



“The beautiful thing about learning is nobody can take it away from you.”

B.B. King – American Musician (1925 -)

Dear Oxygen Education Student:

Welcome to Oxygen Education. I want you to know that the staff at Oxygen Education are fully committed to providing you with the best possible academic experiences to assist you in achieving your goals and to prepare you for the world of tomorrow. Whether you are a first-time student or are returning to school to expand your knowledge, you will, without a doubt, find a large array of opportunities designed to enhance your horizons intellectually.

In this Course Catalog we provide a broad overview of our programs and courses, including a great deal of useful information to guide you through your academic experience. Please take the time to carefully review this important information.

As a leading education provider, Oxygen Education offers a rare combination of vast resources, personal attention and affordability. Offering over 80 courses with more than 500 learning modules, we prepare our students for the leading job markets and the latest technologies. Committed to both quality and access, Oxygen Education meets the educational needs of traditional students, as well as part-time students and lifelong learners.

Oxygen Education has a nationally renowned, full-time staff known for outstanding digital courseware and cutting-edge distance education methodologies. In 2007, Brandon Hall research awarded Oxygen Education with a coveted Excellence in e-Learning award for Best Custom Content. Oxygen Education also received two prestigious awards from the eLearning Guild for Best New Product or Service, and for Best of Show at its 2007 conference.

We are members of the National Coalition for Advanced Technology Centers (NCATC), the National Association of Manufacturers (NAM), the National Council for Advanced Manufacturing (NACFAM), the Association for Career and Technical Education (ACTE), the American Machine Tool Distributor Association (AMTDA), the e-Learning Guild, and the National Tooling and Machining Association (NTMA).

Oxygen Education delivers education to over 1,700 companies, 80 academic institutions and 22,000 students on five continents and in thirteen languages.

On behalf of your fellow students and our staff, I congratulate you on choosing Oxygen Education and for deciding to pursue your education at one of the finest private online learning institutions in the world. I wish you a challenging and fulfilling experience as you work to achieve your goals.

Sincerely,

Joseph Kitterman
President and CEO

ABOUT OXYGEN EDUCATION

OXYGEN EDUCATION'S MISSION

At Oxygen Education our mission is to use the medium of the Internet to Change Lives by providing organizations and individuals with stimulating lifelong education when and where it is needed.

OXYGEN EDUCATION'S VALUES

At Oxygen Education, we are committed to:

- Teaching others
- Honesty
- Respect
- Keeping promises
- Our stakeholders

SUPPORT AND CONTACT INFORMATION

Toll Free: 1-877-263-2178

Sales and Product Information: 1-877-263-2178 – Option 1

Technical Assistance: 1-877-263-2178 – Option 2

E-mail: info@ame21.com

www.ame21.com

NOTICE:

This catalog is intended to supply accurate information to the reader. From time to time, certain information may be changed.

Oxygen Education may revise any matter described in this catalog at any time without publishing a revised edition of this catalog. Courses, programs, curricula and program requirements may be changed or discontinued at any time. Information that appears to apply to a particular student should be verified with Oxygen Education.

© 2009 Oxygen Education

OXYGEN EDUCATION'S COURSE NUMBERING SYSTEM

GENERAL INFORMATION

Courses in this catalog are identified by prefixes and numbers. Our system for course numbering is a simple one that is intended to help you quickly identify the course subject and level of difficulty.

PREFIX DEFINITIONS

All course prefixes indicate the subject matter category. Categories are as follows:

AM	Advanced Manufacturing	MT	Metrology
AU	Automation	PD	Personal Development
BP	Blueprint Reading and Drawings	PE	Production Equipment
CNC	Computer Numerical Control	PS	Problem Solving and Critical Thinking
ES	Equipment Specific	PT	Production Technologies
LM	Lean Manufacturing	QS	Quality Systems
MA	Mathematics	SA	Safety
ML	Materials	TL	Tooling

NUMERIC DEFINITIONS

The first digit of the course number indicates the course level.

100	Level one course
200	Level two course
300	Level three course
400	Level four course
500	Level five course

The last digit in the course number indicates the position of the course in the subject matter series:

- 1 The first course in series
- 2 The second course in the series

Example: MA 304 would be a third level (300 Series) mathematics course, and it would be the fourth course in the mathematics series.

TABLE OF CONTENTS

Course Listing by Level

Level 1	2
Level 2	2
Level 3	2
Level 4	3
Level 5 (Optional)	3

Course Listing by Category

Advanced Manufacturing	4
Automation	4
Blueprint and Drawings	4
CNC	5
Lean Manufacturing	6
Materials	8
Math	8
Metrology	9
Personal Development	11
Problem Solving	11
Production Equipment	12
Production Technologies	12
Quality Systems	13
Safety	14
Tooling	14
Equipment Specific	16

Alphabetic Listing

Course Descriptions	21
---------------------------	----

The AME21™ curriculum is designed in four discrete levels. Each level results in a discreet set of advanced manufacturing skills for the student.

Level 1 — Level 1 is designed to give the student the skills necessary to attain employment in an advanced manufacturing environment. Upon completion of Level 1 the student will:

- Understand the advanced manufacturing environment
- Know how to safely function in the workplace
- Have the math skills required for basic manufacturing jobs
- Understand international quality systems and their role in maintaining them
- Understand the basic types of production equipment
- Have the skills required to perform basic product inspection
- Have introductory knowledge of Lean Manufacturing
- Be able to communicate effectively
- Be able to work in groups and teams

Level 2 — Level 2 prepares the student for multiple pathways within the advanced manufacturing environment. Upon completion of Level 2 the student will:

- Be able to identify and explain the function of machinery used in manufacturing
- Understand and operate manufacturing robots
- Apply the principles of Statistical Process Control
- Be able to solve algebraic equations
- Understand how to read and interpret engineering drawings and blueprints
- Apply advanced product inspection techniques
- Have intermediate knowledge of ferrous and non-ferrous metals
- Properly select, use and maintain cutting tools used in CNC equipment

Level 3 — Level 3 prepares the student for specialized career pathways in CNC machine programming as well as building leadership skills. Upon completion of Level 2 the student will:

- Be able to apply the advanced math skills of geometry and trigonometry
- Have intermediate knowledge of CNC programming for turning and machining
- Properly select, use and maintain other types of cutting tools
- Know how to lead a kaizen event and perform value stream mapping

Level 4 — Level 4 broadens the students skills in leadership, lean manufacturing and CNC programming. Upon completion of Level 4 the student will:

- Understand machine setup and setup reduction techniques
- Be able to apply critical thinking and problem solving techniques
- Have a full understanding of CNC programming for turning and machining
- Be able to apply the full principles of Lean Manufacturing

Level 5 — (Optional) Level 5 is a suite of courses designed to teach the operation and programming of a variety of CNC machine tools. Upon completion of Level 5 the student will:

- Be able to operate CNC turning machines and machining centers
- Have an intermediate level of knowledge in CNC programming
- Understand CNC Swiss turning operations and technology
- Understand CNC multi-spindle machine operations and technology

Career opportunities for the student:

- Production Supervisor
- Lean Manufacturing Specialist
- CNC Programmer
- CNC Operator
- Quality Systems Analyst
- Inspection Technician

RECOMMENDED COURSE OF STUDY

LEVEL 1

CATEGORY

Advanced Manufacturing
Safety

COURSE ID

AM 101
SA 101
SA 102
SA 103
SA 104
SA 105

COURSE TITLE

Principles of Advanced Manufacturing
Safety Practices and Regulations
Personal Protective Equipment
Hazardous Communication
Confined Spaces
Lockout / Tag Out

Math

Blueprint and Drawings

MA 101
BP 101
BP 102

Mathematics 1
Blueprint Reading
AWS Welding Symbols on Blueprints

Production Equipment

PE 101
PE 102

Principles of Turning
Principles of Machining Centers

Tooling

Quality Systems

Metrology

CNC

TL 101
QS 101
MT 101
CN 101

Introduction to Cutting Tools
ISO 9000 and TS 16949
Inspection Techniques 1
Principles of CNC

Lean Manufacturing

LM 101
LM 102

Introduction to Lean
5S

Personal Development

PD 101
PD 102
PD 103

Communication Skills
Conflict Resolution
Working in Groups

LEVEL 2

CATEGORY

Safety
Math
Quality Systems

COURSE ID

SA 206
MA 202
QS 202
QS 203
AU 201
AU 202
BP 203
BP 204

COURSE TITLE

Overhead Crane Safety
Algebra 1
Statistical Process Control 1
ISO-13485 (Medical Device Manufacturing)
Principles of Robotics
Principles of Factory Automation
General Dimensioning & Tolerances
Geometric Dimensioning & Tolerancing

Automation

Blueprint and Drawings

Metrology

MT 202
MT 203
MT 204
MT 205
MT 206
MT 207
MT 208
MT 209
MT 210
MT 211
MT 212
PE 203
ML 201
ML 202
PT 202
PT 201
TL 202
TL 203
TL 204
LM 203
LM 204

Surface Plates
Gauge Blocks
Test Indicators
Height Gauges
Bench Comparators
Optical Comparators
Bore Gauges
Air Gauges
Other Micrometers
Miscellaneous Instruments
Inspection Instrument Selection
Principles of Grinding
Principles of Ferrous Materials
Principles of Non-Ferrous Materials
Principles of Coolants and Oils
Principles of Workholding
Tooling for Turning
Tooling for Machining
Tooling for Grinding
Lean Theory
Kanban

Production Equipment
Materials

Production Technologies

Tooling

Lean Manufacturing

LEVEL 3

CATEGORY

Math
Production Technologies
Materials
Tooling

COURSE ID

MA 303
MA 304
PT 303
ML 303
TL 305
TL 306
TL 307
TL 308
MT 313
MT 314

COURSE TITLE

Solid Geometry
Trigonometry 1
Principles of Hydraulics
Principles of Heat Treating
Tooling for Drilling
Tooling for Reaming
Tooling for Tapping
Tooling for Milling
Inspection Techniques 2
Coordinate Measuring Machines

Metrology

RECOMMENDED COURSE OF STUDY

Quality Systems	QS 304	Statistical Process Control 2
Tooling	TL 309	Threaded Fasteners
CNC	CN 302	G Code Programming for CNC Lathe Operators 1
	CN 303	G Code Programming for CNC Machining Center Operators 1
	CN 304	G Code Programming for CNC Lathe Operators 2
	CN 305	G Code Programming for CNC Machining Center Operators 2
Lean Manufacturing	LM 305	Kaizen
	LM 306	Value Stream Mapping

LEVEL 5 (Optional)

CATEGORY	COURSE ID	COURSE TITLE
Equipment Specific	ES 501.1	Haas SL Series - Understanding the CNC Pendant
	ES 501.2	Haas SL Series - Machine Operations
	ES 501.3	Haas SL Series - CNC Programming
	ES 502.1	Haas VF Series - Understanding the CNC Pendant
	ES 502.2	Haas VF Series - Machine Operations
	ES 502.3	Haas VF Series - CNC Programming
	ES 503.1	Haas TL Series - Understanding the CNC Pendant
	ES 503.2	Haas TL Series - Machine Operations
	ES 503.3	Haas TL Series - CNC Programming
	ES 503.4	Haas - Intuitive Programming for Lathes
	ES 504.1	Haas TM Series - Understanding the CNC Pendant
	ES 504.2	Haas TM Series - Machine Operations
	ES 504.3	Haas TM Series - CNC Programming
	ES 504.4	Haas - Intuitive Programming for Mills
	ES 520.1	Index TNL 26 Series - Machine Overview
	ES 520.2	Index TNL 26 Series - Machine Operation
	ES 520.3	Index TNL 26 Series - Tooling
	ES 520.4	Index TNL 26 Series - Repeat Set-Up
	ES 521.1	Index MS 32C Series - System Overview
	ES 521.2	Index MS 32C Series - Operation
	ES 521.3	Index MS 32C Series - Tooling
	ES 521.4	Index MS 32C Series - Maintenance

LEVEL 4

CATEGORY	COURSE ID	COURSE TITLE
Personal Development	PD 404	Train the Trainer
Production Equipment	PE 404	Turning Machine Setup
	PE 405	Machining Center Setup
Lean Manufacturing	LM 407	Setup Reduction
Problem Solving	PS 401	Analytical Problem Solving Tools 1
	PS 402	Analytical Problem Solving Tools 2
Quality Systems	QS 405	GMP
	QS 406	APQP
CNC	CN 406	G Code Programming for CNC Lathe Operators 3
	CN 407	G Code Programming for CNC Machining Center Operators 3
Lean Manufacturing	LM 408	Total Productive Maintenance
Production Technologies	PT 405	Principles of Gear Manufacturing

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
ADVANCED MANUFACTURING	AM 101	Principles of Advanced Manufacturing	<ul style="list-style-type: none"> • Advanced Manufacturing Overview • Technology and Advanced Manufacturing • Manufacturing Metrics • Plant Layout • Plant Organization
AUTOMATION	AU 201	Principles of Robotics	<ul style="list-style-type: none"> • Robot Introduction • Robot Safety • Robot Motion • Robot Configurations • ABB Robot Controls • ABB Robot Automatic Operations • ABB Robot Manual Operations • ABB Robot Advanced Operations
	AU 202	Principles of Factory Automation	<ul style="list-style-type: none"> • Factory Automation Types • PLC for Factory Automation
BLUEPRINT AND DRAWINGS	BP 101	Blueprint Reading	<ul style="list-style-type: none"> • Blueprint Lines • Blueprints • Blueprint Views • Blueprint Dimensions and Notes • Blueprint Process Drawings
	BP 102	AWS Welding Symbols on Blueprints	<ul style="list-style-type: none"> • Welding Symbols
	BP 203	General Dimensioning & Tolerances	<ul style="list-style-type: none"> • Fundamental Dimensioning Rules • Units & Types of Dimensioning • Dimension Features • Tolerancing Methods
	BP 204	Geometric Dimensioning & Tolerancing	<ul style="list-style-type: none"> • GD & T Introduction • GD & T Symbols • Datums • Modifiers • Form Tolerance Zones • Profile Tolerance Zones • Orientation Tolerance Zones

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
CNC	CN 101	Principles of CNC	<ul style="list-style-type: none"> • Runout Tolerance Zones • Locational Tolerance Zones
	CN 102	Fanuc CNC Control	<ul style="list-style-type: none"> • History of Computer Numerical Controllers • Cartesian Coordinate System • Reference Points • Part Program Overview • Fanuc CNC Control Part 1 • Fanuc CNC Control Part 2 • Navigating the Display Screens • Operations • Troubleshooting
	CN 303	G-Code Programming for CNC Lathe Operators 1	<ul style="list-style-type: none"> • History of Computer Numerical Controllers • Programming Safety • Cartesian Coordinate System • Machine Reference Points • Program Components and Structure • Tool Restart Requirements and Process
	CN 304	G-Code Programming for CNC Machining Center Operators 1	<ul style="list-style-type: none"> • History of Computer Numerical Controllers • Programming Safety • Cartesian Coordinate System • Machine Reference Points • Program Components and Structure • Tool Restart Requirements and Process
	CN 305	G-Code Programming for CNC Lathe Operators 2	<ul style="list-style-type: none"> • Programming Safety • Program Components and Structure • M-Code Definitions • G-Code Definitions • Other Codes • Creating Single Operation Lathe Program • Program Verification and Output
	CN 306	G-Code Programming for CNC Machining Center Operators 2	<ul style="list-style-type: none"> • Programming Safety • Program Components and Structure

CATEGORY**COURSE ID****COURSE TITLE****TOPICS COVERED**

CNC
(continued)

CN 407**G-Code Programming for CNC Lathe Operators 3**

- M-Code Definitions
- G-Code Definitions
- Canned Cycles
- Other Codes
- Creating Single Operation Machining Center Program
- Program Verification and Output
- Programming Safety
- Program Components and Structure
- Tool Path Compensations
- Part Drawing and Material Review
- Tool Layout Review
- Spindle Speed Calculations
- Feedrate Calculations
- Tool Path Creations
- Program Selection Creation
- Finalizing Program
- Program Verification and Output

CN 408**G-Code Programming for CNC Machining Center Operators 3**

- Programming Safety
- Program Components and Structure
- Tool Path Compensations
- Part Drawing and Material Review
- Tool Layout Review
- Spindle Speed Calculations
- Feedrate Calculations
- Tool Path Creations
- Program Selection Creation
- Finalizing Program
- Program Verification and Output

LEAN MANUFACTURING**LM 101****Introduction to Lean**

- The History of Lean Manufacturing
- Benefits of Lean
- The Evolution of Lean
- Batch and Queue
- The Role of Management

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	LM 102	5S	<ul style="list-style-type: none"> • Workplace Organization • S1 - Sort • S2 - Straighten • S3 - Shine • S4 - Standardize • S5 - Sustain
	LM 203	Lean Theory	<ul style="list-style-type: none"> • Waste • Lean Elements • Lean Rules • Lean Tools
	LM 204	Kanban	<ul style="list-style-type: none"> • Introduction to Kanban • Push and Pull Systems • Kanban Types and Uses • Functions of Kanban • Calculating Kanban Quantities • Steps for a Circulating Kanban
	LM 305	Kaizen	<ul style="list-style-type: none"> • Kaizen Defined • 10 Principles • Problem Selection • Kaizen Guidelines • Value-Added and Non-Value Added • Manufacturing Kaizen
	LM 306	Value Stream Mapping	<ul style="list-style-type: none"> • Value Stream Mapping Defined • Purpose and Technology • The Current State Map • The Future State Map • The Team • Developing a Value Stream Map
	LM 407	Setup Reduction	<ul style="list-style-type: none"> • Introduction to SMED • Gathering SMED Data • Separating Waste • Setup Analysis Tools • Developing Standard Setups

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
LEAN MANUFACTURING (continued)	LM 408	Total Production Maintenance	<ul style="list-style-type: none"> • Parallel Operations • Ten Rules of Setup Reduction • The Benefits of TPM • Various Types of Maintenance • Establishing Autonomous Maintenance Routines • The 6 Big Losses • OEE (Overall Equipment Effectiveness) calculation • Tools to Reduce Losses • MTBF (Mean Time Between Failures) • MTTR (Mean Time to Repair)
MATERIALS	ML 201	Principles of Ferrous Materials	<ul style="list-style-type: none"> • Introduction to Ferrous Materials • Steelmaking Process • Properties of Ferrous Materials • Elements of Ferrous Materials • Types of Ferrous Materials • Nomenclature
	ML 202	Principles of Non-Ferrous Materials	<ul style="list-style-type: none"> • Introduction to Non-Ferrous Materials • Manufacturing Processes • Properties of Non-Ferrous Materials • Elements of Non-Ferrous Materials • Types of Non-Ferrous Materials • Nomenclature
	ML 303	Principles of Heat Treating	<ul style="list-style-type: none"> • Introduction to Heat Treating • The Heat Treating Process • Types of Heat Treating
MATH	MA 101	Mathematics I	<ul style="list-style-type: none"> • Course Introduction • Basic Math Terms and Concepts • Working with Whole Numbers • Fractions and Decimals • Percentage, Average, and Ratios • Geometry Basics

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	MA 202	Algebra 1	<ul style="list-style-type: none"> • Order of Operations • Simple Equations • Elements of Factoring • Quadratic Equations • Variables & Constants • Graphic Representations • Simultaneous Equations • Exponents & Radicals • Binomial Theory
	MA 303	Solid Geometry	<ul style="list-style-type: none"> • Polygons • Quadrilaterals • Solids
	MA 304	Trigonometry I	<ul style="list-style-type: none"> • Introduction to Trigonometry • Angles • Triangles and the Pythagorean Theorem • Trigonometric Functions and Their Inverses • Circles and Semicircles • Applications of Trigonometry in Manufacturing
METROLOGY	MT 101	Inspection Techniques 1	<ul style="list-style-type: none"> • The Purpose of Gauges • Calibrating & Mastering Gauges • Variable Analog Gauges • Variable Digital Gauges • Micrometers • Go / NoGo Gauges • Thread Gauges • Attribute Gauges • Proper Care & Storage of Gauges
	MT 202	Surface Plates	<ul style="list-style-type: none"> • Types and Usages • Components & Accessories • Best Practices
	MT 203	Gauge Blocks	<ul style="list-style-type: none"> • Types and Usages • Components & Accessories • Best Practices

CATEGORY**COURSE ID****COURSE TITLE****TOPICS COVERED****METROLOGY
(continued)****MT 204****Test Indicators**

- Types and Usages
- Components & Accessories
- Best Practices

MT 205**Height Gauges**

- Types and Usages
- Components & Accessories
- Best Practices

MT 206**Bench Comparators**

- Types and Usages
- Components & Accessories
- Best Practices

MT 207**Optical Comparators**

- Types and Usages
- Components & Accessories
- Best Practices

MT 208**Bore Gauges**

- Types and Usages
- Components & Accessories
- Best Practices

MT 209**Air Gauges**

- Types and Usages
- Components & Accessories
- Best Practices

MT 210**Specialty Micrometers**

- Types and Usages
- Components & Accessories
- Best Practices

MT 211**Miscellaneous Instruments**

- Types and Usages
- Components & Accessories
- Best Practices

MT 212**Inspection Instrument Selection**

- Introduction to Gauge R&R
- Best Practices

MT 313**Inspection Techniques 2**

- Measuring Flatness
- Measuring Parallelism
- Measuring Roundness
- Measuring Cylindricity
- Measuring Perpendicularity
- Measuring Angularity

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	MT 314	Coordinate Measuring Machines	<ul style="list-style-type: none"> • Measuring Runout and Total Runout • Measuring Concentricity • Measuring True Position • Measuring Symmetry • Measuring Profile of a Line & Surface • CMM Fundamentals • CMM Applications • CMM Fixturing • CMM Operations
PERSONAL DEVELOPMENT	PD 101	Communication Skills	<ul style="list-style-type: none"> • Introduction to Communication • The Sender • The Receiver • The Medium • Feedback and Noise
	PD 102	Conflict Resolution	<ul style="list-style-type: none"> • Understanding Conflict • Advanced Listening Skills for Conflict Management • Managing Conflict
	PD 103	Working in Groups	<ul style="list-style-type: none"> • Group Dynamics • Group Decision-Making
	PD 404	Train the Trainer	<ul style="list-style-type: none"> • Defining a Successful Training Event • Adult Learning Principles • Learning Styles • Developing Training Objectives, Standards, and Outcomes • Training Techniques • Presentation Skills and Feedback
PROBLEM SOLVING	PS 401	Analytical Problem Solving Tools 1	<ul style="list-style-type: none"> • Introduction to Graphical Tools • Distribution Plot - Bar Chart, Histogram & Frequency Curve • Paired Data Plot - Scatter Plots • Paired Data Plot - Youden Plots • Time Series - Linear and Cumulative Plots

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
PROBLEM SOLVING (continued)	PS 402	Analytical Problem Solving Tools 2	<ul style="list-style-type: none"> Data Map - Location Concentration Diagrams Data Map - Polar Concentration Plots Distribution Plot - Linear and Non-Linear Small Multiples – Multi-vari Charts Defined Small Multiples – Constructing Multi-vari Charts Small multiples – Data Maps Function Analysis Systems Technique (FAST) Constructing FAST Diagrams The Analytic Logic Map
	PE 101	Principles of Turning	<ul style="list-style-type: none"> Introduction to Lathes Major Components of a Lathe Types of Lathes Common Lathe Operations and Applications
PRODUCTION EQUIPMENT	PE 102	Principles of Machining Centers	<ul style="list-style-type: none"> Introduction to Machining Centers Major Components of Machining Centers Types of Machining Centers Common Machining Center Operations
	PE 203	Principles of Grinding	<ul style="list-style-type: none"> Introduction to Grinding Grinding Machine Components and Systems Types of Grinding Machines
	PE 404	Turning Machine Setup	<ul style="list-style-type: none"> Preparing the Machine for Changeover Changing the Workholding Changing the Tooling Loading the Part Program Preparing to Run the First Part
	PE 405	Machining Center Setup	<ul style="list-style-type: none"> Preparing the Machine for Changeover Changing the Workholding Changing the Tooling Loading the Part Program Preparing to Run the First Part
	PT 201	Principles of Workholding	<ul style="list-style-type: none"> Workholding Basics Chucks
PRODUCTION TECHNOLOGIES			

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	PT 202	Principles of Coolants and Oils	<ul style="list-style-type: none"> • Between Centers • Vises • Fixtures • Introduction to Coolants and Oils • Oil-based Cutting Fluids • Chemical-based Cutting Fluids • Gases • Machine Lubricants and Oils • Safety and Maintenance
	PT 303	Principles of Hydraulics	<ul style="list-style-type: none"> • Introduction to Hydraulics • Hydraulic Components • Hydraulic Applications • Hydraulic Safety
	PT 404	Principles of Gear Manufacturing	<ul style="list-style-type: none"> • Gear Technology and Terminology • Gear Generation Shaping • Gear Generation Hobbing • Gear Generation Grinding • Gear Generation Honing • Gear Inspection • Gear Inspection Machines • Reading a K-Chart
QUALITY SYSTEMS	QS 101	ISO 9000 and TS 16949	<ul style="list-style-type: none"> • Quality Systems Overview • International Standards • ISO / TS 16949 Standard Part 1 • ISO / TS 16949 Standard Part 2
	QS 202	Statistical Process Control 1	<ul style="list-style-type: none"> • Understanding Variation • Understanding Probability • Control Charts • Constructing Control Charts
	QS 203	ISO 13485 (Medical Device Manufacturing)	<ul style="list-style-type: none"> • Quality System Overview • ISO 13485 Standard Part 1 • ISO 13485 Standard Part 2

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
QUALITY SYSTEMS (continued)	QS 304	Statistical Process Control 2	<ul style="list-style-type: none"> • Interpreting Control Charts • Process Capability
	QS 405	GMP	<ul style="list-style-type: none"> • GMP
	QS 406	APQP	<ul style="list-style-type: none"> • APQP
SAFETY	SA 101	Safety Practices and Regulations	<ul style="list-style-type: none"> • What is Safety? • Regulating Safety • Practicing Safety in the Workplace
	SA 102	Personal Protective Equipment	<ul style="list-style-type: none"> • Introduction to Personal Protective Equipment • Workplace PPE Requirements • Types of PPE Part 1 • Types of PPE Part 2
	SA 103	Hazardous Communication	<ul style="list-style-type: none"> • Definitions, Uses, and Standards • Hazard Communication Documents
	SA 104	Confined Spaces	<ul style="list-style-type: none"> • Confined Space Safety
	SA 105	Lockout/Tagout	<ul style="list-style-type: none"> • Lockout/Tagout Procedures
	SA 206	Overhead Crane Safety	<ul style="list-style-type: none"> • Operator Requirements • Crane System Overview • Inspection of Crane System • Operating an Overhead Crane
TOOLING	TL 101	Principles of Tooling	<ul style="list-style-type: none"> • Cutting Tool Basics • Cutting Tool Materials • Tool Selection and Tool Life
	TL 202	Tooling for Turning	<ul style="list-style-type: none"> • Turning Tools • Insert Nomenclature • Tool Holder Nomenclature • Boring Bar Nomenclature • Proper Care of Turning Tools • Equipment Assembly
	TL 203	Tooling for Machining Centers	<ul style="list-style-type: none"> • Machining Center Tools • Tooling Nomenclature

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	TL 204	Tooling for Grinding	<ul style="list-style-type: none"> • Proper Care of Machining Center Tools • Equipment Assembly • Grinding Wheels and the Grinding Process • Grinding Wheel Nomenclature • Proper Care of Grinding Wheels • Dressing and Dressing Tools • Mount and Dress a Grinding Wheel
	TL 305	Tooling for Drilling	<ul style="list-style-type: none"> • Introduction to Drills • Drill Terminology • Drill Types • Drill Applications
	TL 306	Tooling for Reaming	<ul style="list-style-type: none"> • Introduction to Reamers • Reamer Terminology • Reamer Types • Reamer Applications
	TL 307	Tooling for Tapping	<ul style="list-style-type: none"> • Introduction to Taps • Tap Terminology • Tap Types • Tap Applications
	TL 308	Tooling for Milling	<ul style="list-style-type: none"> • Introduction to Milling Cutters • Milling Cutter Terminology • Milling Cutter Types • Milling Cutter Applications
	TL 309	Threaded Fasteners	<ul style="list-style-type: none"> • Introduction to Threaded Fasteners • Threaded Fastener Terminology • Threaded Fastener Types • Threaded Fastener Applications

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
EQUIPMENT SPECIFIC	ES 501.1	Haas SL Series - Understanding the CNC Pendant	<ul style="list-style-type: none"> • Machine Safety • Cartesian Coordinate System • CNC Pendant Introduction • Navigating the Display Mode Screens
	ES 501.2	Haas SL Series - Machine Operations	<ul style="list-style-type: none"> • Machine Introduction • Machining Area • Chip Removal & Coolant Systems • Air & Lube Systems • Machine Operations Part 1 • Machine Operations Part 2 • Machine Maintenance
	ES 501.3	Haas SL Series - CNC Programming	<ul style="list-style-type: none"> • CNC Programming Introduction • Programming Safety • Machine Reference Points • Part Drawing to Program • Program Structure • G-Code Definitions • M-Code Definitions • Programming Compensations • Subroutines and Subprograms • Advanced Editor • Quick Code & VQC • Common Tasks • Program Writing Tasks • G- and M- Code Reference
	ES 502.1	Haas VF Series - Understanding the CNC Pendant	<ul style="list-style-type: none"> • Machine Safety • Cartesian Coordinate System • CNC Pendant Introduction • Navigating the Display Mode Screens
	ES 502.2	Haas VF Series - Machine Operations	<ul style="list-style-type: none"> • Machine Introduction • Machining Area • Chip Removal & Coolant Systems • Air & Lube Systems • Machine Operations Part 1

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	ES 502.3	Haas VF Series - CNC Programming	<ul style="list-style-type: none"> • Machine Operations Part 2 • Machine Maintenance • CNC Programming Introduction • Programming Safety • Machine Reference Points • Program Structure • G-Code Definitions • M-Code Definitions • Programming Compensations • Subroutines and Subprograms • Advanced Editor • Quick Code & VQC • Common Tasks • Program Writing Tasks
	ES 503.1	Haas TL Series - Understanding the CNC Pendant	<ul style="list-style-type: none"> • Machine Safety • Machine Movements and Reference Points • CNC Pendant Introduction • Navigating the Display Mode Screens
	ES 503.2	Haas TL Series - Machine Operations	<ul style="list-style-type: none"> • Machine Introduction • Machining Area • Coolant & Air Systems • Machine Operations Part 1 • Machine Operations Part 2 • Machine Maintenance
	ES 503.3	Haas TL Series - CNC Programming	<ul style="list-style-type: none"> • CNC Programming Introduction • Programming Safety • Machine Reference Points • Part Drawing to Program • Program Structure • G-Code Definitions • M-Code Definitions • Programming Compensations • Subroutines and Subprograms • Advanced Editor

CATEGORY
EQUIPMENT SPECIFIC
(continued)

COURSE ID

COURSE TITLE

TOPICS COVERED

ES 503.4

Haas - Intuitive Programming for Lathes

- Common Tasks
- Program Writing Tasks
- G- and M- Code Reference

ES 504.1

Haas TM Series - Understanding the CNC Pendant

- CNC Introduction
- Getting Started with IPS
- Intuitive Programming System
- Profiling in Turn and Face Mode
- Working with Programs

ES 504.2

Haas TM Series - Machine Operations

- Machine Safety
- Machine Movements and Reference Points
- CNC Pendant Introduction
- Navigating the Display Mode Screens

ES 504.3

Haas TM Series - CNC Programming

- Machine Introduction
- Machining Area
- Coolant & Air Systems
- Machine Operations Part 1
- Machine Operations Part 2
- Machine Maintenance

ES 504.4

Haas - Intuitive Programming for Machining Centers

- CNC Programming Introduction
- Programming Safety
- Machine Reference Points
- Program Structure
- G-Code Definitions
- M-Code Definitions
- Programming Compensations
- Subroutines and Subprograms
- Advanced Editor
- Common Tasks
- Program Writing Tasks
- CNC Introduction
- Getting Started with IPS
- Intuitive Programming System
- Irregular Pocket Milling
- Working with Programs

CATEGORY	COURSE ID	COURSE TITLE	TOPICS COVERED
	ES 520.1	Index TNL 26 Series - Machine Overview	<ul style="list-style-type: none"> • Introduction to Swiss Turning • TNL 26 Safety • TNL26 System Overview • TNL 26 Machining Area • TX8i System Console Part 1 • TX8i System Console Part 2 • FMB Material Loading System • Chip Conveyor and Coolant Filtration System
	ES 520.2	Index TNL 26 Series - Machine Operation	<ul style="list-style-type: none"> • Navigating the CNC • Material Loading System Set-up • Manual Operation of the System Axes • Basic Manual Operation • Automatic Operation
	ES 520.3	Index TNL 26 Series - Tooling	<ul style="list-style-type: none"> • Tooling Plans • Presetting Tooling • Assembling a Cutting Tool • Assembling a Drilling Tool • Assembling a Tooling Station • Entering Tool Data
	ES 520.4	Index TNL 26 Series - Repeat Setup	<ul style="list-style-type: none"> • Remove the Counter Spindle • Install the Counter Spindle Assembly • Install the Main Spindle Assembly • Install the Guide Bush Collet • Install the Guide Bust Assembly • Setting Up the Tool Stations • Setting Up the Tool Turrets • Check the Lubrication Levels • Entering Tool Life Data
	ES 521.1	Index MS 32C Series - System Overview	<ul style="list-style-type: none"> • Introduction to Multi-Spindle Machines • Safety Overview • System Overview • The MS 32C CNC Lathe • The lemca Bar Feeder System • Siemens 840D CNC Machine Control Panel

CATEGORY
EQUIPMENT SPECIFIC
(continued)

COURSE ID

COURSE TITLE

TOPICS COVERED

ES 521.2

Index MS 32C Series - Operation

- Siemens 840D CNC Operator Control Panel
- Chip and Coolant Control System
- 840D CNC Screen Navigation
- Operating the MS 32C Lathe
- Operating the Lemca Bar Loader

ES 521.3

Index MS 32C Series - Tooling

- Tooling Plans
- Presetting Tool Assemblies
- Assemble a Turning Tool
- Assemble a Drilling Tool
- Assemble a Boring Tool
- Assemble a Live Tool
- Enter Tool Data into the 840D CNC

ES 521.4

Index MS 32C Series - Maintenance

- MS 32C Basic Maintenance and Lube
- Clamping and Chucking System Maintenance
- Spindle Carrier Area Maintenance
- Hydraulic System Maintenance
- CNC Maintenance Tasks
- Lemca Bar Feed Maintenance
- Cooling System and Filtration System Maintenance
- Checking the Lubrication Levels

AM 101—Principles of Advanced Manufacturing

Introduces the student to advanced manufacturing through study of the technologies, processes, performance objectives, and personnel employed in modern manufacturing. Includes examination of computer technologies, such as CNC, PLC, automation, and software. The student learns how to calculate critical performance objectives, as well as common physical plant layouts and the typical organization of manufacturing personnel and their responsibilities.

AU 201—Principles of Robotics

This course reviews the principles of robotics, including robot applications and benefits. The student learns about robot motion, configurations, and control. Using the ABB robot as a model, this course uses 3-D graphics to allow the student to practice automatic and manual operations.

AU 202—Principles of Factory Automation

Introduces the student to the types and uses of automation found in manufacturing. The student reviews the use of PLCs for material handling and movement, process control systems, workpiece handling, and conveyors.

BP 101—Blueprint Reading

Provides an introduction to reading and interpreting blueprints. The student focuses on reviewing common elements, the alphabet of lines, and the differences between types of drawings. The course also gives dimension definitions for height, width, and depth, and reviews dimension and geometric symbols and datums. This course enhances the student's math and geometry knowledge through practical application.

BP 102—AWS Welding Symbols on Blueprints

Introduces the student to the common weld and welding symbols found on blueprints per standards set by ANSI/AWS A2.4-79. Topics of the course include the distinction between weld and welding symbols, the elements of a welding symbol, overview of welding codes, rules, regulations, and specifications. Focus of the course is on identifying and interpreting the common symbols found on blueprints.

BP 203—General Dimensioning and Tolerances

Provides the student with an understanding of fundamental dimensioning rules, units and types of dimensioning, dimensioning features, and tolerancing methods. The student studies the ASME Y14.5M-1994 standard for uniform dimensions and tolerances, common symbols used for dimensioning, and tolerance practices for part features.

BP 204—Geometric Dimensioning and Tolerancing

Introduces the student to the underlying concepts and practices of GD & T. The focus of the course is on understanding dimensions and tolerances on engineering drawings per the ASME Y14.5M-1994 standard. The student studies datums; geometric rules, types, and characteristics; and tolerance zones.

CN 101—Principles of CNC

Covers the fundamentals of the Computer Numerical Control (CNC) device. The student reviews the history, common components and functions, and common types and functions of CNC machines. The student learns how a CNC machine uses the Cartesian coordinate system and reference points to control machine movement. The course also provides an overview of part programming, including programming methods and program structure and codes.

CN 102—Fanuc CNC Control

This course focuses on the purpose, common components, functions, and operations of the Fanuc CNC. The student learns how to use the Screen Control and soft keys to navigate commonly used screens and how to read and interpret the information on the screens. The student gains practical knowledge of how to perform common operations and troubleshooting tasks using the Fanuc CNC.

CN 303—G-Code Programming for CNC Lathe Operators 1

Introduces the student to the fundamentals of programming for CNC lathes. Course topics include the history of CNC, programming safety, the Cartesian coordinate system, machine reference points, and program components and structure. The student gains practical knowledge of tool restart requirements and process.

CN 304—G-Code Programming for CNC Machining Center Operators 1

Introduces the student to the fundamentals of programming for CNC machining centers. Course topics include the history of CNC, programming safety, the Cartesian coordinate system, machine reference points, and program components and structure. The student gains practical knowledge of tool restart requirements and process.

CN 305—G-Code Programming for CNC Lathe Operators 2

Provides the student with an understanding of CNC programming and practical knowledge on basic program operations. The course focuses on programming safety, structure, G- and M-codes, programming compensations, subroutines, and subprograms. The student gains practical knowledge on writing and editing a part program for a lathe operation.

COURSE DESCRIPTIONS

CN 306—G-Code Programming for CNC Machining Center Operators 2

Provides the student with an understanding of CNC programming and practical knowledge on basic program operations. The course focuses on programming safety, structure, G- and M-codes, programming compensations, subroutines, and subprograms. The student gains practical knowledge on writing and editing a part program for a machining center operation.

CN 407—G-Code Programming for CNC Lathe Operators 3

This 4th level programming course provides an advanced study of CNC programming for lathes. Course topics include programming safety, program components and structure, tool path compensations, part drawings and materials, and tool layout. The student gains practical knowledge for calculating spindle speed and feedrate and creating programming for tool path, program selection, and finalizing.

CN 408—G-Code Programming for CNC Machining Center Operators 3

This 4th level programming course provides an advanced study of CNC programming for machining centers. Course topics include programming safety, program components and structure, tool path compensations, part drawings and materials, and tool layout. The student gains practical knowledge for calculating spindle speed and feedrate and creating programming for tool path, program selection, and finalizing.

LM 101—Introduction to Lean

Introduces the student to the concepts, terms, and application of lean manufacturing principles and practices in the manufacturing process. The course provides an overview of the history and evolution of lean, the benefits of lean process, and the role of management in the lean process.

LM 102—5S

Introduces the student to the principles and methods of workplace organization. The student reviews the 5S tool used for organizing and maintaining the workplace: Sort, Straighten, Shine, Standardize, and Sustain.

LM 203—Lean Theory

Covers the underlying concept of lean manufacturing theory: identifying and eliminating waste. The student studies the elements, rules, and tools of lean theory and how to employ them to eliminate waste.

LM 204—Kanban

Introduces the student to the lean manufacturing system of Kanban. Course topics include the definition and description of the Kanban system, Push and Pull systems,

types, uses, and functions of Kanban, calculating Kanban quantities, and steps for circulating Kanban.

LM 305—Kaizen

Introduces the student to the principles and methods of the Kaizen system. Course topics include the continuous improvement process, the ten principles of Kaizen, Kaizen program selection, Kaizen guidelines, value-added and non-value added processes, and applying Kaizen to the manufacturing process.

LM 306—Value Stream Mapping

Introduces the student to the lean technique of Value Stream Mapping. Course topics include the definition and purpose of Value Stream Mapping, the technology used for Value Stream Mapping, techniques for mapping current state and future state, and the practical knowledge for developing a Value Stream Map.

LM 407—Setup Reduction (SMED)

Introduces the student to the concepts and techniques of Setup Reduction. Course topics include the definition and description of SMED, the gathering of SMED data, separating waste, setup analysis tools, developing standard setups, parallel operations, and the ten rules of Setup Reduction.

LM 408—Total Production Maintenance

Introduces the student to the lean manufacturing process of Total Production Maintenance. Course topics include the benefits of TPM, types of maintenance, establishing autonomous maintenance routines, the six big losses, calculating overall equipment effectiveness, mean time between failures and mean time to repair, and tools to reduce losses.

MA 101—Mathematics 1

This basic math course reviews the math operations and concepts commonly used on the job in the production environment. The student hones skills in addition, subtraction, multiplication, division, fractions, decimals, percentages, averages, ratios, and geometry. This course also exposes students to basic linear problem solving and geometric operations, such as calculating surface area and volume.

MA 202—Algebra 1

An in-depth study of order of operations, functions, factoring, quadratics, polynomials, radicals, and simultaneous equations, exponents, and binomial theory. The course provides practical application of the concepts and methodology for solving the equations presented.

MA 303—Advanced Geometry

An in-depth study of advanced geometric topics, including polygons, quadrilaterals, and solids. The course covers the properties and components of the geometric shapes. The student learns to solve the dimensional and relational equations commonly used in manufacturing and industry.

MA 304—Trigonometry I

Provides the student with an in-depth study of right triangle trigonometry and its applications to practical manufacturing calculations. The student studies the foundations of trigonometry, including lines, components and types of angles, and angle measurement. Topics of focus include triangles, the Pythagorean Theorem, understanding and calculating trigonometric ratios and inverse functions, and the components of circles and their relationship to angles.

ML 201—Principles of Materials – Ferrous Metals

Introduces the properties, elements, and types of ferrous materials commonly employed in metal manufacturing. The student learns the basics of steel manufacturing, the elements used to create steel and steel alloys, the main types of ferrous materials and their properties, and the common tests used to measure metal properties.

ML 202—Principles of Materials – Non-Ferrous Metals

Introduces the properties, elements, and types of non-ferrous materials commonly employed in metal manufacturing. The student learns the basics of the non-ferrous material manufacturing process, the elements used to create non-ferrous materials, the main types of non-ferrous materials and their properties, and the common tests used to measure metal properties.

ML 303—Principles of Heat Treating

Studies the fundamentals of thermodynamics and reactions occurring in metals subjected to various kinds of heat treatment. The course provides an overview of heat treating and the heat treating process, as well as the types of heat treating.

MT 101—Inspection Techniques I

Introduces the student to the purpose and use of gauges. The course focuses on identifying and using commonly used gauges, including: variable analog and digital gauges, micrometers, Go / NoGo plug gauges, thread gauges, and attribute gauges. The student learns how to verify calibration, use gauge masters for accurate measurement, and care for and store gauges when not in use.

MT 202—Surface Plates

Focuses on the types and uses, components and accessories, and best practice uses and applications of surface plates.

MT 203—Gauge Blocks

Focuses on the types and uses, components and accessories, and best practice uses and applications of gauging blocks.

MT 204—Test Indicators

Focuses on the types and uses, components and accessories, and best practice uses and applications of test indicators.

MT 205—Height Gauges

Focuses on the types and uses, components and accessories, and best practice uses and applications of height gauges.

MT 206—Bench Comparators

Focuses on the types and uses, components and accessories, and best practice uses and applications of bench comparators.

MT 207—Optical Comparators

Focuses on the types and uses, components and accessories, and best practice uses and applications of optical comparators.

MT 208—Bore Gauges

Focuses on the types and uses, components and accessories, and best practice uses and applications of bore gauges.

MT 209—Air Gauges

Focuses on the types and uses, components and accessories, and best practice uses and applications of air gauges.

MT 210—Specialty Micrometers

Focuses on the types and uses, components and accessories, and best practice uses and applications of micrometers.

MT 211—Miscellaneous Inspection Instruments

Focuses on the types and uses, components and accessories, and best practice uses and applications of sine plates, radius gauges, hardness gauges, Rockwell testers, and other inspection instruments.

COURSE DESCRIPTIONS

MT 212—Inspection Instrument Selection

Introduces the student to the principles and concepts of selecting inspection instruments. Course topics include gauge R&R and best practices.

MT 313—Inspection Techniques 2

This 3rd level course continues the study of inspection techniques. Course topics include measuring flatness, parallelism, roundness, cylindricity, perpendicularity, angularity, run-out and total run-out, concentricity, true position, symmetry, and profile of a line and surface.

MT 314—Coordinate Measuring Machines

Introduces the student to Coordinate Measuring Machines (CMM) through a study of their components, applications, fixturing, and operations. The course focuses on understanding the purpose of CMMs; the form, fit, and function of the various components; common fixtures and their applications; and CMM operations.

PD 101—Communication Skills

Explains the importance of effective communication, listening skills, and feedback. Upon completion, the student will be able to identify the roles of the sender and receiver and explain the effects of encoding and decoding. The student also learns to identify the barriers to effective communication and the appropriate types of communication to use in various situations.

PD 102—Conflict Resolution

Defines conflict for the student and identifies the strategies used to manage it. The student learns to identify the sources of the conflict and categorize the conflict as positive or negative. The course also covers active listening skills and strategies to minimize the negative effects of conflict.

PD 103—Working in Groups

Provides the student with an overview of groups and group decision-making. The student studies group types, group formation, and the components and attributes of working effectively in a group. The student also learns about the advantages and disadvantages of group decision-making, as well as the best decision-making strategies for any situation.

PD 404—Train the Trainer

This 4th level development course provides an overview of critical topics related to training development and delivery to prepare the student to lead a training event. Topics include adult learning theory, learning styles, design of objectives and standards, training techniques, and presentation skills.

PE 101—Principles of Turning

An overview of the equipment and applications used in the turning process. The student learns the history of lathes, major components of manual and CNC lathes, the major types of lathes, and common turning operations.

PE 102—Principles of Machining Centers

An overview of the equipment and applications used in the machining process. The student learns the history of machining centers, major components of horizontal and vertical machining centers, major types of machining centers, and common machining center operations.

PE 203—Principles of Grinding

An overview of the equipment and applications used in the grinding process. The student learns the history of grinding machines, major components of grinding machines, major types of grinding machines, and common grinding operations.

PE 404—Turning Machine Setup

Provides the knowledge and skills required for performing a setup on a lathe. The student learns the steps to complete each task in the setup/changeover process. Topics include machine preparation, changing workholding, changing tooling, loading the part program, and preparation to run the first part.

PE 405—Machining Center Setup

Provides the knowledge and skills required for performing a setup on a machining center. The student learns the steps to complete each task in the setup/changeover process. Topics include machine preparation, changing workholding, changing tooling, loading the part program, and preparation to run the first part.

PS 401—Analytical Problem Solving Tools 1

Introduces the student to graphical tools and analytical techniques used in the diagnosis of production problems. The course focuses on teaching the student how to create and properly interpret distribution plots, paired data plots, time series plots, and data maps. The course provides practical instruction of proper techniques for gathering and plotting data, as well as common presentation pitfalls to look out for when selecting and presenting the tools.

PS 402—Analytical Problem Solving Tools 2

Provides an advanced study of graphical and analytical tools, including multi-vari charts, small multiples data maps, the Function Analysis Systems Technique (FAST), and

the Analytical Logic Map. The course focuses on understanding each tool, providing practical instruction on how to construct each tool, and how to incorporate the tool into a diagnostic strategy.

PT 201—Principles of Workholding

Introduces the student to the theory and concepts of workholding and the devices used for locating and securing workpieces. The student studies the fundamentals of the workholding process and the components, operations, and maintenance of the major types of workholding devices.

PT 202—Principles of Coolants and Oils

Introduces the student to the fundamentals of the major types of coolants and oils used in manufacturing. The course covers oil-based and chemical-based cutting fluid, gases, and machine lubricants and oils. The course focuses on the properties, purpose, application, and safety issues of each type of coolant and oil.

PT 303—Principles of Hydraulics

Introduces the student to the theory and application of hydraulics in manufacturing. The student studies the fundamentals of hydraulic theory; the form, fit, and function of components of a Hydraulic system; common applications of hydraulics in manufacturing; and how to safely operate and maintain Hydraulic systems.

PT 404—Principles of Gear Manufacturing

Introduces the student to the concepts, technology, terminology, and operations required to manufacture gears. The student gains an understanding of the fundamentals of gear design; the various manufacturing processes used to create a gear, including shaping, hobbing, grinding, and honing; and the tools and methods used for gear inspection.

QS 101—ISO 9000 and TS 16949

Defines a quality management system in terms of history, benefits, and the various uses and types of quality systems. After learning about the role of the International Organization for Standardization (ISO), the student reviews the purpose and key points of the eight elements of ISO / TS 16949, as well as the required documentation for this quality system. The student also learns the significance of a "shall statement."

QS 202—Statistical Process Control 1

Introduces the student to concepts of variation and probability and the Control Chart tool. The course defines variation and explains how it impacts the production process. The course also defines probability and teaches the student to use histograms to find the

variability or the standard deviation of a distribution. The student then learns how to calculate and plot the required statistics to construct Control Charts.

QS 203—ISO 13485 (Medical Device Manufacturing)

Reviews the ISO 13485 Quality Management System regulation for medical device companies. Course topics include the description and purpose of ISO 13485, an in-depth review of each clause of the regulation, compliance procedures, and requirements for management and operator roles.

QS 304—Statistical Process Control 2

This 2nd level course continues the study of Statistical Process Control by focusing on how to interpret Control Charts. The student learns how to recognize the difference between points within and outside statistical control limits, and the difference between variations within assignable causes and system causes. The student also studies how to interpret graphical information to determine process capability and how to calculate the capability index of a machine or process.

QS 405—Good Manufacturing Practice (GMP)

Provides an overview of Good Manufacturing Practice guidelines issued by the FDA. The course gives a definition and description of regulations and their relationship to other quality systems, a definition of GMP terminology, and the application of GMP to the manufacturing process.

QS 406—Advanced Product Quality Planning (APQP)

Provides an overview of the generic Advanced Product Quality Planning program, including the program definition and description, product/process design and development, product/process validation, feedback and corrective action, and control plan methodology. The student learns the purpose and application of APQP, the content and timing of APQP phases, the various inputs and outputs of each phase, and documentation requirements for APQP.

SA 101—Safety Practices and Regulations

Reviews basic workplace safety concepts and practices. The course focuses on the common causes of workplace accidents and injuries, the role of OSHA and other federal and state agencies in regulating safety, and workplace safety initiatives.

SA 102—Personal Protective Equipment

Reviews the importance of Personal Protective Equipment (PPE) in maintaining a safe working environment. The course focuses on identifying the potential hazards that

COURSE DESCRIPTIONS

require PPE, types of PPE to mitigate those hazards, and the worker's role in following PPE guidelines and requirements.

SA 103—Hazardous Communication

Reviews the definitions, uses, and standards related to hazardous materials. The student learns how to use and understand a Material Safety Data Sheet (MSDS), hazardous chemical labels, the Hazardous Material Identification System (HMIS), and the HMIS color bar.

SA 104—Confined Spaces

Reviews the hazards involved in entering and working in a confined space and OSHA's requirements for entry permit programs. The course focuses on the procedures and responsibilities for those who enter and monitor workers in confined spaces, as well as the required equipment for entering a confined space.

SA 105—Lockout/Tagout

Reviews the purpose, procedures, requirements, and devices used for lockout/tagout (LOTO). In addition to learning when to use LOTO, students discover the four factors of an effective energy-control program (ECP) and its requirements.

SA 206—Overhead Crane Safety

Reviews the requirements for safe operation of overhead crane equipment. The course focuses on understanding the components of an overhead crane system, as well as the safety requirements and practices for the safe operation and inspection of the overhead crane.

TL 101—Principles of Tooling

Introduces the student to the tools used for metal cutting on lathes and machining centers. The course reviews basic concepts in metal removal, tool materials and their properties, and tool selection and maintenance. The student learns the major types of tools, cutting applications, materials and properties of tools, and the types and causes of tool defects.

TL 202—Tooling for Turning

An in-depth study of the major types of tooling used for turning operations. The course reviews the components of each type, including insert, tool, and tool holder types. The student also studies the ANSI and ISO nomenclature standards for inserts, tool holders, and boring bars, and learns the proper care of tooling. The course includes practical lessons on assembling and mounting turning tools.

TL 203—Tooling for Machining Centers

An in-depth study of the major types of tooling used for machining center operations. The course reviews the major components of each type, including inserts, tool, and tool holder types. The student also studies the ANSI and ISO nomenclature standards for machining center tools, as well as the proper care of tooling. The course includes practical lessons on assembling and mounting machining center tools.

TL 204—Tooling for Grinding

An in-depth study of the major types of grinding wheels used for grinding operations. The course reviews the fundamentals of grinding wheels and grinding operations. The student also studies the ANSI and ISO nomenclature standards for grinding wheels, as well as proper dressing types and methods and care of grinding wheels. The course includes practical lessons on dressing and mounting grinding wheels.

TL 305—Tooling for Drilling

Introduces the student to drill tools used for metal cutting. The course focuses on drill terminology, types and properties, and applications.

TL 306—Tooling for Reaming

Introduces the student to reaming tools used for metal cutting. The course focuses on reamer terminology, types and properties, and applications.

TL 307—Tooling for Tapping

Introduces the student to tapping tools used for metal cutting. The course focuses on tapping terminology, types and properties, and applications.

TL 308—Tooling for Milling

Introduces the student to milling tools used for metal cutting. The course focuses on mill cutter terminology, types and properties, and applications.

TL 309—Threaded Fasteners

Covers the selection, proper tightening, and applications of threaded fasteners. The course focuses on the types, grades, and markings of threaded fasteners. The course also introduces the concepts of torque and loads in relation to fasteners.

ES 501.1—Haas SL Series – Understanding the CNC Pendant

This course introduces the student to the fundamentals of the CNC Pendant used on the Haas SL Series lathe. The student reviews the general safety practices and features of the Haas SL Series machine, the Cartesian coordinate system and how it relates to the axes and movements of the lathe components, the purpose and function of the CNC Pendant, and the functions of the keys and buttons of the CNC Pendant. Also provides practical knowledge of the Display and Mode screens of the CNC Pendant.

ES 501.2—Haas SL Series – Machine Operations

This course introduces the student to the components, systems, and operations of the Haas SL Series lathe. The student reviews the major systems and components of the lathe and gains practical knowledge of the operations and maintenance of the machine.

ES 501.3—Haas SL Series – CNC Programming

This course introduces the student to the fundamentals of G- and M-code programming on the Haas SL Series lathe. The student reviews CNC programming, including programming safety, machine reference points, program structures, G- and M-code definitions, programming compensations, subroutines and subprograms, advanced editor, Quick Code, and VQC. Students also gain practical knowledge of working with and editing programs, and they learn program writing tasks including creating a lathe program format, along with face, turn, and radius program code.

ES 502.1—Haas VF Series – Understanding the CNC Pendant

This course introduces the student to the fundamentals of the CNC Pendant used on the Haas VF Series vertical machining center. The student reviews the general safety practices and features of the Haas VF Series machine, the Cartesian coordinate system and how it relates to the axes and movements of the vertical machining center components, the purpose and function of the CNC Pendant, and the functions of the keys and buttons of the CNC Pendant. Also provides practical knowledge of the Display and Mode screens of the CNC Pendant.

ES 502.2—Haas VF Series – Machine Operations

This course introduces the student to the components, systems, and operations of the Haas VF Series vertical machining center. The student reviews the major systems and components of the vertical machining center and gains practical knowledge of the operations and maintenance of the machine.

ES 502.3—Haas VF Series – CNC Programming

This course introduces the student to the fundamentals of G- and M-code programming on the Haas VF Series vertical machining center. The student reviews CNC programming, including programming safety, machine reference points, program structures, G- and M-code definitions, programming compensations, subroutines and subprograms, advanced editor, Quick Code, and VQC. Students also gain practical knowledge of working with and editing programs, and they learn program writing tasks including creating a mill program format and G-code programs for a mill.

ES 503.1—Haas TL Series – Understanding the CNC Pendant

This course introduces the student to the fundamentals of the CNC Pendant used on the Haas TL Series lathe. The student reviews the general safety practices and features of the Haas TL Series lathe, the Cartesian coordinate system and how it relates to the axes and movements of the lathe components, the purpose and function of the CNC Pendant, and the functions of the keys and buttons of the CNC Pendant. Also provides practical knowledge of the Display and Mode screens of the CNC Pendant.

ES 503.2—Haas TL Series – Machine Operations

This course introduces the student to the components, systems, and operations of the Haas TL Series lathe. The student reviews the major systems and components of the lathe and gains practical knowledge of the operations and maintenance of the machine.

ES 503.3—Haas TL Series – CNC Programming

This course introduces the student to the fundamentals of G- and M-code programming on the Haas TL Series lathe. The student reviews CNC programming, including programming safety, machine reference points, program structures, G- and M-code definitions, programming compensations, subroutines and subprograms, advanced editor, Quick Code, and VQC. Students also gain practical knowledge of working with and editing programs, and they learn program writing tasks including creating a lathe program format, along with face, turn, and radius program code.

ES 503.4—Haas – Intuitive Programming for Lathes

This course introduces the student to the Intuitive Programming System software used to create CNC programs on lathes. The student reviews the purpose and function of IPS and the navigation of the IPS software and gains practical knowledge for creating and editing programs with IPS. Topics include learning manual operations, navigating and operating in various modes, profiling in Turn and Face mode, and recoding and saving IPS programs.

EQUIPMENT SPECIFIC COURSE DESCRIPTIONS

ES 504.1—Haas TM Series – Understanding the CNC Pendant

This course introduces the student to the fundamentals of the CNC Pendant used on the Haas TM Series vertical machining center. The student reviews the general safety practices and features of the Haas TM Series machine, the Cartesian coordinate system and how it relates to the axes and movements of the vertical machining center components, the purpose and function of the CNC Pendant, and the functions of the keys and buttons of the CNC Pendant. Also provides practical knowledge of the Display and Mode screens of the CNC Pendant.

ES 504.2—Haas TM Series – Machine Operations

This course introduces the student to the components, systems, and operations of the Haas TM Series vertical machining center. The student reviews the major systems and components of the vertical machining center and gains practical knowledge of the operations and maintenance of the machine.

ES 504.3—Haas TM Series – CNC Programming

This course introduces the student to the fundamentals of G- and M-code programming on the Haas TM Series vertical machining center. The student reviews CNC programming, including programming safety, machine reference points, program structures, G- and M-code definitions, programming compensations, subroutines and subprograms, advanced editor, Quick Code, and VQC. Students also gain practical knowledge of working with and editing programs, and they learn program writing tasks including creating a machining centers program format and G-code programs for a machining centers.

ES 504.4—Haas – Intuitive Programming for Machining Centers

This course introduces the student to the Intuitive Programming System software used to create CNC programs on machining centers. The student reviews the purpose and function of IPS and the navigation of the IPS software and gains practical knowledge for creating and editing programs with IPS. Topics include learning manual operations, navigating and operating in various modes, reviewing irregular pocket milling and the Profile Creator feature, and recoding and saving IPS programs.

ES 520.1 Index TNL 26 Series – System Overview

This course introduces the major systems, components, and technologies of the Index TNL 26 Series Swiss Turn lathe. The student reviews the history of Swiss turning, safety features, the components and functions of the machining area, the TX 8i System Console, material loading, and the chip conveyor and coolant filtration systems.

ES 520.2 Index TNL 26 Series – Operation

An in-depth review of the features and screens for the TX 8i System Console of the Index TNL 26 Series Swiss Turn lathe. The student learns to navigate the TX 8i and perform basic operations using the system.

ES 520.3 Index TNL 26 Series – Tooling

An overview of the tooling operations for the Index TNL 26 Series Swiss Turn lathe. Topics include tooling plans, presetting tools, and how to assemble tools. The student also gains practical knowledge on how to enter tooling data into the TX 8i System Console.

ES 520.4 Index TNL 26 Series – Repeat Setup

An overview of the repeat set-up operations for the Index TNL 26 Series Swiss Turn lathe. The student gains practical knowledge on how to remove and install the counter spindle, install the main spindle assembly, guide the bush collet, guide the bush assembly, set up tool stations and turrets, check lubrication levels, and enter tool life data.

ES 521.1 Index MS 32C Series – System Overview

This course introduces the major systems, components, and technologies of the Index MS32C Series Multi-spindle lathe. The student reviews the history of multi-spindle lathes, safety features, the components and functions of the system and the lathe, the Siemens 840D CNC, the IEMCA bar feeder system, and the chip and coolant control system.

ES 521.2 Index MS 32C Series – Operation

An in-depth review of the features and screens for the Siemens 840D CNC of the Index MS32C Series Multi-spindle lathe. The student learns to navigate the 840D CNC and perform basic operations using the system. The course also covers the automatic and manual loading of material.

ES 521.3 Index MS 32C Series – Tooling

An overview of the tooling operations for the Index MS32C Series Multi-spindle lathe. Topics include tooling plans, presetting tools, and how to assemble tools. The student also gains practical knowledge on how to enter tooling data into the 840D CNC.

ES 521.4 Index MS 32C Series – Maintenance

An overview of the basic maintenance guidelines and tasks for the Index MS32C Series Multi-spindle lathe. The student gains practical knowledge on how to maintain the clamping and chucking system, spindle carrier area, hydraulic system, CNC, bar feeder system, and cooling and filtration systems.

Oxygen Education, LLC
7820 Innovation Blvd. Suite 250
Indianapolis, IN 46278

317.275.5959
o2ed.com

