



**CERTIFICATE COURSE IN CNC
MILLING (CCCM)**



curriculum

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

COURSES / MODULE TEMPLATE

COURSE NAME: Engineering Drawing-Theory

COURSE CODE: CCCM-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: 46

PRACTICAL HOURS: 44

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. | 3 | 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 • Under stand of | 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, | 3 | 2 |

| | | | | | | |
|------------------|---|---|--|----------|----------|--|
| | | dimensioning Diameter, Radii, Chords, angles . | angles. | | | |
| 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 | 4 | |
| 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 Development of surfaces with section s | 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 | 4 | |
| 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 | 4 | |
| 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 | 4 | 4 | |
| 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 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 | |
| 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 | hinge C-clamp Drill base and table Tool makers clamp Drill jig | 6 | 5 | |

| | | | | | | |
|----------------|---|--|---|----------|----------|--|
| | | <ul style="list-style-type: none"> Identify parts of the assembly Parts drawing | Plumber block, etc. | | | |
| 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 Direction of lay Machining allowance Position of symbol Symbols with inscriptions Additional indications</p> | 4 | 5 | |
| 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 Pipe vice Tail stock Swivel bearing Plumber block Machine vice Shaper tool head Machine elements</p> | 8 | 5 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Engineering Drawing-Theory

Course Code : CCCM-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 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> | 3 | 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> | 3 | 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 inclined to HP and Perpendicular to VP, Draw development of Solids resting completely on its base</p> | 4 | 4 |
| <p>Topic 5: Orthographic projection of machine parts</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Meaning of orthographic projection | 4 | 4 |

| | | |
|--|----------|----------|
| <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 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> | 4 | 4 |
| <p>Topic 7: Temporary fastenings used in engineering applications 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 | 5 |
| <p>Topic 8: Preparation of assembly drawing 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 | 5 |
| <p>Topic 9: Surface finish symbols 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 | 5 |
| <p>Topic 10: Preparation of detail drawing, assembly and part list 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> | 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

COURSE NAME: Engineering Drawing - Practical

COURSE CODE: CCCM-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: 46

PRACTICAL HOURS: 44

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 demonstrat e 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 | State the types of lines and their uses. Identify different dimensioning methods. Use Chain, parallel and combined dimensioning. | 4 | 6 | |

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|-----------------|--|---|---|----------|----------|--|
| | | <p>types of lines.</p> <ul style="list-style-type: none"> • Use of co-ordinate dimensioning • Understand of dimensioning Diameter, Radii, Chords, angles. | <p>Use aligned and unidirectional system of dimensioning in given situation.</p> <p>Use co-ordinate dimensioning, methods of dimensioning Diameter, Radii, Chords, angles.</p> | | | |
| 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 | 6 | |
| 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 | 6 | |
| 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 | 6 | |

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|-----------|---|---|--|---|---|--|
| 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 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> | 4 | 6 | |
| 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 • Under stand of drawing sheet lay out. <p>Explain and demonstrate use of scales</p> | <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 | |
| 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 C-clamp Drill base and table Tool makers clamp Drill jig Plumber block, etc.</p> | 4 | 6 | |

| | | | | | | |
|-----------------------|---|--|---|---|---|--|
| <p>Unit IX</p> | <p>Surface finish symbols</p> | <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 Special surface Direction of lay Machining allowance Position of symbol Symbols with inscriptions Additional indications</p> | <p style="text-align: center;">4</p> | <p style="text-align: center;">6</p> | |
| <p>Unit X</p> | <p>Preparation of detail drawing, assembly and part list</p> | <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 Screw jack Pipe vice Tail stock Swivel bearing Plumber block Machine vice Shaper tool head Machine elements</p> | <p style="text-align: center;">4</p> | <p style="text-align: center;">6</p> | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Engineering Drawing-Practical

Course Code : CCCM-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 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> | 4 | 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> | 4 | 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 | neelkantha |

| | | | |
|----|--------------------|--|--------------------|
| | | (Mechanical) | |
| 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

COURSE NAME: Engineering Metrology -Theory

COURSE CODE: CCCM-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

THEORY HOURS: 22

PRACTICAL HOURS:22

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 | End & line standards for length, Airy & Bessel points, Desirable features of end standards, slip gauge manufacture, calibration of end standards by interferometry. Measurement of large displacements using lasers, Photoelectric Autocollimator, calibration of polygons & circular scales. Types of interchangeability, dimensional chains | 4 | 8 |
| UNIT-II | Fixed & Indicating Gauges | After completion of unit Student should be able to <ul style="list-style-type: none"> • Explain and demonstrate various gauges • Understand and demonstrate comparators like multi | 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 | 4 | 8 |

| | | | | | |
|----------|--------------------|--|---|---|---|
| | | angle, sigma comparators | | | |
| 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 | <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> | 4 | 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 • 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. 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> | 4 | 8 |
| 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> | 6 | 8 |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Engineering Metrology -Theory

Course Code : CCCM-03

Teaching and Examination Scheme:

| Teaching Scheme | | Examination Scheme | | | |
|-----------------|----|--------------------|----|----|-------|
| TH | PR | PAPER HRS | TH | PR | TOTAL |
| 22 | - | 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 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 <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> | 4 | 8 |
| <p>Topic 2: Fixed & Indicating Gauges</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain and demonstrate various gauges ➤ Understand and demonstrate comparators like multi angle, sigma comparators <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. Air to electric transducer, Differential transducer, Variation transducer, Preprocess, In-process & Post process gauging, computation & match gauging.</p> | 4 | 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, 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> | 4 | 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 | 4 | 8 |

| | | |
|---|---|---|
| Evaluation of straightness & flatness, usage of beam comparator, evaluation of roundness – intrinsic & extrinsic datums. Surface Finish: stylus instrument (TALYSURF). M & E Systems, numerical assessment, vertical & horizontal descriptors, profile as a random process, usage of interferograms. Plastic replica technique. | | |
| Topic 5: Screw Threads Objective: <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. | 6 | 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/fitandtoll.htm

COURSES / MODULE TEMPLATE

COURSE NAME: Engineering Metrology -Practical

COURSE CODE: CCCM-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

THEORY HOURS: 22

PRACTICAL HOURS:22

THEORY MARKS:

PRACTICAL MARKS:60

| 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 | End & line standards for length, Airy & Bessel points, Desirable features of end standards, slip gauge manufacture, calibration of end standards by interferometry. Measurement of large displacements using lasers, Photoelectric Autocollimator, calibration of polygons & circular scales. Types of interchangeability, dimensional chains | 4 | 12 |
| UNIT-II | Fixed & Indicating Gauges | After completion of unit Student should be able to <ul style="list-style-type: none"> • Explain and demonstrate various gauges • Understand and demonstrate comparators like multi | 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 | 4 | 12 |

| | | | | | |
|----------|--------------------|--|---|---|----|
| | | angle, sigma comparators | | | |
| 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 | <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> | 4 | 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 • 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. 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> | 4 | 12 |
| 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> | 6 | 12 |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Engineering Metrology -Practical

Course Code : CCCM-04

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 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 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</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 <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> | 4 | 12 |
| <p>Topic 2: Fixed & Indicating Gauges</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Explain and demonstrate various gauges ➤ Understand and demonstrate comparators like multi angle, sigma comparators <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. Air to electric transducer, Differential transducer, Variation transducer, Preprocess, In-process & Post process gauging, computation & match gauging.</p> | 4 | 12 |
| <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 ➤ 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, 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> | 4 | 12 |
| <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 –</p> | 4 | 12 |

| | | |
|---|---|----|
| intrinsic & extrinsic datums. Surface Finish: stylus instrument (TALYSURF). M & E Systems, numerical assessment, vertical & horizontal descriptors, profile as a random process, usage of interferograms. Plastic replica technique. | | |
| Topic 5: Screw Threads Objective: <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. | 6 | 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/fitandtoll.htm

COURSES / MODULE TEMPLATE

COURSE NAME: Workshop Technology - Theory

COURSE CODE: CCCM-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,
- Calculate Cutting Speed and rpm.
- 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: 46

PRACTICAL HOURS: 44

THEORY MARKS: 40

PRACTICAL MARKS:

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | PR hours | Mark s | |
|----------|----------------------------|---|---|----------|--------|--|
| 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 arrangements, Sawing - Power hacksaw, parts, function of type of blade, band saw, parts function, types of blade. Pliers, Spanners, Screw drivers,. | 6 | 5 | |

| | | | | | | |
|----------|----------------------------|--|---|---|---|--|
| 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 | 5 | |
| 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> | 6 | 5 | |
| 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> | 6 | 5 | |
| UNIT-V | 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 Milling tools • Demonstrate and explain Milling machine accessories and attachments. | <p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools L.H. tool, (1) 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 | 5 | |
| UNIT- | Milling | After completion of unit | Principle of Milling , Classification Column | 4 | 5 | |

| | | | | | | |
|-----------|--------------------|---|---|---|---|--|
| VI | machine | <p>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>& 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> | | | |
| UNIT-VII | 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> | 6 | 5 | |
| UNIT-VIII | 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</p> <p>Machine power, Surface finish, Roughness waviness revolution, Cutting fluid</p> <p>Advantages & characteristics of a cutting fluid</p> <p>Types, functions and application of cutting fluid</p> | 6 | 5 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Workshop Technology - Theory

Course Code : CCCM-05

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 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 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. Calculate Cutting Speed and rpm.
5. The working of Milling Machines,.
6. Various types of Milling cutters, Work holding devices.
7. Various types of Milling operations like Indexing, Boring .

8. Calculate Speeds & Feeds and Calculation of Machining time.
9. The working of various types of Holding devices for Milling cutters and milling machine attachments and accessories

Theory: Workshop Technology

| Topic and Contents | Hours | Marks |
|--|-------|-------|
| <p>Topic 1: Introduction to Hand Tools 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 | 5 |
| <p>Topic 2: Marking tools 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 | 5 |
| <p>Topic 3: Drills and Drill Machine 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 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> | 6 | 5 |
| <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 | 5 |
| <p>Topic 5: Types of cutting tools Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of Milling tools ➤ explain Milling machine accessories and attachments. <p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools L.H. tool, (1) 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</p> | 6 | 5 |

| | | |
|--|----------|----------|
| knurling tool holder, Joint type knurling tool holder, Revolving head knurling tool. | | |
| Topic 6: 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. | 4 | 5 |
| Topic 7: 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 | 6 | 5 |
| Topic 8: Milling parameters Objective: <ul style="list-style-type: none"> ➤ 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. | 6 | 5 |

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

COURSE NAME: Workshop Technology - Practical

COURSE CODE: CCCM-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
- Calculate Cutting Speed and rpm.
- 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

THEORY HOURS: 46

PRACTICAL HOURS: 44

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 arrangements, Sawing - Power hacksaw, parts, function of type of blade, band saw, parts function, types of blade. Pliers, Spanners, Screw drivers,. | 5 | 6 | |
| 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, | 5 | 6 | |

| | | | | | | |
|----------|----------------------------|--|--|---|---|--|
| | | | functions, types of uses. | | | |
| 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.</p> <p>Counter sinkers – Definition angle of counter sinking, countersinks, counter sink with pilots.</p> <p>Counter boring & spot facing.</p> <p>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> | 5 | 8 | |
| 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.</p> <p>Construction, Cutting Tool shape & Geometry, Work Holding Devices, Cutting Speed feed and depth of cut.</p> | 5 | 8 | |
| UNIT-V | 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 Milling tools • Demonstrate and explain Milling machine accessories and attachments. | <p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools L.H. tool, (1) R.H. tool, Facing tool, Threading tool, Boring tool, Profile tool, Parting of or end cutting tool.</p> <p>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> | 5 | 8 | |
| UNIT-VI | 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 | <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 –</p> | 5 | 8 | |

| | | | | | | |
|-----------|--------------------|---|---|---|---|--|
| | | <p>explain different parts of a milling machine</p> <ul style="list-style-type: none"> • Explain different types of milling machine | <p>column, knee, gear box, spindle, saddle, over arm and brace, Controls Functions, Specifications</p> | | | |
| UNIT-VII | 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> | 7 | 8 | |
| UNIT-VIII | 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> | 7 | 8 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN MILLING

Course Title : Workshop Technology - Practical

Course Code : CCCM-06

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 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 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. Calculate Cutting Speed and rpm.
5. The working of Milling Machines,.
6. Various types of Milling cutters, Work holding devices.
7. Various types of Milling operations like Indexing, Boring .

8. Calculate Speeds & Feeds and Calculation of Machining time.
9. The working of various types of Holding devices for Milling cutters and milling machine attachments and accessories

Practical: Workshop Technology

| Topic and Contents | Hours | Marks |
|--|-------|-------|
| <p>Topic 1: Introduction to Hand Tools 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> | 5 | 6 |
| <p>Topic 2: Marking tools 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> | 5 | 6 |
| <p>Topic 3: Drills and Drill Machine 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 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> | 5 | 8 |
| <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> | 5 | 8 |
| <p>Topic 5: Types of cutting tools Objective:</p> <ul style="list-style-type: none"> ➤ explain different types of Milling tools ➤ explain Milling machine accessories and attachments. <p>HSS, Carbide, Diamond, Ceramic, Tool angles and their functions, Roughing tools, Finishing tools Plain Milling (1) L.H. tool, (2) R.H. tool, Facing tool, Threading tool, Boring tool, Profile tool, Parting</p> | 5 | 8 |

| | | |
|---|----------|----------|
| 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. | | |
| Topic 6: 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. | 5 | 8 |
| Topic 7: 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 | 7 | 8 |
| Topic 8: Milling parameters Objective: <ul style="list-style-type: none"> ➤ 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. | 7 | 8 |

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

COURSE NAME: Workshop Calculation

COURSE CODE: CCCM-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 | After completion of unit Student should be able to <ul style="list-style-type: none"> • Calculate Density • Calculate Percentage | 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. PERCENTAGE: Definition, changing percentage to decimal and fraction and vice versa. Applied problems related to trade. | 20 | 20 | |
| UNIT-III | ALGEBRA MENSURATION | After completion of unit Student should be able to <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. | ALGEBRA:- Fundamental algebra operations and simplification problems- algebra formula derivations and problems. Factorization of equations like simple, simultaneous, quadratic. Learning to use calculator. MENSURATION:- Introduction. Pythagoras theorem, geometry & properties of 2D & 3D figures, Area, perimeter and other | 20 | 20 | |

| | | | | | | |
|---------|--------------------------------|---|--|----|----|--|
| | | <ul style="list-style-type: none"> Pythagoras theorem, geometry & properties of 2D & 3D figures, Area, perimeter and other dimension determination of plane | 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. | | | |
| UNIT-IV | TRIGONOMETRY GRAPH | <p>After completion of unit Student should be able to</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 Milling. 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 APPLICATIONS: Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper Milling 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>ALGEBRA: Indices, Concept and rules, Examples on indices. Application of Quadratic equations.</p> <p>MENSURATION: 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 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Workshop Calculation

Course Code : CCCM-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 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, sector and segment of circles and practical related exercise.</p> | 20 | 20 |
| <p>Topic 4: TRIGONOMETRY GRAPH</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Trigonometrically ratios, Relationship between them-Measurement of angles, | 20 | 20 |

| | | |
|---|-----------|-----------|
| <p>Trigonometric tables.</p> <ul style="list-style-type: none"> ➤ Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper Milling. ➤ 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>TRIGNOMETRY APPICATONS: Solutions of triangles-finding height & distance using trigonometry. Sine bar, taper Milling problems and other practical problems.</p> <p>GRAPH: Introduction - Procedure of drawing graph, solving of algebraic equations.</p> | | |
| <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>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 |

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

COURSE NAME: Quality Management System

COURSE CODE: CCCM-08

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,

THEORY HOURS: 46

PRACTICAL HOURS:

THEORY MARKS: -100

PRACTICAL MARKS:

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | TH hours | Marks |
|----------|--|--|--|----------|-------|
| 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. | 06 | 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. | 06 | 10 |
| UNIT-III | Management systems and quality management principles for excellenc | After completion of unit Student should be able to <ul style="list-style-type: none"> • Peculiarities of implementation, certification and audit of quality management systems; • The usage of quality control methods for | 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 | 06 | 10 |

| | | | | | | |
|---------|--|---|--|----|----|--|
| | e | the analysis and solution of organizations' problems. | and safety management system. Eco-labelling. Total quality management. | | | |
| UNIT-IV | Total quality management TQM PRINCIPLES | After completion of unit Student should be able to <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 | 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. | 08 | 10 | |
| UNIT-V | Quality System | After completion of unit Student should be able to <ul style="list-style-type: none"> • ISO 9000, • ISO 9000:2000 • TS 16949, • ISO 14000 | 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. | 06 | 20 | |
| UNIT-VI | 5S | After completion of unit Student should be able to <ul style="list-style-type: none"> • Sort • Straighten • Shine • Standardize • Sustain | 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. 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 | 08 | 20 | |

| | | | | | | |
|----------|------------------------|---|---|----|----|--|
| | | | -Easy to Find, Easy to Do. 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. | | | |
| 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. | 06 | 20 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN MILLING

Course Title : Quality Management System

Course Code : CCCM-08

Teaching and Examination Scheme:

| Teaching Scheme | | Examination Scheme | | | |
|-----------------|----|--------------------|-----|----|-------|
| TH | PR | PAPER HRS | TH | PR | TOTAL |
| 46 | - | 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 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> | 06 | 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> | 06 | 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> | 06 | 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. ➤ 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 | 08 | 10 |

| | | |
|---|-----------|-----------|
| <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> | 06 | 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> | 08 | 20 |
| <p>Topic 7: Six Sigma Fundamentals</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Methodology ➤ Process Improvement Model (DMAIC) ➤ 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> | 06 | 20 |

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

COURSE NAME: Group Discussion and Personality Improvement

COURSE CODE: CCCM-09

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: 46

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. | 11 | 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 | Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking. | 11 | 25 | |

| | | | | | |
|----------|-------------------------------------|---|--|----|----|
| | | <ul style="list-style-type: none"> • Six thinking hats Mind Mapping & Analytical Thinking | | | |
| UNIT-III | Teamwork | <p>After completion of unit Student should be able to</p> <ul style="list-style-type: none"> • Team formation process • Stages of Group • Group Dynamics • Managing Team Performance & Team Conflicts | <p>Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.</p> | 12 | 25 |
| UNIT-IV | Ethics, Moral & Professional Values | <p>After completion of unit Student should be able to</p> <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. | <p>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.</p> | 12 | 25 |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN MILLING

Course Title : Group Discussion and Personality Improvement

Course Code : CCCM-09

Teaching and Examination Scheme:

| Teaching Scheme | | Examination Scheme | | | |
|-----------------|----|--------------------|-----|----|-------|
| TH | PR | PAPER HRS | TH | PR | TOTAL |
| 46 | - | 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 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</p> <p>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> | 11 | 25 |
| <p>Topic 2: Critical Thinking & Problem Solving</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Lateral thinking ➤ Critical thinking ➤ Multiple Intelligence ➤ Problem Solving ➤ Six thinking hats Mind Mapping & Analytical Thinking <p>Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking.</p> | 11 | 25 |
| <p>Topic 3: Teamwork</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Team formation process ➤ Stages of Group ➤ Group Dynamics ➤ Managing Team Performance & Team Conflicts <p>Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.</p> | 12 | 25 |
| <p>Topic 4: Ethics, Moral & Professional Values</p> <p>Objective:</p> <ul style="list-style-type: none"> ➤ Human Values ➤ Civic Rights ➤ Operator Ethics ➤ Operator as Social Experimentation ➤ Environmental Ethics | 12 | 25 |

- 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.

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

COURSE NAME: CNC MILLING PROGRAMMING AND CNC MACHINING - THEORY

COURSE CODE: CCCM-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 milling machines for various machining operations

THEORY HOURS: 46

PRACTICAL HOURS: 140

THEORY MARKS: -40

PRACTICAL MARKS:

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | TH hours | Marks | |
|----------|-------------------------|--|--|----------|-------|--|
| UNIT-I | CNC Programming | After completion of unit Student should be able to <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 | 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, & Controls through post processors. Programming exercise. Machining of programmed exercise on CNC milling machines. | 23 | 20 | |
| UNIT-II | CNC Machining – Milling | After completion of unit Student should be able to <ul style="list-style-type: none"> • Optimize parameters for milling | Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed , depth of cut etc. and set a | 23 | 20 | |

| | | | | | | |
|--|--|---|---|--|--|--|
| | | <p>operations</p> <ul style="list-style-type: none"> 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>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> | | | |
|--|--|---|---|--|--|--|

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : CNC MILLING PROGRAMMING AND CNC MACHINING - Theory

Course Code : CCCM-10

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 CNC MILLING 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 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 MILLING 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 MILLING PROGRAMMING AND CNC MACHINING - THEORY is made integral part of all CNC Operator for Certificate Course In CNC 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 milling machines for various machining operations

Theory: CNC MILLING PROGRAMMING AND CNC MACHINING

| Topic and Contents | Hours | Marks |
|---|-------|-------|
| <p>Topic 1: 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 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 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, DMG TURNPLUS & Controls through post processors. Programming exercise. Machining of programmed exercise on CNC milling machines.</p> | 23 | 20 |
| <p>Topic 2: CNC Machining –Milling</p> <p>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> | 23 | 20 |

Books: CNC MILLING 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

COURSE NAME: CNC MILLING PROGRAMMING AND CNC MACHINING - PRACTICAL

COURSE CODE: CCCM-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 milling machines for various machining operations

THEORY HOURS: 46

PRACTICAL HOURS: 140

THEORY MARKS:-

PRACTICAL MARKS: 60

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | PR hours | Marks | |
|----------|-------------------------|--|--|----------|-------|--|
| UNIT-I | CNC Programming-Milling | After completion of unit Student should be able to <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 | 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. | 70 | 30 | |
| UNIT-II | CNC Machining – Milling | After completion of unit Student should be able to <ul style="list-style-type: none"> • Optimize parameters for milling operations | Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed , depth of cut etc. and set a | 70 | 30 | |

| | | | | | | |
|--|--|---|---|--|--|--|
| | | <ul style="list-style-type: none"> • 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>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> | | | |
|--|--|---|---|--|--|--|

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : CNC MILLING PROGRAMMING AND CNC MACHINING - PRACTICAL

Course Code : CCCM-11

Teaching and Examination Scheme:

| Teaching Scheme | | Examination Scheme | | | |
|-----------------|-----|--------------------|----|----|-------|
| TH | PR | PAPER HRS | TH | PR | TOTAL |
| - | 140 | 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 MILLING 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 MILLING 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 MILLING PROGRAMMING AND CNC MACHINING - Practical is made integral part of all CNC Operator for Certificate Course In CNC 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 milling machines for various machining operations

Practical: CNC MILLING 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 milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.</p> | 30 | 20 |
| <p>Topic 2: 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, Controls through post processors. Programming exercise. Machining of programmed exercise on CNC Milling machines.</p> | 50 | 20 |
| <p>Topic 3: CNC Machining –Milling</p> <p>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</p> | 60 | 20 |

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.

Books: CNC MILLING 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

COURSE NAME: Employability Skill-Theory

COURSE CODE: CCCM-12

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.

THEORY HOURS: 22

PRACTICAL HOURS: 22

THEORY MARKS: 40

PRACTICAL MARKS:

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | TH hours | Marks | |
|-----------------|--|--|--|-----------|-----------|--|
| Unit I | 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 application | 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. | 06 | 10 | |
| Unit II | 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 | 06 | 10 | |
| Unit III | Safety & Health | After completion of unit Student should be able to <ul style="list-style-type: none"> • Use of Accident | Introduction to Occupational Safety and Health importance of safety and health at workplace | 05 | 10 | |

| | | | | | | |
|----------------|------------------------------------|---|--|-----------|-----------|--|
| | | <p>Prevention techniques.</p> <ul style="list-style-type: none"> • Use of protective equipment. • Understanding of Occupation safety. | <p>Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards.</p> <p>Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention</p> <p>Basic principles for protective equipment.</p> <p>Accident Prevention techniques – control of accidents and safety measures.</p> | | | |
| Unit IV | Concept of Entrepreneurship | <p>After completion of unit Student should be able to</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 vs. management, Entrepreneurial motivation.</p> <p>Performance & Record, Role & Function of 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.</p> | 05 | 10 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Employability Skill- Theory

Course Code : CCCM-12

Teaching and Examination Scheme:

| Teaching Scheme | | Examination Scheme | | | |
|-----------------|----|--------------------|----|----|-------|
| TH | PR | PAPER HRS | TH | PR | TOTAL |
| 22 | - | 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 MILLING PROGRAMMING - 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 MILLING PROGRAMMING - 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 MILLING PROGRAMMING - On job training is made integral part of all CNC Operator for Certificate Course In CNC 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.

Theory: Employability Skill

| Topic and Contents | Hours | Marks |
|---|-----------|-----------|
| <p>Topic 1: English Literacy Reading/Writing 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, Construction of simple sentences, Writing simple English. Develop Resumes or curriculum vita. Letters of application reference to previous communication.</p> | 06 | 10 |
| <p>Topic 2: Motivational Training Behavioral Skills Objective:</p> <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, Importance of Commitment, Ethics and Values, Ways to Motivate Oneself, Personal Goal setting and Employability Planning, Problem Solving.</p> | 06 | 10 |
| <p>Topic 3: Safety & Health Objective:</p> <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, 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.</p> | 05 | 10 |
| <p>Topic 4: Concept of Entrepreneurship 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 vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of 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.</p> | 05 | 10 |

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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

COURSE NAME: Employability Skill - Practical

COURSE CODE: CCCM-13

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.

THEORY HOURS: 22

PRACTICAL HOURS: 22

THEORY MARKS:

PRACTICAL MARKS: 60

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | PR hours | Marks |
|-----------------|--|--|--|-----------|-----------|
| Unit I | 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 application | 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. | 06 | 15 |
| Unit II | 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 | 06 | 15 |
| Unit III | Safety & Health | After completion of unit Student should be able to <ul style="list-style-type: none"> • Use of Accident | Introduction to Occupational Safety and Health importance of safety and health at workplace | 05 | 15 |

| | | | | | | |
|----------------|------------------------------------|---|--|-----------|-----------|--|
| | | <p>Prevention techniques.</p> <ul style="list-style-type: none"> • Use of protective equipment. • Understanding of Occupation safety. | <p>Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards.</p> <p>Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention</p> <p>Basic principles for protective equipment.</p> <p>Accident Prevention techniques – control of accidents and safety measures.</p> | | | |
| Unit IV | Concept of Entrepreneurship | <p>After completion of unit Student should be able to</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 vs. management, Entrepreneurial motivation.</p> <p>Performance & Record, Role & Function of 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.</p> | 05 | 15 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : Employability Skill- Practical

Course Code : CCCM-13

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 CNC MILLING PROGRAMMING - 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 MILLING PROGRAMMING - 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 MILLING PROGRAMMING - On job training is made integral part of all CNC Operator for Certificate Course In CNC 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.

Practical: Employability Skill

| Topic and Contents | Hours | Marks |
|---|-----------|-----------|
| <p>Topic 1: English Literacy Reading/Writing 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, Construction of simple sentences, Writing simple English. Develop Resumes or curriculum vita. Letters of application reference to previous communication.</p> | 06 | 15 |
| <p>Topic 2: Motivational Training Behavioral Skills Objective:</p> <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, Importance of Commitment, Ethics and Values, Ways to Motivate Oneself, Personal Goal setting and Employability Planning, Problem Solving.</p> | 06 | 15 |
| <p>Topic 3: Safety & Health Objective:</p> <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, 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.</p> | 05 | 15 |
| <p>Topic 4: Concept of Entrepreneurship 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 vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of 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.</p> | 05 | 15 |

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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 asinpiblishers Delhi |
| 5 | R.T.Uprath | Employablility Skill | Amul |

COURSES / MODULE TEMPLATE

COURSE NAME: CNC MILLING PROGRAMMING - On job training

COURSE CODE: CCCM-14

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 milling machines for various machining operations

THEORY HOURS: 0

PRACTICAL HOURS: 104

THEORY MARKS:

PRACTICAL MARKS: 100

| Unit No. | Unit Name | Unit level outcomes | Contents (chapters/topics) | PR hours | Marks | |
|----------|---|--|---|----------|-------|--|
| UNIT-I | CNC MILLING PROGRAMMING - On Job Training | 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 • Understand the importance and use of PPE's • Industrial culture | 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 milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine. | 104 | 100 | |

COURSE WISE DETAILS CONTENTS

Program Name : CERTIFICATE COURSE IN CNC MILLING

Course Title : CNC MILLING PROGRAMMING - On job training

Course Code : CCCM-14

Teaching and Examination Scheme:

| Teaching Scheme | | Examination Scheme | | | |
|-----------------|-----|--------------------|----|-----|-------|
| TH | PR | PAPER HRS | TH | PR | TOTAL |
| - | 104 | 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 MILLING PROGRAMMING - 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 MILLING PROGRAMMING - 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 MILLING PROGRAMMING - On job training is made integral part of all CNC Operator for Certificate Course In CNC 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 milling machines for various machining operations

Practical: CNC PROGRAMMING AND CNC MACHINING - On job training

| Topic and Contents | Hours | Marks |
|--|------------|------------|
| <p>Topic 1: CNC MILLING PROGRAMMING - 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 milling machines. Application Numerical Control, Advantages, & Disadvantages, Adoptive Control System. Practical training & workshop for above sub topics on CNC Machine.</p> | 104 | 100 |

Books: CNC MILLING 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. |