machining of programmed exercise on CNC lathe & milling machines.</p>		
<p>Topic 3: CNC Machining – Lathe Objective:</p> <ul style="list-style-type: none"> ➤ Optimize parameters for turning operations ➤ Analyze the parameters of lathe operations ➤ Explain operation sequence for the lathe operations ➤ Prepare operation sequence for test run ➤ Set , Simulate, and perform various operations like turning , grooving threading etc <p>Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc. and set a references for the various operations, Prepare operation and operation sequence for the lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed, Execute program and inspect simple geometrical forms / standard parts, Use of various PPE’s on CNC lathe machine.</p>	24	8
<p>Topic 4: CNC Machining –Milling Objective:</p> <ul style="list-style-type: none"> ➤ Optimize parameters for milling operations ➤ Analyze the parameters of milling operations ➤ Explain operation sequence for the milling operations ➤ Prepare operation sequence for test run ➤ Set , Simulate, and perform various operations like core milling , cavity milling , PCD drilling etc. <p>Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed , depth of cut etc. and set a references for the various operations, Various methods of work process like edge finding block center etc. Prepare & set CNC Milling operations and test run programmed, Execute program and inspect simple geometrical forms / standard parts, Use of various PPE’s on CNC milling machine.</p>	24	8
<p>Topic 5: Modern CNC Systems Objective:</p> <ul style="list-style-type: none"> ➤ Explain and use Indexable tools ➤ Describe and use ATC and explain its applications ➤ Describe advanced CNC systems and its applications ➤ Explain the importance of Computer Aided Part Programming ➤ Interface Computer systems for Manufacturing <p>Indexable carbide tools, Modular Tooling & Tool Presetting, Machining Centers, Automatic tool changers, Introduction to advanced CNC systems like HSM, RP,CIM, Importance and application of advanced CNC systems, Computer Aided Part Programming, Part Program Generation through Master CAM, Post Processors Computations for part programming.</p>	38	8

Books: CNC PROGRAMMING AND CNC MACHINING

Sl. No.	Author	Title	Publisher
1	Alan Overby	CNC Machining Handbook: Building, Programming, and Implementation	McGraw-Hill Education TAB; 1
2	Peter Smid	CNC Programming Handbook	Industrial Press Inc
3	James A. Harvey	CNC Trade Secrets	Industrial Press Inc
4	Steve Krar / Arthur Gill	Computer Numerical Control Programming Basics	INDUSTRIAL PRESS, INC.

COURSES / MODULE TEMPLATE

Semester-II

COURSE NAME: CNC PROGRAMMING AND CNC MACHINING - PRACTICAL

COURSE CODE: CCCTM-11

COURSE OUTCOMES:

After completion of course Student should be able to:

- Explain applications and advantages of CNC machines and technology
- Demonstrate and explain various CNC control Calculate technological data for CNC machining
- The importance and use of PPE's
- Prepare line program for various profiles Identify and set parameters for various simulators
- Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
- Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
- Define and explain Modern CNC systems and explain its importance in manufacturing.

THEORY HOURS: 134

PRACTICAL HOURS: 238

THEORY MARKS:-

PRACTICAL MARKS: 60

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to CNC technology and CNC programming	After completion of unit Student should be able to <ul style="list-style-type: none"> • Explain applications and advantages of CNC machines and technology • Understand and explain difference between conventional & non-conventional machine tool • Demonstrate and explain various CNC control • Calculate technological data for CNC machining • Explain the JH system, its use and application • Understand the importance and use of PPE's 	Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC Basic health and safety CNC programming basics. Introduction to manual NC programming Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages,	12	10	

			Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.			
UNIT-II	CNC Programming-Turning	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand and explain the concept and importance of CNC programming • Prepare and understand line program for various profiles • Identify and set parameters for various simulators • Prepare and simulate various operation cycles for lathe and milling • Use and simulate cycles using various Controls • Analyze parameters for various machining cycles and operations 	<p>Introduction to CNC programming</p> <p>Introduction and demonstration of line programs</p> <p>CNC programming for lathe machine using iso codes into the CNC simulator.</p> <p>CNC programming for lathe machines using different machining cycles into the CNC simulator.</p> <p>Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations</p> <p>Exposure for programming and simulator of FANUC, SINUMERIC, Controls through post processors.</p> <p>Programming exercise.</p> <p>Machining of programmed exercise on CNC lathe machines.</p>	48	10	
UNIT-III	CNC Programming-Milling	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Understand and explain the concept and importance of CNC programming • Prepare and understand line program for various profiles • Identify and set parameters for various simulators • Prepare and simulate various operation cycles for milling • Use and simulate cycles using various Controls • Analyze parameters for 	<p>Introduction to CNC programming</p> <p>Introduction and demonstration of line programs</p> <p>CNC programming for Milling machine using iso codes into the CNC simulator.</p> <p>CNC programming for Milling machines using different machining cycles into the CNC simulator.</p> <p>Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations</p>	50	10	

		various machining cycles and operations	Exposure for programming and simulator of FANUC, SINUMERIC, Controls through post processors. Programming exercise. Machining of programmed exercise on CNC Milling machines.			
UNIT-IV	CNC Machining – Lathe	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Optimize parameters for turning operations • Analyze the parameters of lathe operations • Explain operation sequence for the lathe operations • Prepare operation sequence for test run • Set , Simulate, and perform various operations like turning , grooving threading etc 	<p>Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc. and set a references for the various operations Prepare operation and operation sequence for the lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE’s on CNC lathe machine</p>	50	10	
UNIT-V	CNC Machining – Milling	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Optimize parameters for milling operations • Analyze the parameters of milling operations • Explain operation sequence for the milling operations • Prepare operation sequence for test run • Set , Simulate, and perform various operations like core milling , cavity milling , PCD drilling etc. 	<p>Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed , depth of cut etc. and set a references for the various operations Various methods of work process like edge finding block center etc. Prepare & set CNC Milling operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE’s on CNC milling machine</p>	60	10	
UNIT-VI	Modern CNC Systems	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain and use Indexable tools • Describe and use ATC 	<p>Indexable carbide tools, Modular Tooling & Tool Presetting, Machining Centers, Automatic tool changers Introduction to advanced cnc systems like HSM, RP,CIM</p>	14	10	

		and explain its applications <ul style="list-style-type: none"> • Describe advanced CNC systems and its applications • Explain the importance of Computer Aided Part Programming • Interface Computer systems for Manufacturing 	Importance and application of advanced CNC systems Computer Aided Part Programming Part Program Generation through ProE/DelCAM Post Processors Computations for part programming			
--	--	--	---	--	--	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : II

Course Title : CNC PROGRAMMING AND CNC MACHINING - PRACTICAL

Course Code : CCCTM-11

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	234	04	-	60	60

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, “Skills to Transfer Skills”. To cope up this quality possession of core skills is imperative.

Ability to read CNC PROGRAMMING AND CNC MACHINING - Practical is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus CNC PROGRAMMING AND CNC MACHINING - Practical is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of CNC PROGRAMMING AND CNC MACHINING - Practical is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Explain applications and advantages of CNC machines and technology
2. Demonstrate and explain various CNC control Calculate technological data for CNC machining
3. The importance and use of PPE’s
4. Prepare line program for various profiles Identify and set parameters for various simulators
5. Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
6. Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
7. Define and explain Modern CNC systems and explain its importance in manufacturing.

Practical: CNC PROGRAMMING AND CNC MACHINING

Topic and Contents	Hours	Marks
Topic 1: Introduction to CNC technology and CNC programing Objective: <ul style="list-style-type: none"> ➤ Explain applications and advantages of CNC machines and technology ➤ Understand and explain difference between conventional & non-conventional machine tool ➤ Demonstrate and explain various CNC control 	12	10

<ul style="list-style-type: none"> ➤ Calculate technological data for CNC machining ➤ Explain the JH system, its use and application ➤ Understand the importance and use of PPE's <p>Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control, Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC, Basic health and safety, CNC programming basics. Introduction to manual NC programming, Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.</p>		
<p>Topic 2: CNC Programing-Turning</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand and explain the concept and importance of CNC programming ➤ Prepare and understand line program for various profiles ➤ Identify and set parameters for various simulators ➤ Prepare and simulate various operation cycles for lathe and milling ➤ Use and simulate cycles using various Controls ➤ Annalise parameters for various machining cycles and operations <p>Introduction to CNC programming, Introduction and demonstration of line programs, CNC programming for lathe machine using iso codes into the CNC simulator. CNC programming for lathe machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations, Exposure for programming and simulator of FANUC, Controls through post processors. Programming exercise. Machining of programmed exercise on CNC lathe machines.</p>	48	10
<p>Topic 3: CNC Programing-Milling</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Understand and explain the concept and importance of CNC programming ➤ Prepare and understand line program for various profiles ➤ Identify and set parameters for various simulators ➤ Prepare and simulate various operation cycles for milling ➤ Use and simulate cycles using various Controls ➤ Analyze parameters for various machining cycles and operations <p>Introduction to CNC programming, Introduction and demonstration of line programs, CNC programming for Milling machine using iso codes into the CNC simulator. CNC programming for Milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms, Tool compensations, Exposure for programming and simulator of FANUC, SINUMERIC, Controls through post processors. Programming exercise. Machining of programmed exercise on CNC Milling machines.</p>	50	10
<p>Topic 4: CNC Machining – Lathe</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Optimize parameters for turning operations ➤ Analyze the parameters of lathe operations ➤ Explain operation sequence for the lathe operations ➤ Prepare operation sequence for test run ➤ Set , Simulate, and perform various operations like turning , grooving threading etc <p>Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc.</p>	50	10

<p>and set a references for the various operations, Prepare operation and operation sequence for the lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed, Execute program and inspect simple geometrical forms / standard parts, Use of various PPE's on CNC lathe machine.</p>		
<p>Topic 5: CNC Machining –Milling Objective:</p> <ul style="list-style-type: none"> ➤ Optimize parameters for milling operations ➤ Analyze the parameters of milling operations ➤ Explain operation sequence for the milling operations ➤ Prepare operation sequence for test run ➤ Set , Simulate, and perform various operations like core milling , cavity milling , PCD drilling etc. <p>Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed , depth of cut etc. and set a references for the various operations, Various methods of work process like edge finding block center etc. Prepare & set CNC Milling operations and test run programmed, Execute program and inspect simple geometrical forms / standard parts, Use of various PPE's on CNC milling machine.</p>	60	10
<p>Topic 6: Modern CNC Systems Objective:</p> <ul style="list-style-type: none"> ➤ Explain and use Indexable tools ➤ Describe and use ATC and explain its applications ➤ Describe advanced CNC systems and its applications ➤ Explain the importance of Computer Aided Part Programming ➤ Interface Computer systems for Manufacturing <p>Indexable carbide tools, Modular Tooling & Tool Presetting, Machining Centers, Automatic tool changers, Introduction to advanced CNC systems like HSM, RP,CIM, Importance and application of advanced CNC systems, Computer Aided Part Programming, Part Program Generation through MasterCAM, Post Processors Computations for part programming.</p>	14	10

Books: CNC PROGRAMMING AND CNC MACHINING

Sl. No.	Author	Title	Publisher
1	Alan Overby	CNC Machining Handbook: Building, Programming, and Implementation	McGraw-Hill Education TAB; 1
2	Peter Smid	CNC Programming Handbook	Industrial Press Inc
3	James A. Harvey	CNC Trade Secrets	Industrial Press Inc
4	Steve Krar / Arthur Gill	Computer Numerical Control Programming Basics	INDUSTRIAL PRESS, INC.

COURSES / MODULE TEMPLATE

Semester-II

COURSE NAME: Quality Management System

COURSE CODE: CCCTM-12

COURSE OUTCOMES:

After completion of course Student should be able to:

- Describe the basic concepts, terminology and overcome legislative framework in the subject area of quality, quality control and quality management system
- Describe ways of applying quality management in the actual organization,
- Demonstrate the capability of making quality process for the selected process,
- Perceiving the organization to determine the existence or nonexistence of the implemented quality management system,
- Demonstrate the capability of making quality process, given the well-known process, identify the standard that could be applied, the roles and responsibilities of reference legislative framework
- Choose the optimal approach to the analysis of a given process by describing the activities

THEORY HOURS: 96

PRACTICAL HOURS:

THEORY MARKS: -100

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Mark s	
UNIT-I	Introduction	After completion of unit Student should be able to <ul style="list-style-type: none"> • to use quality management concepts easily • Peculiarities of evolution of quality management and its significance for the management of modern organizations 	Introduction: Importance of quality in the management of company. Concepts of quality management. Quality dimensions of goods and services. Quality management evolution and works of quality gurus.	08	10	
UNIT-II	Quality policy and quality organizations	After completion of unit Student should be able to <ul style="list-style-type: none"> • Analyse quality features of products and services; • principles of standardization and conformity assessment; 	Quality policy and quality organizations: International and Indian quality organizations. Indian quality policy. International, regional and national standardization. System of assessment of quality conformity in Indian.	10	10	

UNIT-III	Management systems and quality management principles for excellence	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Peculiarities of implementation, certification and audit of quality management systems; • The usage of quality control methods for the analysis and solution of organizations' problems. 	<p>Management systems and quality management principles for excellence: Quality management systems. Quality control methods. Quality audit and certification of management systems. Sustainable development. Environment management systems. Occupational health and safety management system. Eco-labelling. Total quality management.</p>	12	10	
UNIT-IV	Total quality management TQM PRINCIPLES	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain the meaning of total quality management (TQM). • Identify costs of quality. • Describe the evolution of TQM. • Identify key leaders in the field of quality and their contributions. • Identify features of the TQM philosophy. • Describe tools for identifying and solving quality problems. • Describe quality awards and quality certifications. • KAIZEN 	<p>INTRODUCTION: Definition of Quality, Dimensions of Quality, Quality Planning, Basic concepts of Total Quality Management, Principles of TQM, Quality Council, Quality Statements, Strategic Planning. TQM PRINCIPLES: Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal. TQM TOOLS : Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, Total Productive Maintenance (TPM) - Concept, Improvement Needs. KAIZEN, Quality Circles, Quality Models for organizational excellence. 7 QC tools, 7 New Quality Management Tools.</p>	16	10	
UNIT-V	Quality System	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • ISO 9000, • ISO 9000:2000 • TS 16949, • ISO 14000 	<p>QUALITY SYSTEMS: Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 -</p>	16	20	

			Concept, Requirements and Benefits.			
UNIT-VI	5S	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Sort • Straighten • Shine • Standardize • Sustain 	<p>Purpose of 5S: 5S Creates a Visual Factory, The 5S Cycle, 5S Activities Explained, The Purpose and Payoff of 5S, Remove the Roadblocks in the Way, 5S Program Overview.</p> <p>5S Program Steps: Workplace Observation, Set a Target Area Vision, The Power of a Shared Vision, What You See Before 5S, What You See After 5S, After 5S -Easy to Find, Easy to Do. Sort–keep only what is needed Today, Red Tag Process, Red Tag Inspection List, Red Tagged Items Log.</p> <p>Straighten –find it fast; faster, Put Order and Sense into the Workplace, Set-in-Place to Make Life Easy, Visual Control of Tool Storage, Visual Management of Inventory and Stock, Straighten the Workflow, Straighten Check Sheet. Shine–see problems when they are small, Shine Check Sheet, Plan Who, What, How to Clean. Standardize–the same rules for all, Set Standards for Condition and Use of Tools and Equipment. Sustain– this is how we do it here, Weekly and Monthly Feedback on Performance, Workplace Measurement Checklist – tracking your performance weekly, Tracking Your Performance Monthly.</p>	16	20	

UNIT-VII	Six Sigma Fundamentals	After completion of unit Student should be able to <ul style="list-style-type: none"> • Methodology • Process Improvement Model (DMAIC) • Six Sigma Organization, • Six Sigma Implementation Requirements 	Six Sigma Fundamentals: Basic Concept, Methodology, Process Improvement Model (DMAIC) Steps (Objectives, Tools and Techniques Used), Six Sigma Organization, Six Sigma Implementation Requirements, Introduction to Lean Six Sigma.	16	20	
----------	------------------------	---	--	----	----	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : II

Course Title : Quality Management System

Course Code : CCCTM-12

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
94	-	02	100	-	100

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read Quality Management System is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Quality Management System is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Quality Management System is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Describe the basic concepts, terminology and overcome legislative framework in the subject area of quality, quality control and quality management system
2. Describe ways of applying quality management in the actual organization,
3. Demonstrate the capability of making quality process for the selected process,
4. Perceiving the organization to determine the existence or nonexistence of the implemented quality management system,
5. Demonstrate the capability of making quality process, given the well-known process, identify the standard that could be applied, the roles and responsibilities of reference legislative framework
6. Choose the optimal approach to the analysis of a given process by describing the activities

Theory: Quality Management System

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ to use quality management concepts easily ➤ Peculiarities of evolution of quality management ➤ and its significance for the management of modern organizations <p>Introduction: Importance of quality in the management of company. Concepts of quality management. Quality dimensions of goods and services. Quality management evolution and works of quality gurus.</p>	08	10
<p>Topic 2: Quality policy and quality organizations</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Analyse quality features of products and services; ➤ Principles of standardization and conformity assessment; <p>Quality policy and quality organizations: International and Indian quality organizations. Indian quality policy. International, regional and national standardization. System of assessment of quality conformity in Indian.</p>	10	10
<p>Topic 3: Management systems and quality management principles for excellence</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Peculiarities of implementation, certification and audit of quality management systems; ➤ The usage of quality control methods for the analysis and solution of organizations' problems. <p>Management systems and quality management principles for excellence: Quality management systems. Quality control methods. Quality audit and certification of management systems. Sustainable development. Environment management systems. Occupational health and safety management system. Eco-labelling. Total quality management.</p>	12	10
<p>Topic 4: Total quality management & TQM PRINCIPLES</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain the meaning of total quality management (TQM). ➤ Identify costs of quality. ➤ Describe the evolution of TQM. 	16	10

<ul style="list-style-type: none"> ➤ Identify key leaders in the field of quality and their contributions. ➤ Identify features of the TQM philosophy. ➤ Describe tools for identifying and solving quality problems. ➤ Describe quality awards and quality certifications. ➤ KAIZEN <p>INTRODUCTION: Definition of Quality, Dimensions of Quality, Quality Planning, Basic concepts of Total Quality Management, Principles of TQM, Quality Council, Quality Statements, Strategic Planning.</p> <p>TQM PRINCIPLES: Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal.</p> <p>TQM TOOLS : Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, Total Productive Maintenance (TPM) - Concept, Improvement Needs. KAIZEN, Quality Circles, Quality Models for organizational excellence. 7 QC tools, 7 New Quality Management Tools.</p>		
<p>Topic 5: Quality System</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ ISO 9000, ➤ ISO 9000:2000 ➤ TS 16949, ➤ ISO 14000 <p>QUALITY SYSTEMS: Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 - Concept, Requirements and Benefits.</p>	16	20
<p>Topic 6: 5S</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Sort ➤ Straighten ➤ Shine ➤ Standardize ➤ Sustain <p>Purpose of 5S: 5S Creates a Visual Factory, The 5S Cycle, 5S Activities Explained, The Purpose and Payoff of 5S, Remove the Roadblocks in the Way, 5S Program Overview.</p> <p>5S Program Steps: Workplace Observation, Set a Target Area Vision, The Power of a Shared Vision, What You See Before 5S, What You See After 5S, After 5S -Easy to Find, Easy to Do.</p> <p>Sort—keep only what is needed Today, Red Tag Process, Red Tag Inspection List, Red Tagged Items Log. Straighten—find it fast; faster, Put Order and Sense into the Workplace, Set-in-Place to Make Life Easy, Visual Control of Tool Storage, Visual Management of Inventory and Stock, Straighten the Workflow, Straighten Check Sheet. Shine—see problems when they are small, Shine Check Sheet, Plan Who, What, How to Clean. Standardize—the same rules for all, Set Standards for Condition and Use of Tools and Equipment. Sustain— this is how we do it here, Weekly and Monthly Feedback on Performance, Workplace Measurement Checklist – tracking your performance weekly, Tracking Your Performance Monthly.</p>	16	20
<p>Topic 7: Six Sigma Fundamentals</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Methodology ➤ Process Improvement Model (DMAIC) 	16	20

<ul style="list-style-type: none"> ➤ Six Sigma Organization, ➤ Six Sigma Implementation Requirements <p>Six Sigma Fundamentals: Basic Concept, Methodology, Process Improvement Model (DMAIC) Steps (Objectives, Tools and Techniques Used), Six Sigma Organization, Six Sigma Implementation Requirements, Introduction to Lean Six Sigma.</p>		
--	--	--

Books: Quality Management System

Sl. No.	Author	Title	Publisher
1	James O. Westgard, Sten A. Westgard	Basic Quality Management Systems	Published by Westgard QC, Inc.
2	David Hoyle	ISO 9000 Quality Systems Handbook	OXFORD AUCKLAND BOSTON JOHANNESBURG MELBOURNE NEW DELHI
3	Dale H. Besterfield	Total Quality Management	Pearson Education;

COURSES / MODULE TEMPLATE

Semester-II

COURSE NAME: Group Discussion and Personality Improvement

COURSE CODE: CCCTM-13

COURSE OUTCOMES:

After completion of course Student should be able to:

- To develop communication competence in prospective students.
- To enable them to convey thoughts and ideas with clarity and focus.
- To develop report writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process.
- To prepare them on problem solving skills.
- To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- To learn leadership qualities and practice them.

THEORY HOURS: 96

PRACTICAL HOURS:

THEORY MARKS: -100

PRACTICAL MARKS:

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	TH hours	Marks	
UNIT-I	Communication Skill	After completion of unit Student should be able to <ul style="list-style-type: none"> • Listening Skills • Writing Skills • Technical Writing • Letter Writing • Job Application • Report Writing 	Communication Skill : Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.	22	25	

UNIT-II	Critical Thinking & Problem Solving	After completion of unit Student should be able to <ul style="list-style-type: none"> • Lateral thinking • Critical thinking • Multiple Intelligence • Problem Solving • Six thinking hats Mind Mapping & Analytical Thinking 	Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking.	24	25	
UNIT-III	Teamwork	After completion of unit Student should be able to <ul style="list-style-type: none"> • Team formation process • Stages of Group • Group Dynamics • Managing Team Performance & Team Conflicts 	Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.	24	25	
UNIT-IV	Ethics, Moral & Professional Values	After completion of unit Student should be able to <ul style="list-style-type: none"> • Human Values • Civic Rights • Operator Ethics • Operator as Social Experimentation • Environmental Ethics 	Ethics, Moral & Professional Values: Human Values, Civic Rights, Operator Ethics, Operator as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.	24	25	

		<ul style="list-style-type: none"> • Global Issues • Code of Ethics like ASME, ASCE, IEEE. 				
--	--	--	--	--	--	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : II

Course Title : Group Discussion and Personality Improvement

Course Code : CCCTM-13

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
94	-	02	100	-	100

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, “Skills to Transfer Skills”. To cope up this quality possession of core skills is imperative.

Ability to read Group Discussion and Personality Improvement is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail

planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Group Discussion and Personality Improvement is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Group Discussion and Personality Improvement is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. To develop communication competence in prospective students.
2. To enable them to convey thoughts and ideas with clarity and focus.
3. To develop report writing skills.
4. To equip them to face interview & Group Discussion.
5. To inculcate critical thinking process.
6. To prepare them on problem solving skills.
7. To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
8. To create an awareness on Engineering Ethics and Human Values.
9. To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
10. To learn leadership qualities and practice them.

Theory: Group Discussion and Personality Improvement

Topic and Contents	Hours	Marks
<p>Topic 1: Communication Skill Objective:</p> <ul style="list-style-type: none"> ➤ Listening Skills ➤ Writing Skills ➤ Technical Writing ➤ Letter Writing ➤ Job Application ➤ Report Writing <p>Communication Skill : Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.</p>	22	25
<p>Topic 2: Critical Thinking & Problem Solving Objective:</p> <ul style="list-style-type: none"> ➤ Lateral thinking ➤ Critical thinking ➤ Multiple Intelligence ➤ Problem Solving ➤ Six thinking hats Mind Mapping & Analytical Thinking 	24	25

Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking.		
Topic 3: Teamwork Objective: <ul style="list-style-type: none"> ➤ Team formation process ➤ Stages of Group ➤ Group Dynamics ➤ Managing Team Performance & Team Conflicts Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.	24	25
Topic 4: Ethics, Moral & Professional Values Objective: <ul style="list-style-type: none"> ➤ Human Values ➤ Civic Rights ➤ Operator Ethics ➤ Operator as Social Experimentation ➤ Environmental Ethics ➤ Global Issues ➤ Code of Ethics like ASME, ASCE, IEEE. Ethics, Moral & Professional Values: Human Values, Civic Rights, Operator Ethics, Operator as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.	24	25

Books: Group Discussion and Personality Improvement

Sl. No.	Author	Title	Publisher
1	Patricia Prendiville	Developing Facilitation Skills	Combat Poverty Agency
2	Dr.Chandra Prasad Sreedhar & Mr.Oommen Mathew	TRAINING MODULE ON PERSONALITY DEVELOPMENT	Department of Personnel & Training Government of India & U.N.D.P
3	Ann-Marie Nazzaro, Joyce Strazzabosco	GROUP DYNAMICS AND TEAM BUILDING	HEMOPHILIA ORGANIZATION DEVELOPMENT

COURSES / MODULE TEMPLATE

Semester-II

COURSE NAME: Computer Aided Drafting & Design(AutoCAD)

COURSE CODE: CCCTM-14

COURSE OUTCOMES:

After completion of course Student should be able to:

- Describe types of different CAD software.
- Create 2D geometric sketches by using Auto CAD software.
- Develop 3D modeling by using advanced command.
- Define assembly constraint & develop different types of assembly design by using AutoCAD Software.
- Describe design generative & interactive drafting.

THEORY HOURS:

PRACTICAL HOURS: 120

THEORY MARKS:

PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to AutoCAD	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • CAD/CAM software. • various feature in CAD software. • various types of CAD software. • Uses and Importance of CAD software in Industries. • Selection criteria of CAD software. 	Capability of CAD Software and Introduction to AutoCAD. Description of the feature that have been added or changed since new Release CAD. Criteria for selection of CAD workstations, Drafting & Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.	20	20	
UNIT-II	Drawing	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Drawing curve object. • Create various types of sketch geometry. • Editing property tools. • Controlling drawing display. • Geometric dimension & tolerance method 	Drawing curve objects (Circle, Arc, Ellipse, elliptical arcs). Creating solid filled areas- Regions, Hatch, Dotnut. Drawing line object like line, polyline, multiline etc. Drawing curve objects like Circle, Arc, Ellipse, elliptical arcs etc. Editing objects using the object property tool bar and various method & Controlling Drawing	24	20	

			Display. Lengthen, Stretching, Offset, Align, Trim, Extend, Array etc. Detailed discussion on Dimensions, Geometrical Dimension, Tolerance method in AutoCAD.			
UNIT-III	Block & defining block	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> Working with block & defining block attributes. Concept of Isometric Drawing, Layout & Plotting. Execute of solid modeling / 3d modeling. Create surface modeling. 	Working with block & defining block attributes. Concept of Isometric Drawing, Layout & Plotting. Creating of solid modeling / 3d modeling. Like creating, Editing, and modification technique. Creating of surface modeling like creating, Editing, and modification technique.	24	20	
UNIT-IV	Dimensioning and Detailing	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> Capability of AutoCAD. 2D drawing generation with dimensioning & detailing. Create and Modification of Surface Entities Trimming and Lofting of Surfaces, Surface Diagnostics, Reflection Line Analysis. Create Solid Modeling and Feature Based Part Modeling. Assembly- Constraint based Parametric Profile Editing and 3D Constraint Solver. 	Capability of AutoCAD Software and Brief Introduction to AutoCAD. Introduce AutoCAD Modeling Philosophy. Build and Edit entities in Virtual 3D Space, 2D Profile and free hand Sketching, Plot Configuration, Generation of 2D Drawings, Dimensioning and Detailing. Creation and Modification of Surface Entities Trimming and Lofting of Surfaces, Surface Diagnostics, Reflection Line Analysis. Generate complex Surfaces and Create Solid Modeling Primitive Solids Slab, Revolution Solid, Sweep Solid Boolean operations, Mass and Section property calculations, Sectioning, Slicing, and Feature Based Part Modeling. Assembly- Constraint based Parametric Profile Editing and 3D Constraint Solver.	24	20	
UNIT-V	Drafting generate standard	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> Bill of Materials. Create Assembly Drawings. Create & draw various drafting views. Dimensions, annotations& various Engineering symbols. 	Bill of Materials, Assembly Drawings, Drafting generate standard three views, model view, and predefined view, standard section views, crafting drawings, creating dimensions, annotations, notes and surface finish symbols, add geometric tolerance to the drawing views, add center marks and center lines to the drawing	24	20	

			views, add center marks and center lines to the drawing views			
--	--	--	---	--	--	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : II

Course Title : Computer Aided Drafting & Design (AutoCAD)

Course Code : CCCTM-14

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	116	04	-	100	100

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, “Skills to Transfer Skills”. To cope up this quality possession of core skills is imperative.

Ability to read Computer Aided Drafting & Design(AutoCAD)is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Computer Aided Drafting & Design(AutoCAD)is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Computer Aided Drafting & Design(AutoCAD)is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

- Describe types of different CAD software.
- Create 2D geometric sketches by using Auto CAD software.
- Develop 3D modeling by using advanced command.
- Define assembly constraint & develop different types of assembly design by using AutoCAD Software.
- Describe design generative & interactive drafting.

Practical: Computer Aided Drafting & Design(AutoCAD)

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to AutoCAD Objective:</p> <ul style="list-style-type: none"> ➤ CAD/CAM software. ➤ various feature in CAD software. ➤ various types of CAD software. ➤ Uses and Importance of CAD software in Industries. ➤ Selection criteria of CAD software. <p>Capability of CAD Software and Introduction to AutoCAD. Description of the feature that have been added or changed since new Release CAD. Criteria for selection of CAD workstations, Drafting & Design Process, Design criteria, Geometric modeling, entities, 2D & 3D Primitives. Different Types of cad software. Also comparison of various CAD Software. CAD software features. Concept of hardware & software.</p>	20	20
<p>Topic 2: Drawing Objective:</p> <ul style="list-style-type: none"> ➤ Drawing curve object. ➤ Create various types of sketch geometry. ➤ Editing property tools. ➤ Controlling drawing display. ➤ Geometric dimension & tolerance method <p>Drawing curve objects (Circle, Arc, Ellipse, elliptical arcs). Creating solid filled areas- Regions, Hatch, Donut. Drawing line object like line, polyline, multiline etc. Drawing curve objects like Circle, Arc, Ellipse, elliptical arcs etc. Editing objects using the object property tool bar and various method & Controlling Drawing Display. Lengthen, Stretching, Offset, Align, Trim, Extend, Array etc. Detailed discussion on Dimensions, Geometrical Dimension, Tolerance method in AutoCAD.</p>	24	20
<p>Topic 3: Block & defining block Objective:</p> <ul style="list-style-type: none"> ➤ Working with block & defining block attributes. ➤ Concept of Isometric Drawing, Layout & Plotting. ➤ Execute of solid modeling / 3d modeling. ➤ Create surface modeling. 	24	20

Working with block & defining block attributes. Concept of Isometric Drawing, Layout & Plotting. Creating of solid modeling / 3d modeling. Like creating, Editing, and modification technique. Creating of surface modeling like creating, Editing, and modification technique.		
<p>Topic 4: Dimensioning and Detailing</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Capability of AutoCAD. ➤ 2D drawing generation with dimensioning & detailing. ➤ Create and Modification of Surface Entities Trimming and Lofting of Surfaces, Surface Diagnostics, Reflection Line Analysis. ➤ Create Solid Modeling and Feature Based Part Modeling. ➤ Assembly- Constraint based Parametric Profile Editing and 3D Constraint Solver. <p>Capability of AutoCAD Software and Brief Introduction to AutoCAD. Introduce AutoCAD Modeling Philosophy. Build and Edit entities in Virtual 3D Space, 2D Profile and free hand Sketching, Plot Configuration, Generation of 2D Drawings, Dimensioning and Detailing. Creation and Modification of Surface Entities Trimming and Lofting of Surfaces, Surface Diagnostics, Reflection Line Analysis. Generate complex Surfaces and Create Solid Modeling Primitive Solids Slab, Revolution Solid, Sweep Solid Boolean operations, Mass and Section property calculations, Sectioning, Slicing, and Feature Based Part Modeling. Assembly-Constraint based Parametric Profile Editing and 3D Constraint Solver.</p>	24	20
<p>Topic 5: Drafting generate standard</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Bill of Materials. ➤ Create Assembly Drawings. ➤ Create & draw various drafting views. ➤ Dimensions, annotations& various Engineering symbols. <p>Bill of Materials, Assembly Drawings, Drafting generate standard three views, model view, and predefined view, standard section views, crafting drawings, creating dimensions, annotations, notes and surface finish symbols, add geometric tolerance to the drawing views, add center marks and center lines to the drawing views, add center marks and center lines to the drawing views</p>	24	20

Books: Computer Aided Drafting & Design (AutoCAD)

Sl. No.	Author	Title	Publisher
1	Linkan Sagar	AutoCAD 2015 instant Reference	BPB Publications
2	Cheryl R. Shrock	Exercise Workbook for Advanced AutoCAD	New Age International Private Limited
3	Dorothy Kent	AutoCAD reference guide	New Riders Pub.,

COURSES / MODULE TEMPLATE

Semester-II

COURSE NAME: Computer Aided manufacturing (Master CAM)

COURSE CODE: CCCTM-15

COURSE OUTCOMES:

After completion of course Student should be able to

- Capabilities of CAM Software like Master CAM.
- Create 2D geometric sketches by using Master CAM.
- 3D solid & surface terminology.
- CNC Programming Concept.
- Post processing.
- Execute & generate various CNC Turning & CNC Milling operations NC program.

THEORY HOURS:

PRACTICAL HOURS: 120

THEORY MARKS:

PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	Introduction to MasterCAM	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Capabilities of CAM Software like MasterCAM. • Scope of software. • Difference between CAM/CAD software. • Analyze various CAM software compare to MasterCAM. 	Capability of CAM Software and Introduction to MasterCAM. Scope of CAM software in Market advantages of CAM. Introducing CNC machining by using CAM. Distinguish between Various types of CAM software and MasterCAM. CAM software features. Concept of hardware & software.	20	20	
UNIT-II	2D drawing	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • 2D drawing. • Create basic geometry. • Execute editing, modification, creating features. • Brief Transformation feature. • Understand modify tool. 	Introduction to master CAM environment. To understanding 2D drawing. Creation of basic geometry like Point, line, rectangle, arc, ellipse, helix, spline & polygon. Modify Like fillet, chamfer, Trim, Break, Join, Extend, Dragging spline to arc, control point I NURBS Spline, Break Drafting etc. Transformation of object - Mirror, Rotate, Translate, Scale. Selection Methods Creating Groups / Masking of entities / Assigning / Changing colors. Chain / Window / Area / Group / Delete /	24	20	

			Undelete / Undo. Transformation of object - Mirror, Rotate, Translate, Scale.			
UNIT-III	Wireframe Modeling	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • Plane concept. • Wireframe 3D modeling. • Create surface modeling by use modification & editing surface feature. • solid terminology • Create Drafting with all Engineering symbols & dimensions. 	<p>Plane concepts. Wireframe Modeling: 3D Wireframe, normal, entity, rotated, named, number. Surface terminology. Modification of surfaces and Editing of Surfaces features. Solid terminology - Creation of solids extrude, revolve, lofts, sweep, solids manager, fillet, chamfer, solids editing, trim, Boolean operations, shell, draft etc. Creating drafting : dimensions/ drafting note/ freestanding witness / leader lines / attributes / Editing drafting text/ Creating hatch /Smart mode function to create a layout of different part views/ Layout view selection / dimensioning.</p>	24	20	
UNIT-IV	2D Tool path generation	<p>At the end of this Unit the student should be able to:</p> <ul style="list-style-type: none"> • 2D tool path generation. • concept of CNC machining. • Perform & execute generate various milling & Lathe operations. • Post processing. • NC program Transfer to machine. 	<p>2D Tool path generation. Concepts of Machining: CNC control basics, & coordinate systems, Selection of tool, tool parameters, Program Manager / Creation of 2D tool path: contour / Facing / Pocket. Compensations, Drilling parameters / 3D contour machining surface roughing methods.- Pocket / Parallel for 3D Surfaces And Solids. Various 3D machining surface finishing methods.3D machining surface roughing methods. Various 3D machining surface finishing methods. Post Processing: Generating NC Files / Editing NC Files / Verification and Program generation for actual machining / verification / post processing / Job machining on CNC Milling Machine DMU 50 T simulation - Backplot / Solid NC Verification of material cutting and simulation .DNC Data I.e. NC Program Transfer to machine.</p>	24	20	

UNIT-V	Milling and Lathe operations	At the end of this Unit the student should be able to: <ul style="list-style-type: none"> • Various Milling and Lathe operations by using CAM. • Execute various drilling, reaming operation & hole making etc. • various boundary setting. • Execute all milling & lathe operation by using CAM. 	Various Milling and Lathe operations by using CAM. Point to point machining. Creating drilling & reaming operation and hole making. Planner mill overview Profiling, Single level, Multi-level. Multi region, Creation of Boundaries. Setting Custom Boundary Member Data Setting Drive Cutting Method, Ramping method. Cut types, Trim boundary, and Uncut Region boundary. Creating Cavity Milling operation. Blank Geometry and offset, Uses of cutting option. Creating fixed contour operation. Lathe cross section, common turning parameters, Rough & Finishing.	24	20	
--------	------------------------------	---	---	----	----	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : II

Course Title : Computer Aided manufacturing (Master CAM)

Course Code : CCCTM-15

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	116	04	-	100	100

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, “Skills to Transfer Skills”. To cope up this quality possession of core skills is imperative.

Ability to read Computer Aided manufacturing (Master CAM) is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus Computer Aided manufacturing (Master CAM) is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of Computer Aided manufacturing (Master CAM) is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

- Capabilities of CAM Software like Master CAM.
- Create 2D geometric sketches by using Master CAM.
- 3D solid & surface terminology.
- CNC Programming Concept.
- Post processing.
- Execute & generate various CNC Turning & CNC Milling operations NC program.

Practical: Computer Aided manufacturing (Master CAM)

Topic and Contents	Hours	Marks
<p>Topic 1: Introduction to MasterCAM Objective:</p> <ul style="list-style-type: none"> ➤ Capabilities of CAM Software like MasterCAM. ➤ Scope of software. ➤ Difference between CAM/CAD software. ➤ Analyze various CAM software compare to MasterCAM. <p>Capability of CAM Software and Introduction to MasterCAM. Scope of CAM software in Market advantages of CAM. Introducing CNC machining by using CAM. Distinguish between Various types of CAM software and MasterCAM. CAM software features. Concept of hardware & software.</p>	20	20
<p>Topic 2: 2D drawing Objective:</p> <ul style="list-style-type: none"> ➤ 2D drawing. ➤ Create basic geometry. ➤ Execute editing, modification, creating features. ➤ Brief Transformation feature. ➤ Understand modify tool. <p>Introduction to master CAM environment. To understanding 2D drawing. Creation of basic</p>	24	20

<p>geometry like Point, line, rectangle, arc, ellipse, helix, spline & polygon. Modify Like fillet, chamfer, Trim, Break, Join, Extend, Dragging spline to arc, control point NURBS Spline, Break Drafting etc. Transformation of object - Mirror, Rotate, Translate, Scale. Selection Methods Creating Groups / Masking of entities / Assigning / Changing colors. Chain / Window / Area / Group / Delete / Undelete / Undo. Transformation of object - Mirror, Rotate, Translate, Scale.</p>		
<p>Topic 3: Wireframe Modeling Objective:</p> <ul style="list-style-type: none"> ➤ Plane concept. ➤ Wireframe 3D modeling. ➤ Create surface modeling by use modification & editing surface feature. ➤ solid terminology ➤ Create Drafting with all Engineering symbols & dimensions. <p>Plane concepts. Wireframe Modeling: 3D Wireframe, normal, entity, rotated, named, number. Surface terminology. Modification of surfaces and Editing of Surfaces features. Solid terminology - Creation of solids extrude, revolve, lofts, sweep, solids manager, fillet, chamfer, solids editing, trim, Boolean operations, shell, draft etc. Creating drafting : dimensions/ drafting note/ freestanding witness / leader lines / attributes / Editing drafting text/ Creating hatch /Smart mode function to create a layout of different part views/ Layout view selection / dimensioning.</p>	24	20
<p>Topic 4: 2D Tool path generation Objective:</p> <ul style="list-style-type: none"> ➤ 2D tool path generation. ➤ concept of CNC machining. ➤ Perform & execute generate various milling & Lathe operations. ➤ Post processing. ➤ NC program Transfer to machine. <p>2D Tool path generation. Concepts of Machining: CNC control basics, & coordinate systems, Selection of tool, tool parameters, Program Manager / Creation of 2D tool path: contour / Facing / Pocket. Compensations, Drilling parameters / 3D contour machining surface roughing methods.- Pocket / Parallel for 3D Surfaces And Solids. Various 3D machining surface finishing methods.3D machining surface roughing methods. Various 3D machining surface finishing methods. Post Processing: Generating NC Files / Editing NC Files / Verification and Program generation for actual machining / verification / post processing / Job machining on CNC Milling Machine DMU 50 T simulation - Backplot / Solid NC Verification of material cutting and simulation .DNC Data I.e. NC Program Transfer to machine.</p>	24	20
<p>Topic 5: Milling and Lathe operations Objective:</p> <ul style="list-style-type: none"> ➤ Various Milling and Lathe operations by using CAM. ➤ Execute various drilling, reaming operation & hole making etc. ➤ various boundary setting. ➤ Execute all milling & lathe operation by using CAM. <p>Various Milling and Lathe operations by using CAM. Point to point machining. Creating drilling & reaming operation and hole making. Planner mill overview Profiling, Single level, Multi-level. Multi region, Creation of Boundaries. Setting Custom Boundary Member Data Setting Drive Cutting Method, Ramping method. Cut types, Trim boundary, and Uncut Region boundary. Creating Cavity Milling operation. Blank Geometry and offset, Uses of cutting option. Creating fixed contour operation. Lathe cross section, common turning parameters, Rough & Finishing.</p>	24	20

Books: Computer Aided manufacturing (MasterCAM)

Sl. No.	Author	Title	Publisher
1	James Valentino	Learning Mastercam Mill Step by Step	Industrial Press, Inc.
2	MasterCAM Software	Mastercam x getting started tutorials	CNC Software, Inc

COURSES / MODULE TEMPLATE

Semester-II

COURSE NAME: CNC PROGRAMMING AND CNC MACHINING - On job training

COURSE CODE: CCCTM-16

COURSE OUTCOMES:

After completion of course Student should be able to:

- Explain applications and advantages of CNC machines and technology
- Demonstrate and explain various CNC control Calculate technological data for CNC machining
- The importance and use of PPE's
- Prepare line program for various profiles Identify and set parameters for various simulators
- Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
- Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
- Define and explain Modern CNC systems and explain its importance in manufacturing.

THEORY HOURS: 0

PRACTICAL HOURS: 144

THEORY MARKS:

PRACTICAL MARKS: 100

Unit No.	Unit Name	Unit level outcomes	Contents (chapters/topics)	PR hours	Marks	
UNIT-I	CNC PROGRAMMING AND CNC MACHINING - On Job Training	<p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Explain applications and advantages of CNC machines and technology • Understand and explain difference between conventional & non-conventional machine tool • Demonstrate and explain various CNC control • Calculate technological data for CNC machining • Understand the importance and use of PPE's 	<p>Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC Basic health and safety CNC programming basics. Introduction to manual NC programming Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages, Adaptive Control System.</p>	144	100	

		<ul style="list-style-type: none"> Industrial culture 	Practical training & workshop for above sub topics on CNC Machine.			
--	--	--	--	--	--	--

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC TURNING & MILLING

Semester : II

Course Title : CNC PROGRAMMING AND CNC MACHINING - On job training

Course Code : CCCTM-16

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme			
TH	PR	PAPER HRS	TH	PR	TOTAL
-	140	04	-	100	100

Rationale:

Success & Sustainability of any Training System depends upon given other things, availability of good quality instructors. An Instructor should possess, besides trade skills, "Skills to Transfer Skills". To cope up this quality possession of core skills is imperative.

Ability to read CNC PROGRAMMING AND CNC MACHINING - On job training is essential to perform a job / task of CNC Operator. It is the skills set which enables comprehending the given job and subsequent planning to complete the task/job. Thus it is regarded as core skills for all CNC Operator.

Similarly, knowledge of basic scientific principles creates the foundation for acquiring hard skills. It is the initial/inherent knowledge set which enables analyzing the given job and subsequent detail planning; Such as selecting proper physical conditions e.g. Temperature for a heat treatment process, Material of cutting tool etc.

Similarly, ability to perform simple calculations also creates the foundation for proper hard skills. It is the inherent knowledge set which enables to analyse the given job - Quantitatively and subsequent detail planning; Such as selecting the physical conditions quantitatively e.g. speed and feed of a cutting operation.

Thus CNC PROGRAMMING AND CNC MACHINING - On job training is regarded as a core skill set which supplement hard skill in all CNC Operator.

Recognizing this importance of the core skill, the subjects of CNC PROGRAMMING AND CNC MACHINING - On job training is made integral part of all CNC Operator for Certificate Course In CNC Turning & Milling under MSME (NSQF).

OUTCOMES:

1. Explain applications and advantages of CNC machines and technology
2. Demonstrate and explain various CNC control Calculate technological data for CNC machining
3. The importance and use of PPE's
4. Prepare line program for various profiles Identify and set parameters for various simulators
5. Prepare programs , demonstrate , simulate and operate CNC lathe machines for various machining operations
6. Prepare programs , demonstrate , simulate and operate CNC milling machines for various machining operations
7. Define and explain Modern CNC systems and explain its importance in manufacturing.

Practical: CNC PROGRAMMING AND CNC MACHINING - On job training

Topic and Contents	Hours	Marks
<p>Topic 1: CNC PROGRAMMING AND CNC MACHINING - On Job Training</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain applications and advantages of CNC machines and technology ➤ Understand and explain difference between conventional & non-conventional machine tool ➤ Demonstrate and explain various CNC control ➤ Calculate technological data for CNC machining ➤ Understand the importance and use of PPE's ➤ Industrial culture <p>Introduction to CNC technology – CNC machines & controls. History & development of CNC technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control, Calculation of technological data for CNC machining. CNC clamping system. Implementation of JH for CNC, Basic health and safety, CNC programming basics. Introduction to manual NC programming, Manual NC programming for lathe & milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.</p>	144	100

Books: CNC PROGRAMMING AND CNC MACHINING

Sl. No.	Author	Title	Publisher
1	Alan Overby	CNC Machining Handbook: Building, Programming, and Implementation	McGraw-Hill Education TAB; 1
2	Peter Smid	CNC Programming Handbook	Industrial Press Inc
3	James A. Harvey	CNC Trade Secrets	Industrial Press Inc
4	Steve Krar / Arthur Gill	Computer Numerical Control Programming Basics	INDUSTRIAL PRESS, INC.